



WPI

Exploring the City of Islands:

Interactive Resources for Analyzing the Islands of Venice

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Authorship

The creation of this paper was a group effort with all members contributing to its construction as well as its editing and finalization for submission. Each member of the group wrote an equal portion of this paper. For a detailed breakdown of each team member's individual contribution, see below.

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Abstract

Our project team created a unified database of demographic, dimensional, historical, and cultural information pertaining to each of the 166 islands in the Venetian Archipelago. Deliverables included online encyclopedia entries, an interactive map application that will help users access and compare island information, and bibliographic resources. We also created prototypes for booklets and brochures on the lesser known islands of Venice. Each deliverable creates easy access to information on this historic city for tourists, researchers and city officials alike.

Executive Summary

The historic city of Venice and its surrounding lagoon are important cultural sites that have had a long and rich history spanning nearly two thousand years. This well-documented history has resulted in many publications on Venice and its famous attractions, but it is sometimes difficult to find comprehensive information on specific islands within the archipelago. The goal of this project was to create a single, complete, and easily accessible source of information on all the Islands of Venice, and to promote the preservation and revitalization of abandoned Minor Lagoon Islands.

This goal was achieved by working towards the following objectives:

1. To collect and organize information on the Lagoon Islands
2. To collect and organize information on the Inner City Islands
3. To publish comprehensive information on all the Islands of Venice
4. To create an Interactive Visualization Tool: *The Isolario Interattivo*



The first two objectives focused on collecting and organizing a comprehensive dataset on each island of Venice. For the context of this project, an island is defined as any piece of land, surrounded by water, which contains human artifacts, excluding the *casone*, which are fishing lodges in the lagoon. This includes the 126 Inner City Islands of the historic center, eight Major Lagoon Islands, and thirty-two Minor Lagoon Islands. The data set collected for each island included dimensional data, island accessibility, island usage, historical information, demographic data, points of interest, and photographs.

Dimensional data on each island was calculated from detailed maps of Venice. Data on island accessibility, usage, and history were then collected through various scholarly publications. Demographic data on Venice were gathered from past censuses, which was most relevant to the Inner City Islands. Traditionally, demographic information for the city has been reported in terms of census tracts, which change from year to year, and aren't organized by island. By reorganizing this information on a per-island basis, trends in the demographics of the city could be analyzed on a much more stable basis. Remaining information was collected from the resources available through the Venice Project Center.

The first set of many valuable resources created were island-specific bibliographies. The electronic reference management tool, Zotero, was used to catalogue and tag each reference by island, so that an island's unique bibliography can be accessed from other web applications.

Once a full set of data on each of the 166 islands was collected, the third objective was to publish this information on the following platforms, both online and in print:

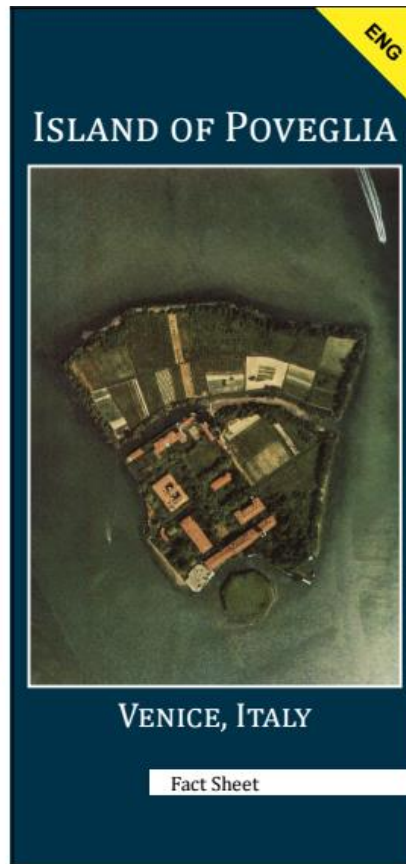
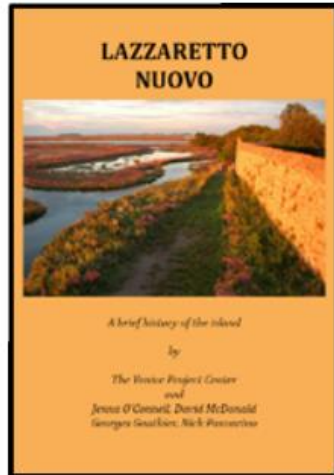
- Online Venipedia Pages
- Printed Booklet on the island of Lazzaretto Nuovo
- Printed Brochure on the island of Poveglia

Venipedia is a Venice-centered online encyclopedia on Venice that is managed by the Venice Project Center. Prior to this project, no information on the islands of Venice existed in Venipedia. After developing a template for publishing the information as Venipedia pages, the following categorial pages were created: a singular “Island” page, defining an island in the context of this project; the Inner City, Major Lagoon, Minor Lagoon island types; and an island group page for each major lagoon island. Then, after the team had gathered and organized information on each individual island, a total of 197 Venipedia pages, each on a single island, were generated. These pages all follow a similar format to ensure that the same information is reported on each island of Venice. A template of a Venipedia page on an individual island of Venice is shown in the following image.

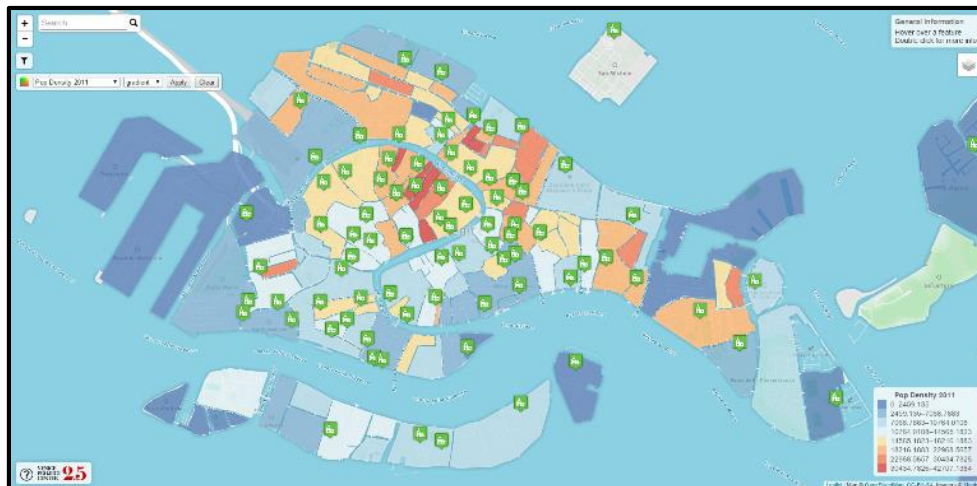
The screenshot shows a Venipedia page for the "Island of San Lazzaro degli Armeni". The page layout includes a header with the Venipedia logo and user navigation options (Djmcdonald, Talk, Preferences, Watchlist, Contributions, Log out). Below the header is a search bar and a "Page" dropdown menu set to "Discussion". The main title is "Island of San Lazzaro degli Armeni". A note states: "This article is about the island of San Lazzaro degli Armeni. For the definition of an island in the context of the Venice Project Center's work, refer to the Island and Islands pages. For more generalized information on Minor Lagoon Islands, see Minor Lagoon Islands." A table of contents lists sections: 1 About, 2 Accessibility, 3 Dimensional Data, 4 Demographic Data, 5 Interactive Media, 6 Map, 7 See Also, 8 References, and 9 External Links. The "About" section contains text: "San Lazzaro degli Armeni is home to a functional monastery of Armenian monks. They are all multilingual and produce tourist information on their island in several languages on their 16th century printing press. The island was one of Lord Byron's favorite places to visit. The island of San Lazzaro degli Armeni is categorized as an monastery. San Lazzaro degli Armeni is a minor island, and is located in sestiere IM." An "Accessibility" section notes: "San Lazzaro degli Armeni has the following boat stop(s): San Lazzaro. These boat stop(s) can be accessed using line(s): 20". On the right side, there is a "Basic Information" table:

Island of San Lazzaro degli Armeni	
Codice	IM
ID Number	1028
Type	monastery
Usage	monastery
Handicap Accessible	yes
Inhabited	yes

In addition to these online publications, a physical booklet was produced on the island of Lazzaretto Nuovo, and a brochure was produced on the island of Poveglia. The booklet contained sections on the island’s history, restoration, usage today, a firsthand account of the team’s visit to the island, a timeline of important events, and an extensive bibliography. The brochure on Poveglia contained a shortened version of each of these sections as well as information about the association Poveglia per Tutti’s plans to revitalize the island. The aims of these publications were both to make information on these islands more easily accessible, and to promote the preservation and revitalization of the abandoned islands of Venice. Sample images of each publication are shown below.



The fourth objective focused on developing interactive and visual platforms to display this island specific information. These platforms were created in a manner that allowed for each to be linked to each other and to other relevant publications produced and developed by this project. The most significant interactive web application developed by this team was the *Isolario Interattivo*. The *Isolario Interattivo* allows for its users to view all of the information we had stored in the spreadsheets, and other relevant data stored by the VPC on a visual map of the archipelago. A screenshot of the application is shown below. The application can be accessed at islands.veniceprojectcenter.org.



The *Isolario Interattivo* has been designed so that it is intuitive for new users to interact with. The application contains several important tools and features that allow users to choose content which they would like to be displayed on the map. One such tool is a search bar that allows for users to locate specific islands in the Venetian Archipelago by searching their name. Users also have the ability to view additional data from the Venice Project Center's online repositories of information, such as convent and bell tower locations throughout the city. In order to make it as easy as possible to visualize data trends across all islands, the application also contains filtering and coloring tools for manipulating map content. Users have the ability to selectively filter information being shown on the map to reduce the overall amount of content being displayed, and to color-code islands to match various data trends. By clicking on a specific island, users are able to open a popup window containing statistics and generalized information, as well as links to the island's bibliography, Venipedia page, and other online applications containing information on that island. One other useful feature of this application is its ability to track a user's location and to display information on map features located in the vicinity of the user. In addition to these features, the *Isolario Interattivo* was created with an easily accessible help page for new users.

Along with creating the *Isolario Interattivo*, this team also focused on further developing the Historical Map Explorer, an online application developed by past Venice Project Center Teams. It allows users to view historical maps of Venice, such as the de'Barbari Map, and also overlays key features such as islands, bell towers, and bridges. These updates included correcting island names in this application so they match actual islands, and creating links to this application from the newly created *Isolario*.

This project filled the need for a single unified database that provides access to all varieties of information on the city of Venice and its islands. This helps raise awareness for abandoned islands and promotes revitalization efforts. Our deliverables make the content from this database easier to search and to connect with. Future teams may use these tools as they continue to add information and resources on Venice. Venipedia, Zotero, the Historical Map Explorer, and the *Isolario* all can be updated as new resources and information are added to the VPC's repositories. This allows for a database that is always current.

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1. Introduction

The city of Venice has served as an important center of history and culture for many centuries. Venice is unique since it has retained much of its original architecture and aesthetic design despite the wear of time. Maintaining all of the historical and cultural information of the city is just as important as the physical upkeep of the city itself. To understand and preserve the city and its history scholars, tourists, and government officials need access to large amounts of well-organized information on various aspects and parts of the city. A useful way to organize these resources and datasets is by spatially indexing and making them widely available online. This makes it so that anyone with access to the Internet can quickly and easily find information on cities based on geographic region. Despite already being divided into sets of islands that could easily serve as ideal references for spatial indexing, Venice does not currently have a database that organizes information in this way.

The city of Venice is comprised of so many islands that few sources can agree on the same number. Overall, this project has identified 166 individual islands in the Lagoon.¹ Because of these islands, the city is not structured like a traditional city: each island has its own unique history that makes it like a smaller city within Venice. In addition to all of these islands, Venice is also part of the Province of Venezia which includes several cities that surround the lagoon. As a result, many different areas of land can be attached to the name Venezia, each with their own unique history and identity, creating a myriad of data that makes it very hard to find the right information.

When searching for information on specific islands of Venice, it is difficult to find the information all from one source. Much of the easily accessible information on Venice is only about the city as a whole with highlights of popular attractions, but there are fewer reliable sources on specific individual islands, especially those that are less famous. Information on specific islands and *sestiere* within the inner city is still available, but it is scattered across endless travel sites or guides, which are not the most reliable sources. Sifting out information on a single island in Venice quickly becomes an arduous task. This lack of organization is not only a hindrance for visitors looking to learn about the beautiful city, but for the Venetians who wish to learn more about their home. Without easy access to quality information on the various islands of the Venetian archipelago, it is more difficult to perform tasks such as promoting public awareness on the preservation and revitalization of islands in the Lagoon, especially the lesser known ones. Quality sources that do exist on Venice's islands are also often written in Italian, and this creates a barrier for non-Italian speakers. This project aimed to address these problems by creating an easily accessible database where anyone can go for specific information they need on any island of Venice.

Several projects have been done in the past to catalog and otherwise describe the city of Venice such as the *Atlante della Laguna*², a scientific atlas describing various aspects of the lagoon, research by WPI students at the Venice Project Center, or VPC, on all areas of the city from bell towers to shops, and old *Isolarii*, which are traditional books detailing a grouping of islands. While these past efforts have been extremely valuable, they fall short in several areas.

¹ F Carrera, personal communication, September 2, 2015

² Atlante della Laguna. Retrieved from <http://www.silvenezia.it>

Both the *Atlante della Laguna* and the old *Isolarii* are written in Italian and the VPC research is not organized into one single set of data. No single source contains a comprehensive list of information, sorted by island, in English. To find information pertaining to a specific island, one would need to search each source separately for different categories of data. For example: one source may contain census information, but nothing about history or culture.

This project aimed to resolve these issues by assembling a single, complete, and easily accessible set of information on all islands of Venice. Wiki pages were created for each island in the Venetian Lagoon. These pages contain cultural and historical information, and up to date data from the Venice Project Center's database. To visualize this information and make it more easily accessible, an interactive tool, the *Isolario Interattivo*, was created which allows users to navigate the islands geographically and search and display relevant information on each. It also provides links to related wiki pages and further bibliographic references. Lastly, the first in a series of booklets on Minor Lagoon Islands will be published to serve as a template for future teams to continue this work. These booklets will help to promote the preservation and revitalization of abandoned islands. These new project deliverables help to fill the need for a complete and spatially indexed guide to each island in the city.

2. Background



Figure 1. An aerial view of the Venetian Lagoon

The Venetian Lagoon, shown in Figure 1, covers approximately 550 square kilometers, and consists of about 9% land, 11% open water and canals, and 80% mud flats, tidal shallows, and marshes.³ The historic center of the city of Venice is an archipelago of 126 islands with 40 more islands located in the lagoon for a total of 166 islands. An island is defined as “any piece of land, surrounded by water, which contains human artifacts, excluding the *casone*.”⁴ The lagoon is the largest wetland in the Mediterranean Basin, and UNESCO has named Venice and its lagoon a World Heritage City.⁵

The Lagoon’s rich history extends back over two thousand years which leads to an extensive amount of information on Venice and its surroundings, so much that it is easy for researchers to become lost in this overwhelming sea of sources. The only way to conduct quality research on the individual islands of Venice is to sift through generalized information on the city as a whole with the hope of finding something relevant, or to sort through countless travel guides which may or may not have island-specific information. Almost all island-specific historical information available is written in Italian, and there is almost no information available on the Minor Lagoon Islands in any language. Any information that is published in English is scattered and therefore it is hard to find exactly what is needed. While information does exist on Venice, the most informative sources are only in Italian. As an example, analysis of search results from searches on both Venice and the Island of Poveglia can be found in Appendix A: Search Results. As shown there, the most reliable sources are in Italian, which is an inconvenience for non-Italian speaking researchers. When searching for Poveglia a large number of sources are only found based on a single mention of the island name, and are not about the island or its history. The aim of this project is to fill the need for a single, complete, comprehensible, and easily accessible set of information on all the islands of Venice. Since the Venetians have structured their city on an island-by-island basis, one logical way to organize information on history and culture is by island.

2.1 The Origin of the Venetian Islands

Islands had been forming in the lagoon for many years, but were not used until around the fifth century. The first settlers of Venice were refugees fleeing invaders of the declining Roman Empire. These first Venetians originally settled on the islands of



Figure 2. Venetians Building Wooden Foundations⁶

³ Poggioli, Sylvia "MOSE Project Aims to Part Venice Floods".

⁴ F Carrera, personal communication, September 23, 2015

⁵ "Venice and Its Lagoon." UNESCO World Heritage Centre. Accessed September 10, 2015.

⁶ "The Construction of Venice, the Floating City." Ancient Origins. June 14, 2014. Accessed September 24, 2015.

Torcello, Iesolo, and Malamocco.⁷ Though these were at first temporary settlements, they gradually became more permanent residences. The Venetians drove pilings into the marsh to support the wooden platforms and foundations of their new city as shown in Figure 2. Eventually, these wooden foundations were replaced by stone⁸ and the city began to grow even more. See Appendix B: List of the Venetian Islands for a list of islands and Appendix C: Maps for detailed maps of the modern day lagoon.

2.2 Major Lagoon Islands

Outside of the 126 Inner City Islands, Venice has thirty-two Minor Lagoon Islands and eight Major Lagoon Islands: Murano, Sant’Erasmus, Vignole, Burano, Mazzorbo, Torcello, and the two *lidi*: Lido di Venezia and Pellestrina. A *lido* is a long, narrow, barrier islands outside the inner city that separates the lagoon from the Adriatic Sea. A Major Lagoon Island is classified as any inhabited landmass entirely surrounded by water, with human structures, that is over 0.02 km² in area. Some of these islands are made of several smaller sub-islands. These major islands all have a unique history and have specific uses within the context of the city as a whole. Table 1 lists these major islands, their sub-islands, and basic statistics, such as area, perimeter, and population. See Appendix C.2 for a labeled map of these islands.

Table 1: List of Major Lagoon Islands

Name	Number of Sub-Islands	Area (km ²)	Perimeter (km)	Total Population
Murano	7	1.2	15.6	4,506
Sant’Erasmus	2	3.2	19	693
Vignole	5	0.9	12.5	56
Burano	4	0.2	5.3	2,658
Mazzorbo	3	0.5	11.5	308
Torcello	9	0.4	11.8	17
Lido di Venezia	9	7.4	63.2	16,869
Pellestrina	1	2.3	32.8	3,896

2.3 Minor Lagoon Islands

Apart from the eight Major Lagoon Islands there are also 32 Minor Lagoon Islands in the lagoon. See Appendix C.3 for a labeled map of the Minor Lagoon Islands. A Minor Lagoon Island is defined as any landmass entirely surrounded by water, with human artifacts, and under 0.2 km² in area. These islands can be either inhabited or uninhabited and belong to one of four categories based on their original use: *batterie*, *ottagoni*, *ospedali* and convents/monasteries. Some of these minor islands have been revitalized as hotels and private residences.

⁷ Ibid.

⁸ Ibid.



Figure 3. San Secondo

2.3.1 Batterie

The *batterie* consist of ten abandoned islands in the lagoon that used to have fortifications on them to defend against intruders from the mainland. Specifically, they had artillery positioned to fire toward the mainland.⁹ Figure 3 shows a picture of San Secondo, one of the *batterie*.

2.3.2 Ottagoni

There are four *ottagoni* in the southern lagoon. These islands are octagonal artificially constructed islands that used to have fortifications on them to defend against intruders from the Adriatic Sea.¹⁰ Figure 4 shows a picture of *Ottagono Alberoni* which is located at the southern tip of Lido.



Figure 4. Ottagono Alberoni

2.3.3 Ospedali

There are seven *ospedali*, or hospital islands in the lagoon. Two of these hospital islands are *lazaretti*, Lazaretto Vecchio and Lazaretto Nuovo, which were used to quarantine travelers and the sick during plague times. The Venetians invented the idea of a quarantine with these revolutionary islands. Lazaretto Vecchio is show in Figure 5, and Lazaretto Nuovo is an archeological museum today.¹¹ The remaining hospital islands were converted into hospitals for infectious diseases, convalescent homes, or asylums.¹²

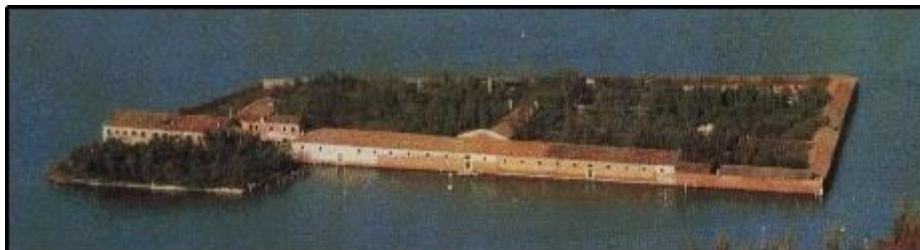


Figure 5. Lazaretto Vecchio

⁹ Carrera, F, personal communication, October 7, 2015.

¹⁰ Venezia, Comune di. 1983. *Invito alle isole: informazioni e documenti sulle isole minori della laguna di Venezia*. Venezia. 18.

¹¹ Publishing, DK. 2014. *Venice & The Veneto, Eyewitness Travel: DK Publishing*. Travel Guide. 161.

¹² Sprigge, Sylvia. 68-76.

2.3.4 Convents and Monasteries

Many churches in the inner city of Venice established convents and monasteries on the smaller islands in the lagoon. The convents have since fallen into disuse and are now abandoned, while some monasteries are still functioning like San Francesco del Deserto, shown in Figure 6, and San Lazzaro degli Armeni.¹³



Figure 6. San Francesco del Deserto

2.4 Inner City Islands

The historic city center of Venice is made up of 126 islands, taking up a total area of approximately two square miles. Each island belongs to its own *sestiere*, or neighborhood. There are six *sestieri* in Venice as shown in Figure 7: Cannaregio, Castello, Dorsoduro, San Marco, San Polo, and Santa Croce. Each of these *sestieri* are in turn broken into nearly 1200 census tracts. A census tract is a “small, relatively permanent statistical subdivision of a geographical region ... designed to be relatively homogeneous with respect to population characteristics, economic status, and living conditions.”¹⁴ Census tracts are very useful in offering region-specific information, but in this case, because the tracts do not categorize information by island per se, it is challenging to characterize the demographics of each island itself.

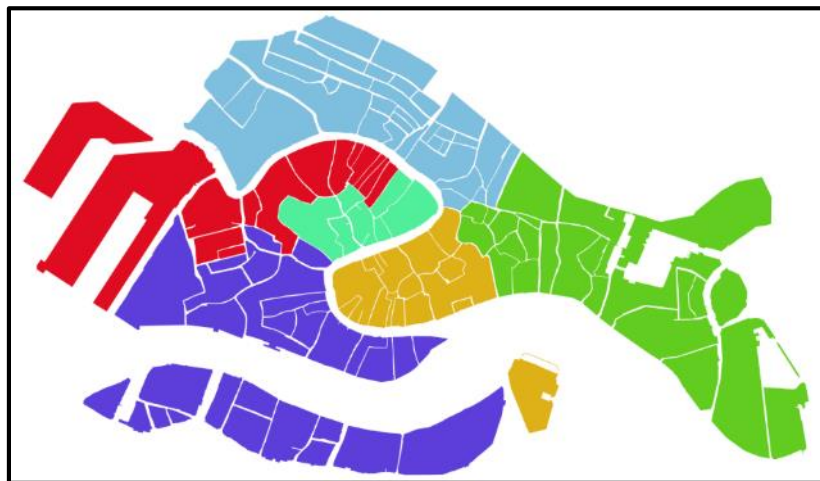


Figure 7. The Sestieri of Venice

The boundaries for the census tracts change from year to year, creating inconsistency—Figure 8 demonstrates this, showing differences in the 1981 and 2001 census tracts. It follows that a more consistent and useful model would be to collect data by island instead.

¹³ Sprigge, Sylvia. 76-79.

¹⁴ “Census Tracts”, Venipedia.org, (October 2, 2015).

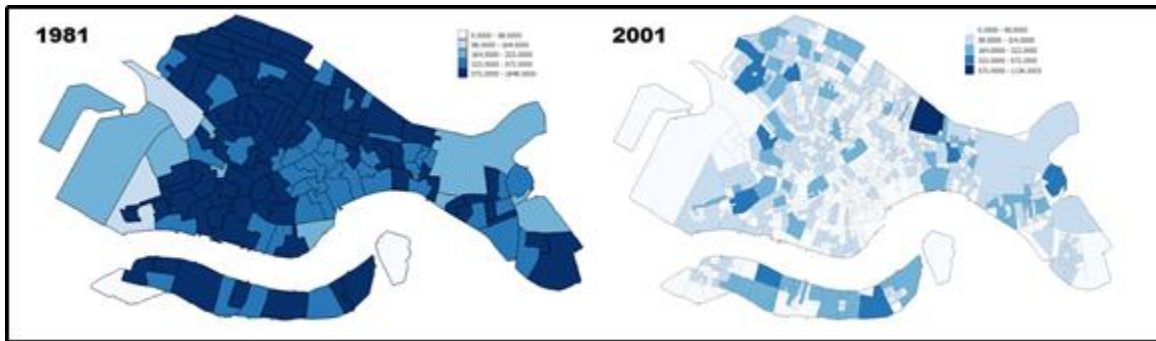


Figure 8. Comparison of 1981 and 2001 Census Tracts

2.5 Information on Specific Venetian Islands

While there are many sources of information on the city of Venice and its lagoon, this information is typically scattered across databases, history and guide books, atlases, encyclopedias and maps, which makes finding island-specific data difficult. The problem with census data as described above only exacerbates the situation.

This project aimed to alleviate the fragmentation of information on the Venetian islands by creating an organized database categorized by island which will be easily accessible to the world. This new database was inspired by several existing publications and databases including traditional *isolarii*, the *Atlas of the Lagoon*, history books and encyclopedia entries on Venice, reference books, guidebooks, and several Venice-focused databases created by the Venice Project Center, and Geographic Information Systems.



Figure 9. The world's first *isolario*, made by Cristoforo Buondelmonti in 1420

2.5.1 Traditional *Isolarii*

An *Isolario* is defined as a “Cartographic Encyclopedia of Islands,”¹⁵ or a “book of islands.” It is a visual genre categorized by a collection of maps and drawings of related islands, each presented with some additional background and contextual information. One example is the first *isolario* ever known which was made by Cristoforo Buondelmonti in 1420.¹⁶ Figure 9 shows the most famous page from this work: a detailed map of Constantinople. It started as a collection of drawings, which Buondelmonti sent to others attached with comments and descriptions. From there it evolved into a genre that would be expanded upon by future artists and cartographers.

In 1485 Bartolomeo dalli Sonetti released an *isolario* depicting the islands of Venice and major islands in the Aegean Sea.¹⁷ Sonetti's *isolario* included descriptive sonnets for each island

¹⁵ Tolia, G. (2013). *The Politics of the Isolario: Maritime Cosmography and Overseas Expansion During the Renaissance* (Vol. 9). 27

¹⁶ Tolia, G. (2007). *Isolarii, fifteenth to seventeenth century. Cartography in the European Renaissance*, 8, 265

¹⁷ Tolia, G. (2007). 269

and was structured more as a map, making it useful for navigational purposes. It was also the first known of its kind to be printed using wood carvings.¹⁸ In 1528, the famous *isolario* of Benedetto Bordone was published. This also depicted major islands of Venice and the Aegean, as well as chapters on the New World. Each map was more detailed and provided descriptions of each island.¹⁹

These historical *isolarii* provide the fundamental idea and inspiration behind the major goals of this project: categorizing information on an island-by-island basis and presenting that information in a both visual and textual formats, but in an interactive way in the form of a modern, digital, interactive *isolario*.

2.5.2 Atlas of the Lagoon

The *Atlante della Laguna*, or Atlas of the Lagoon, is a map-based visualization tool developed by the City of Venice with the assistance of other organizations. The Atlas's aim is to “[make] available to a wide audience of experts and citizens ... information on the Venice Lagoon, its drainage basin, and the coastal area.²⁰” It has an application that can be used to display scientific data concerning Venice and the Venetian Lagoon such as currents in the lagoon and canal depth within the city. These data are displayed visually on an interactive map of the lagoon, allowing users to see the entire map at once or zoom in to a specific area of interest. This tool is an excellent resource for mariners, scientists and researchers; however it does not provide comprehensive information on an island-by-island basis and is missing other types of information such as cultural information. Furthermore, most of the instructions and information in the Atlas program are in Italian. The goal of this project is to create an application as functional and powerful as the Atlas program, but with the addition of cultural and historical information provided in English.

2.5.3 Databases and References from the Venice Project Center

For over 25 years the Venice Project Center, or VPC, has been collecting and documenting a variety of data on the city of Venice. Several of these efforts will serve as important inspirations for this project. The first is Venipedia, a wikipedia-esque website that currently hosts over 17,800 articles,²¹ each pertaining to some aspect of Venice or the Venetian Lagoon. Venipedia is an excellent source of some types of information that can be used in the *Isolario*—for example, it contains pages on every church in the city and their location. It is also a venue for publishing informative island-specific entries that were created over the course of this project.

A 2001 VPC project²² explored how the abandoned minor lagoon islands in the Venetian Lagoon could be reused to benefit the city. Each minor lagoon island was researched extensively and size, ownership, historical uses, and accessibility were documented. This

¹⁸ Ibid.

¹⁹ Ibid.

²⁰ *Atlante della Laguna: Presentation of the Atlante della Laguna*.

²¹ Venipedia.org. 2015.

²² Christopher O'Malley, S. M., Amanda Connor, Nicole Buzzell. (2001). *The Reutilization of the Minor Islands of the Venetian Lagoon*.

research report provided content for this project and inspired a template for organizing information for all types of the islands in the lagoon.

Lastly, the de'Barbari Explorer²³ is a web application developed and hosted by the Venice Project Center. It allows users to view the city of Venice from the perspective of several different historical maps. The maps contain several layers, which can be turned on and off to highlight different features such as the locations of churches and bell towers across each map. The "islands" layer of this application served as inspiration for this project's visual component. The team also worked to update the de'Barbari Explorer by correcting and adding to the information in the islands layer.

2.5.4 Geographic Information Systems

Much of the information collected by the Venice Project Center is now in the form of multiple GIS layers. A Geographic Information System (GIS) is a system of storing, manipulating, and displaying geographic and/or spatial data. It is a broad term that can be used to describe various technologies, but is often used to represent locations on the planet earth (in latitude, longitude, and elevation). Using this information, it is possible to create "layers" which are groupings of related features. An example layer could be "islands", which would contain many polygons in the shape of different islands (each polygon being represented by points in x, y, and z coordinates). Once this layer is created, other information can be attached to it, such as name, population, age, etc. The layer can also be displayed on a map, alongside other layers, creating a powerful means of visualizing data. Figure 7 is a GIS layer showing the *sestieri*. Over the course of this project, the team referenced the GIS layers created by the Venice Project Center in the past, and also produced new layers.

²³ Justin Chines, Eric Eoff, Alexander Reynolds, Amanda Weis. (2013). Venice Through the Canals of Time: Mapping the Physical Evolution of the City.

3. Methodology

The goal of this project was to assemble a single, complete, and easily accessible set of information on the all islands of Venice and to promote the preservation and revitalization of abandoned islands. This goal was achieved by working towards the following objectives:

1. To collect and organize information on the Lagoon Islands
2. To collect and organize information on the Inner City Islands
3. To publish comprehensive information on all the Islands of Venice
4. To create an Interactive Visualization Tool: the *Isolario Interattivo*

This project focused solely on Venetian Lagoon and its islands. The data collected on these islands spanned a time period from when the landmass first fit the definition to the present day. The data concerned both the physical aspects of the island as well as the cultural and historical aspects of its residents. Figure 10 provides a visual representation of our objectives.

3.1 Collecting and Organizing Data on the Lagoon Islands



Figure 10. Data Compilation Methods

The following kinds of data were collected and organized on both the Major and Minor Lagoon Islands: dimensional data such as area, perimeter, and latitude and longitude; demographic data such as population, age, and employment status of residents; island accessibility for the general public; island usage throughout its history; points of interest on the island, and historical information spanning from the original settlement to today.

3.1.1 Collecting Information on the Major Lagoon Islands

The data for the Major Lagoon Islands was collected from several different sources:

1. Dimensional data was collected from the GIS layers of the Venetian Lagoon provided by the Venice Project Center.
2. Demographic data was collected by analyzing the 2011 Census Data. For a description of this process, see Section 3.2.1 Aggregating Population Data.
3. Island Accessibility data was collected from the GIS layers of the public transportation, docks, and bridges on the islands provided by the Venice Project Center.
4. Island usage, points of interest, and historical information was collected from archives, guidebooks, online databases like the *Atlante della Laguna*, and scholarly articles.

5. Any additional information such as photographs that had not been found after the above sources were analyzed was collected through team visits to the islands.

3.1.2 Collecting Information on the Minor Lagoon Islands

The data set for the Minor Lagoon islands was the same as the data set for the Major Lagoon Islands. The methods for researching and collecting data was the same. The thirty-two Minor Islands were broken into the following categories:

1. *Batterie*
2. *Ottagoni*
3. *Ospedali*
4. Convents and Monasteries

The same types of data were collected for all islands in all of these categories, using the same sources and methods as described above. Figure 11 visualized the types of data that were collected on each island.

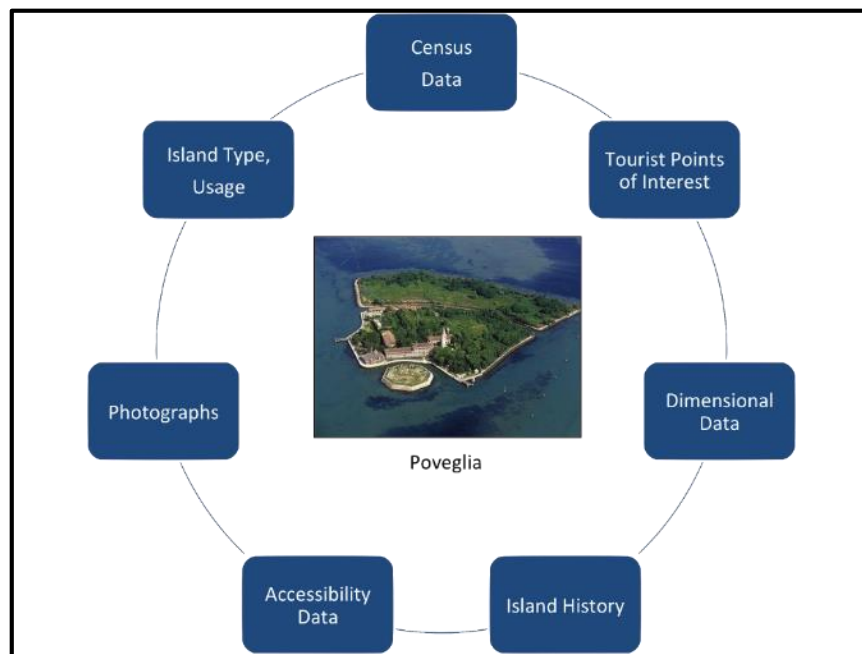


Figure 11. Island Data Mapping

3.1.3 Creating Island-Specific Bibliographies

All of the sources the team referenced in this project were catalogued and organized using Zotero, an online citation tool. The sources were then tagged by what kind of information they contained. This ranged from general information on the Venetian Lagoon, to information on groups of islands, to information on specific islands. This tagged bibliography was linked to Venipedia pages and the *Isolario Interattivo* and is publically accessible online.

3.2 Collecting and Organizing Data on the Inner City Islands

The process for collecting and organizing data for the inner city islands was much the same as the process used for the lagoon islands. Similar to above, the data set collected included: dimensional data; demographic data; island accessibility; island usage; points of interest, and historical information, spanning from the original settlement to today. This data set was collected from the following sources:

1. Dimensional data was collected from the GIS layers of the Venetian Lagoon provided by the Venice Project Center.
2. Demographic data was collected and aggregated on a per-island basis from the 2011 Census Data. For a detailed description of this process, see Section 3.2.1 Aggregating Population Data.
3. Island Accessibility data was collected from the GIS layers of the public transportation, docks, and bridges on the islands provided by the Venice Project Center.
4. Island usage, points of interest, and historical information was collected from archives, guidebooks, online databases like the *Atlante della Laguna*, and scholarly articles.
5. Any additional information that had not been found after the above sources were analyzed was collected through team visits to the islands.

3.2.1 Aggregating Population Data

The population data were analyzed by census tracts from the most recent census in 2011. Maps of census tracts were analyzed in conjunction with this data to recalculate population by island. This aggregation process, represented in Figure 12, drew on:

- 2011 census data
- Each island's individual census tracts
- Island codes from GIS layers

For a visualization of the data this method produces, see Appendix D: Example of Census Tracts by Island. The census information was aggregated by:

1. Determining which census tracts belonged to which island
2. Collecting total population per each census tract
3. Grouping the census tracts with their respective island in a spreadsheet
4. Adding the total census tract populations per each island to get a total island population

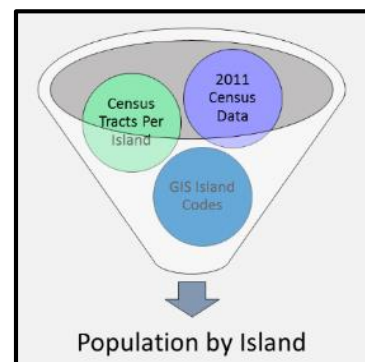


Figure 12. Population Data Aggregation

This process allowed the data to be displayed on a per-island basis rather than per each census tract which is a much more useable metric.

3.3 Publishing Island-Specific Information

After information on the Lagoon and Inner City islands had been collected and organized, it was then made publically accessible. To make these sets of information as easily available as possible, online wiki pages were created using the Venice Project Center's Venipedia platform, and the first in a series of published booklets on the outer lagoon islands was designed.

All of the information collected through this project was organized into master spreadsheets uploaded to the Venice Project Center's online project repositories. Web applications such as Venipedia can automatically populate themselves using this repository. This allows future updates to be made by simply updating the information stored in the spreadsheets.

3.3.1 Creating a Template and Planning Components for Venipedia Pages

Venipedia pages are structured like encyclopedia entries and each part of the entry can pull visual, textual, or numerical data from spreadsheet-like tables from the VPC's online repositories. Each individual spreadsheet in the repository contains a different category of data on the same set of islands: pictures, bibliographic references, numerical data, etc. In order to fully represent the information gathered throughout the course of this project, the following categorical Venipedia pages were created:

- Island
- Islands
- Lagoon Islands
- Inner City Islands

At the broadest level, the *Island* Venipedia page sets the context of this project by explaining the team's definition of an island. The *Islands* Venipedia page explains the categories of Major and Minor Lagoon and Inner City islands. This page contains a list of the islands contained within each category, as well as links to the *Major Lagoon Islands*, *Minor Lagoon Islands*, and *Inner City Islands* Venipedia pages, which contain much more detailed information on the islands contained within the said page's category. This information is organized in a tabular form by island name and contains links to the individual Venipedia pages created on each island.

Each page on an individual island serves as a complete reference for the island that it represents, and contains factual information and bibliographic references to all of the information collected on that particular island. First, a mock-up for a Venipedia page was created that indicated the desired categories of information to be included in the page and where this information would appear, as shown in Figure 13.²⁴ The wiki page templates created by this project can be broken down as shown in Figure 14.

²⁴ "Lagoon Islands", Venipedia.org, (October 10, 2015).

Similar templates were created for both the Inner City and Major Lagoon Island pages and included the following data types:

- Demographics
- Dimensional Data
- Accessibility Data
- Points of Interest

Figure 13. Example Venipedia Template

- Island History
- Overnight Accommodations
- Photographs

Pages on Minor Lagoon Islands contain the same information, and are also organized according to type. These island types include the following:

- *Batteria*
- *Ottagoni*
- *Lazaretti*
- Convents and Monasteries

The team also planned each page to include external links and bibliographic references to all relevant information available on its respective island. Each of these pages would contain the same data types as listed above for the Inner City and Major Lagoon islands pages, with the exceptions of accessibility data and

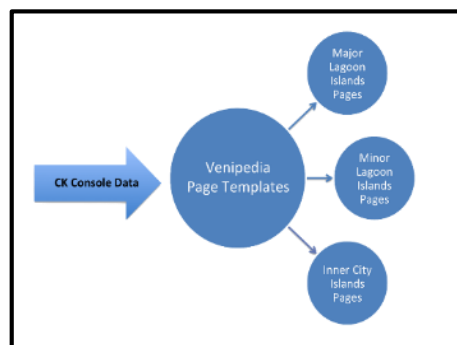


Figure 14. Venipedia Page Creation

overnight accommodations. In order to extend the wealth of information contained in these Venipedia pages to other media, it was planned for each page to contain the option to view it in a form suitable for printing. This will make it easier to produce a condensed form of the information in a hard copy format.

3.3.2 Planning Published Booklets

Along with creating a printable format for each Venipedia page on an island, this project also aimed to contribute content to the first in a series of booklets on the Minor Lagoon islands of the Venetian lagoon. The team learned about the necessary content for this booklet by meeting with writer and publisher Giovanni Distefano of Supernova Publishing. Through an interview with Sig. Distefano, it was made clear that the main purpose of these booklets would be to describe the current state of each Minor Lagoon island and to present a detailed history and bibliography. The intended audience would be the residents of each island as well as tourists or researchers interested in learning more about the island.²⁵ The team's role in creating the booklet was initially to provide images, content, and develop a stylistic template for a booklet on Lazzaretto Nuovo.

This prototype was intended to be further modified by publisher Giovanni Distefano and printed through Supernova publishing. In terms of content, Sig. Distefano recommended the following sections:

- Technical description and maps of the island
- Emotional impression of the island with photos
- Island history from its origins to today
- Literature on the island
- Bibliography and Sitography

After a team visit to Lazzaretto Nuovo and Lazzaretto Nuovo and seeing the brochure available at both islands, the team decided to produce a brochure on Poveglia to promote more awareness for the island. Both the Venipedia pages, published booklet, and brochure aim to act as comprehensive guides on the islands of Venice, but each lack an element of interactivity. For this reason, this project also focused on creating simpler and more interactive ways to visualize the highly detailed information collected on Venice.

3.4 Developing Interactive Visualization Tools

Once relevant information on each island was collected, organized, and published, there was still a need to make it searchable and accessible to those who are looking for it. This is the purpose of the *Isolario Interattivo*, an Interactive Visualization tool, which collects information on each island from various sources and allow users to access it in a simple, intuitive way. The target audience of this *Isolario* was identified as both researchers looking for specific information relevant to a particular island such as area, perimeter, and census information, as well as tourists looking for information on a particular place they are interested in such as historical information and attractions. Figure 15 shows an early prototype of the *Isolario*, along with the various sources used for inspiration and data collection during development.

²⁵ Distefano, Giovanni. Personal interview, 11 November 2015.

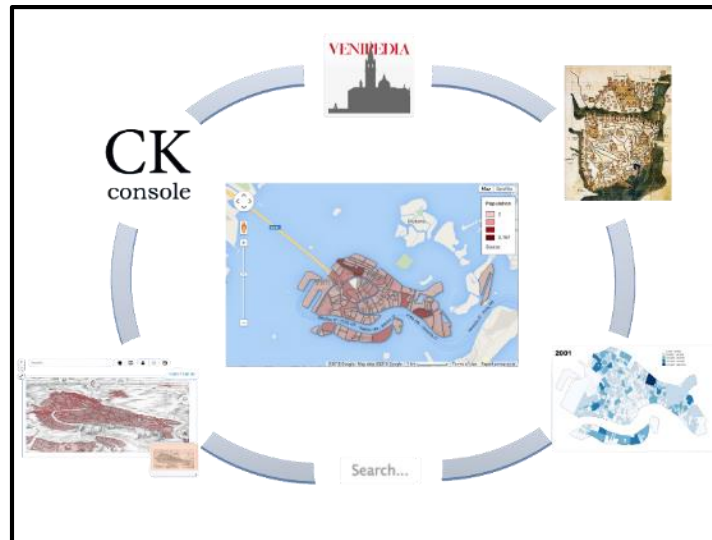


Figure 15. *Isolario Prototype*

3.4.1 Design

The first step in creating the *Isolario Interattivo* was to develop a concrete design that was oriented around how what a user would want in the application. The design phase was where the team figured out exactly what the *Isolario* would be. This process is represented in Figure 16.

First, research was conducted on previous works which were either similar to the *Isolario* or contained elements which could be included in the new *Isolario*. These sources included historical works like ancient *Isolarii*, as well as more modern applications such as the de'Barbari Explorer, and online visualizations from census.gov. Furthermore, since none of the team members had any experience with developing applications for the web, HTML, or JavaScript, the team researched how to implement some of the desired features and what tools/libraries were available to create them. Based on this research, the team made key decisions, including: what capabilities it would have; what features it would include; what kind of interface it would have; and what visual styles and layout it would have. This step involved sketches, mock-up

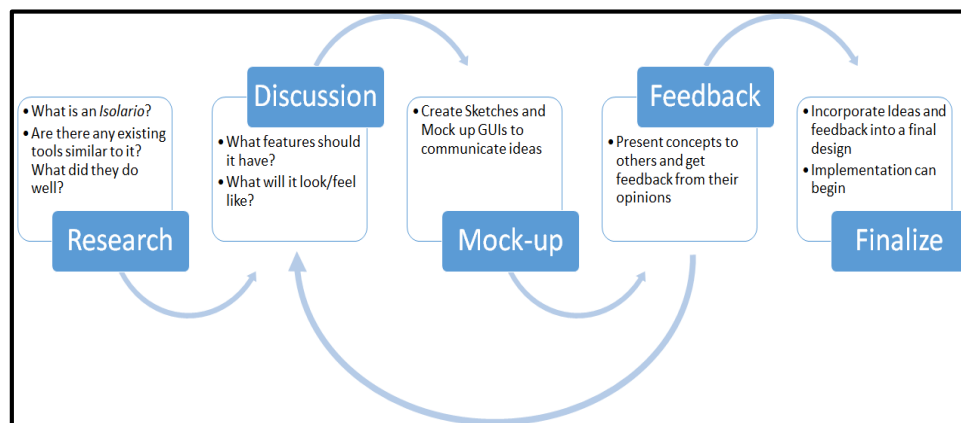


Figure 16. *Designing an Isolario*

interfaces (GUIs), and much discussion. The decisions made were based on which features would add the most value to the application, as well as which features the team members felt were feasible to implement with their skillset. Once the team had reached a consensus, outside opinions were sought from those who are less familiar with the project, to gauge how other users might react to the features and interface. This involved showing this application design and/or prototype to peers and advisors and getting their opinion about features and appearance. Technical feedback was also received from Tomaso Minnelli about code flow and organization. Based on this feedback, the design was modified and the process was repeated until a complete idea for an intuitive and easy to use interface was developed. The initial design consisted of the features shown in Figure 17.





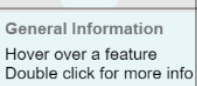



Controllable Zoom and Navigation		Move to the area of the lagoon you want to see
Fuzzy-Search		Quickly find an island using approximate spelling or information
Dynamic Filtering		Show only information relevant to a specific island or islands
Dynamic Recoloring		Color Islands based on different properties
Display Information		Immediate access to basic information Optional access to detailed information
Toggle Layers		Show/hide different types of information (i.e churches, bridges, etc..)
Link To Venipedia		Navigate to the relevant Venipedia page for more information
Link To Venipedia		View island's history in the de'Barbari Explorer

Figure 17. List of Features

3.4.2 Tools and Libraries

Before beginning the implementation phase, the team had to decide which tools, if any, would be best suited to fit the requirements of the design. The benefits and downsides of the following tools were considered for this application: JavaScript libraries including d3.js and AngularJS; ArcGIS; Google services such as Google Maps and Google Fusion tables; and programming environments such as Visual Studio, Eclipse, and Justinmind. The final decisions were influenced by the usefulness and value of the tool, but the team was also limited by what past projects have used. The tools and libraries decided upon are explained and outlined in Appendix F: Tools.

3.4.3 Implementation

The first step of the implementation was to create a foundation for the application. At its core, the main functionality of this application is to retrieve data from the VPC database and display it on a map. This was achieved by experimenting with the Leaflet library and extracting data sets from the VPC database. Using this experience, an application was created that can retrieve any data set from the VPC database. If the data has valid point or polygon data, it is displayed on the map and an option to toggle its visibility is made available to the user. If the object is clicked, a dialog box displays the remaining information associated with the data set to the user. While these functions were somewhat basic, they created a basis for the final application, and were an excellent way to get familiar with the libraries that were needed. Additionally, this generic application provides future project teams a starting point and a framework to build on. More details about the exact procedure used to achieve this functionality are given in Appendix F: Tools.

The next step was to add an “Islands” layer to the application and begin to visualize the information available for each island. Population data from 2011 and other fields such as island type, category, and population density were added to the GIS layers provided by the Venice Project Center. Next, the layers were converted into a GeoJSON format which can be displayed

on the web. They were loaded into the application using a method similar to the way other data were retrieved from the VPC database. Once the layers were loaded and displayed correctly, layer coloring was tested based on population data. Additionally, the population data was used to test the ability to display information when hovering over with the mouse or double clicking. To the box that appears after double clicking, placeholder links were added to link to Venipedia and the de'Barbari explorer.

After gaining the ability to display both Island layers and data from the VPC database, it became necessary to connect information from these two sources in some way. This would allow the application to fulfill its intended purpose: organize and display information by island. There were two ways to do this:

1. Some of the datasets from the VPC database already contained an "Island" tag, which had a value corresponding to the island they belong to. In this case, it was possible to search for this tag and use that to connect the data to a specific island or islands.
2. For datasets that did *not* have an island tag, but *did* have location data such as latitude and longitude, it was still possible to figure out which island(s) the data belongs to. To do this, a "spatial query" was performed using the coordinates of the islands and the coordinates of the unknown feature. This information can be sent to an algorithm that decides if a feature belongs to an island by repeatedly checking if a point is within a polygon, or if two lines intersect.

At this stage, the groundwork was set to develop the more powerful features of the application, such as search, filtering, and recoloring. The search feature would allow the user to find a specific island or feature on the map. If a user finds the application while looking for a specific island, this feature would allow them to quickly find it and instantly access all the information available on the application. Since the application is map-based, users could also see the island with respect to the lagoon and find other nearby locations which may also be of interest. The filter feature would allow the user to limit the information they see to only islands with specific traits: from only an island with a certain name; to all islands with a population greater or less than any value; to only islands that are used as convents. Lastly, the color feature allows the user to create visualizations of the islands based on what information they want to see. For example they could color the islands randomly based on sestiere, or apply a gradient based on population density.

3.4.4 Updating the Historical Map Explorer

As discussed in Section 2.5.3 Databases and References from the Venice Project Center, the Venice Project Center has focused on making historical maps of Venice interactive and accessible through the de'Barbari Explorer application and its predecessor, the Historical Map Explorer.²⁶ The Historical Map Explorer was based on a similar concept as the new *Isolario*, and gives the user the ability to view several different sets of information overlaid on historical maps. At the start of this project, this application contained support for an "Islands" layer that gives the user the ability to learn about individual islands on the map. This layer

²⁶ cartography.veniceprojectcenter.org

contained little to no correct information on the islands of Venice, and only contained information for a single map out of the six maps featured in the application.

The team's role in this application was to update the "Islands" layer so that it contained the following modifications:

- Correct names for each island
- Corresponding Venipedia links for each island
- All islands featured on every map

Figure 18. Historical Map Updates shows the updated plan for the Historical Map Explorer. Overall, these new updates to this application would help to further disseminate information on the islands of Venice, and allow for users to explore Venice from an accurate

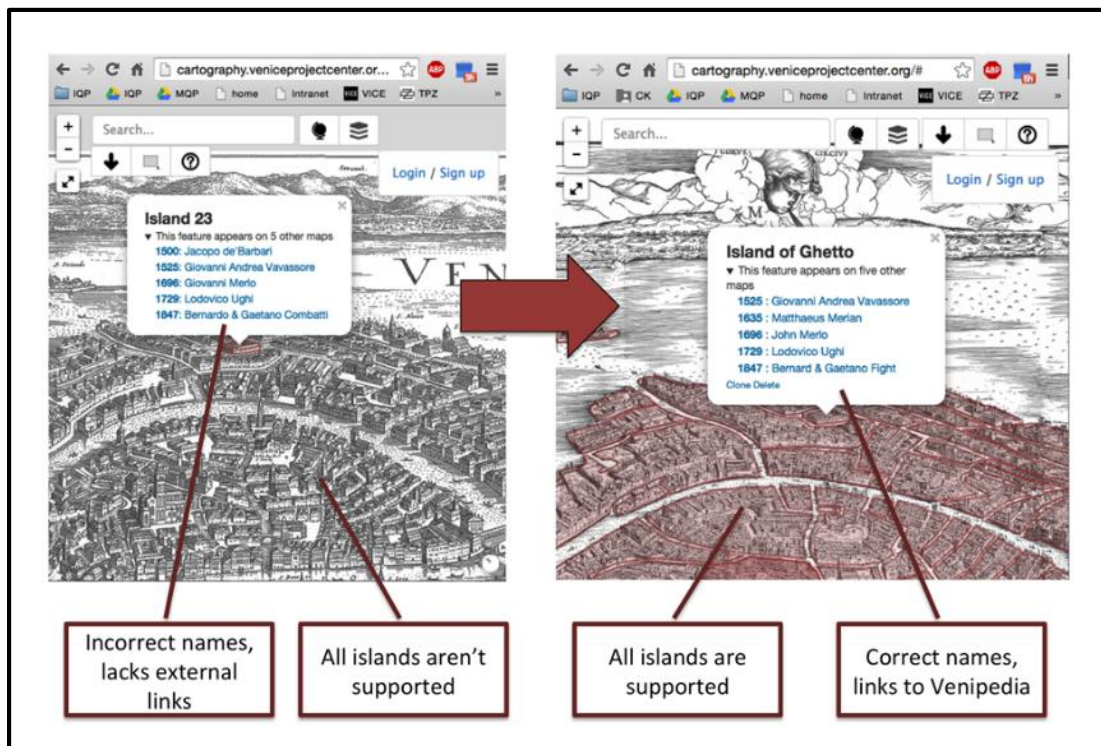


Figure 18. Historical Map Updates

historical standpoint.

3.4.5 Extensibility

The Venice Project Center hosts many teams each year, and will host many more after this project is completed. For this reason, it was important that the new *Isolario* be flexible and easily adaptable so that others may understand, reuse, and improve it in the future. One goal of this project was to ensure that the application can be adapted by future teams. This was achieved by separating data and code as much as possible. Data can change: it gets updated, added to, or even removed. Ideally, the application created is flexible enough to reflect those changes without breaking or requiring modifications to the code. For a more detailed analysis of this process see Section 4.4.1 *Isolario* and Chapter 5. Conclusions and Recommendations.

4. Results and Analysis

This chapter outlines the results of the project. Results are organized by the objectives introduced in the Methodology Chapter.

4.1 Organized Information on the Lagoon Islands

All information pertaining to the Lagoon Islands was recorded in two spreadsheets: one for the Minor Lagoon Islands and one for the Major Lagoon islands. The most important outcome of the data collection on the Lagoon was to create the online bibliographies hosted on Zotero. Figure 19 shows this bibliography. The bibliography has been organized by individual islands and tagged by the following categories in addition to individual islands:

- Venetian Lagoon
- Lagoon Islands
- Major Islands
- Minor Islands
- Inner City Islands

When looking at the bibliography, the user can select one or many tags. When searching on an island or multiple islands, Zotero will create a unique bibliography based on that search. This bibliography has a unique link that was added to both the *Isolario Interattivo* and Venipedia pages so that users can immediately access the bibliography for whatever island they were researching on either site.

Island-specific bibliographies are an important resource. The ability to have an extensive list of all kinds of sources on each individual island in the Venetian Lagoon allows a user to look through further sources of information and determine what best fits their needs. These bibliographies are one of the ways that this project created a single source that displays all possible information on each island in the Venetian Lagoon.

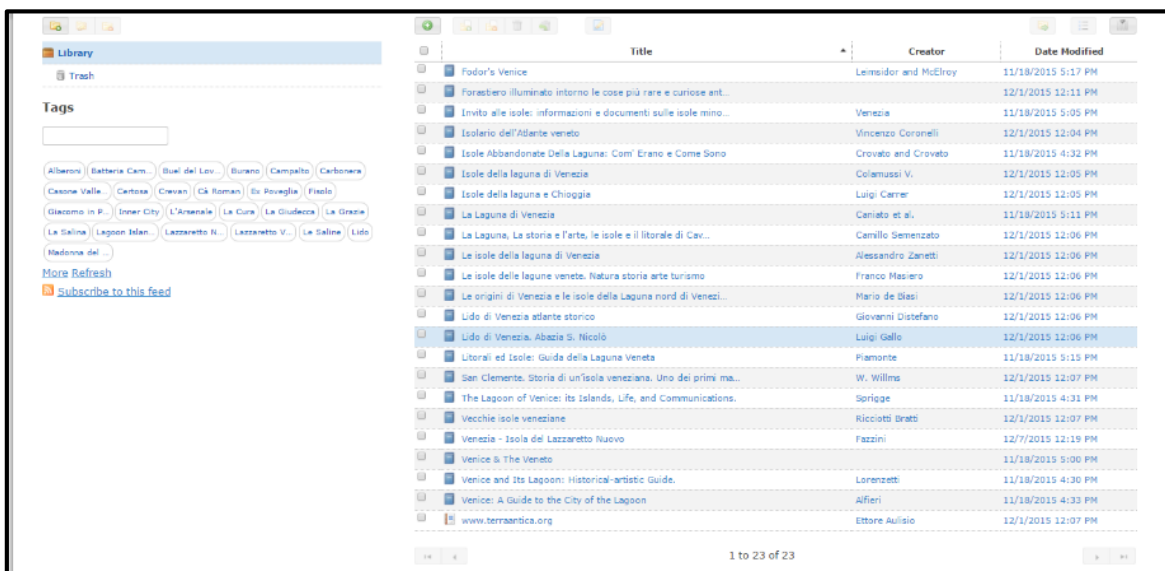


Figure 19. Online Bibliography

4.2 Organized Information on the Inner City Islands

All information pertaining to the Inner City Islands was recorded in a spreadsheet. As mentioned in the background chapter, population in the city of Venice has traditionally been reported only in terms of individual census tracts. One goal of this project was to show the census data on an island-by-island basis.

Organizing information by island rather than by census tract allows for a clearer picture of Venice as a whole. This is because the islands don't change—the census tracts change every ten years, but the island borders are static. This data organization method allows for a constant base on which to report various demographic data and trends within this data over time such as age and gender. The rest of the deliverables in this project use this per-island basis for data organization.

4.3 Published Information

4.3.1 Online Repositories

Using the process outlined in section 3.3 Publishing Island-Specific Information, once all information pertaining to the islands of Venice had been collected and organized, it was uploaded to the Venice Project Center's online repositories of data. This information is broken up into three separate spreadsheets on the Inner City, Major Lagoon, and Minor Lagoon islands. The creation of these repositories was an important step in this project, since both the Venipedia Pages and *Isolario Interattivo* application use the content from each repository to generate content on the Islands. When the content in these repositories is updated, both the Venipedia pages and *Isolario* reflect changes automatically.

4.3.2 Venipedia Pages

In order to create an overall structure for Island-based Venipedia content, the Island, Islands, Major/Minor Lagoon Islands, and Inner City Islands pages (described in Section 3.3.1) were created first. Each of these pages was coded by hand, and contains no automatically-generated content.

Next, the following pages were created for Major Lagoon island groups:

- Murano
- Burano
- Torcello
- Lido
- Vignole

These pages were created in order to help link Venipedia users to the actual islands that make up each group, since each group is usually referred to by its name rather than by the names of the individual islands in the group. Each group page is also created by hand.

After all handmade pages had been created, the group designed three templates for pages on individual Inner City, Major Lagoon, and Minor Lagoon islands. These templates were designed so that they could be automatically populated with information from the Venice Project

Center's online repositories. Using the templates, each page effectively pulls content from online versions of the spreadsheets. An example page can be seen in Figure 20.

The screenshot shows the Venipedia page for the Island of San Lazzaro degli Armeni. The page layout includes a navigation menu on the left, a main content area with sections for 'About', 'Accessibility', and 'Basic Information', and a search bar at the top right.

Navigation Menu (Left):

- Main page
- Community portal
- Current events
- Recent changes
- Random page
- Google Analytics
- Help
- Toolbox
 - What links here
 - Related changes
 - Upload file
 - Special pages
 - Printable version
 - Permanent link
 - Browse properties
 - Rate this page

Main Content Area:

Island of San Lazzaro degli Armeni

This article is about the island of San Lazzaro degli Armeni.

For the definition of an island in the context of the Venice Project Center's work, refer to the [Island](#) and [Islands](#) pages. For more generalized information on Minor Lagoon Islands, see [Minor Lagoon Islands](#).

Contents [hide]

- About
- Accessibility
- Dimensional Data
- Demographic Data
- Interactive Media
- Map
- See Also
- References
- External Links

About [edit]

San Lazzaro degli Armeni is home to a functional monastery of Armenian monks. They are all multilingual and produce tourist information on their island in several languages on their 16th century printing press. The island was one of Lord Byron's favorite places to visit.

The island of San Lazzaro degli Armeni is categorized as an monastery. San Lazzaro degli Armeni is a minor island, and is located in sestiere IM.

Accessibility [edit]

San Lazzaro degli Armeni has the following boat stop(s): San Lazzaro.

These boat stop(s) can be accessed using line(s): 20

Basic Information

Codice	IM
ID Number	1028
Type	monastery
Usage	monastery
Handicap Accessible	yes
Inhabited	yes

Figure 20. San Lazzaro Degli Armeni Venipedia Page

4.3.3 Booklet on Lazzaretto Nuovo

The final booklet produced as a prototype for other island booklets was on the island of Lazzaretto Nuovo. The booklet contained the following sections:

- Introduction: a section to introduce the reader to the need to save the abandoned islands in the Venetian Lagoon.
- History of the *lazzaretti*: a brief introduction into the definition of a *lazzaretto* island.
- The Story of Lazzaretto Nuovo: a narrative history of the island including descriptions of what it was used for under various regimes.
- Archeoclub Italia: an introduction into the mission of this organization.
- Lazzaretto Nuovo Today: a description of how the island has been revitalized with the help of Archeoclub Italia and Gerolamo Fazzini.
- Natural Aspects: a description of the plants, birds, and bio-constructed wet-land that are on the island.
- A Visit to the Island: a firsthand account with pictures of the team's visit to the island.
- Timeline of Events: a timeline of important events on the island.
- Bibliography: an extensive bibliography of sources on the island.

This booklet is meant to serve as the template for future teams to develop similar booklets on all the minor islands in the Venetian Lagoon. The sections included in the book are meant to provide as much information as possible on all aspects of the island to the reader. All of this information was also published in an in depth Venipedia page on the island which can be printed from the site. Figure 21 below is an example of a spread in the book. Each section has a large heading with a more in-depth subheading in italics. Pictures are interspersed throughout the text with captions.

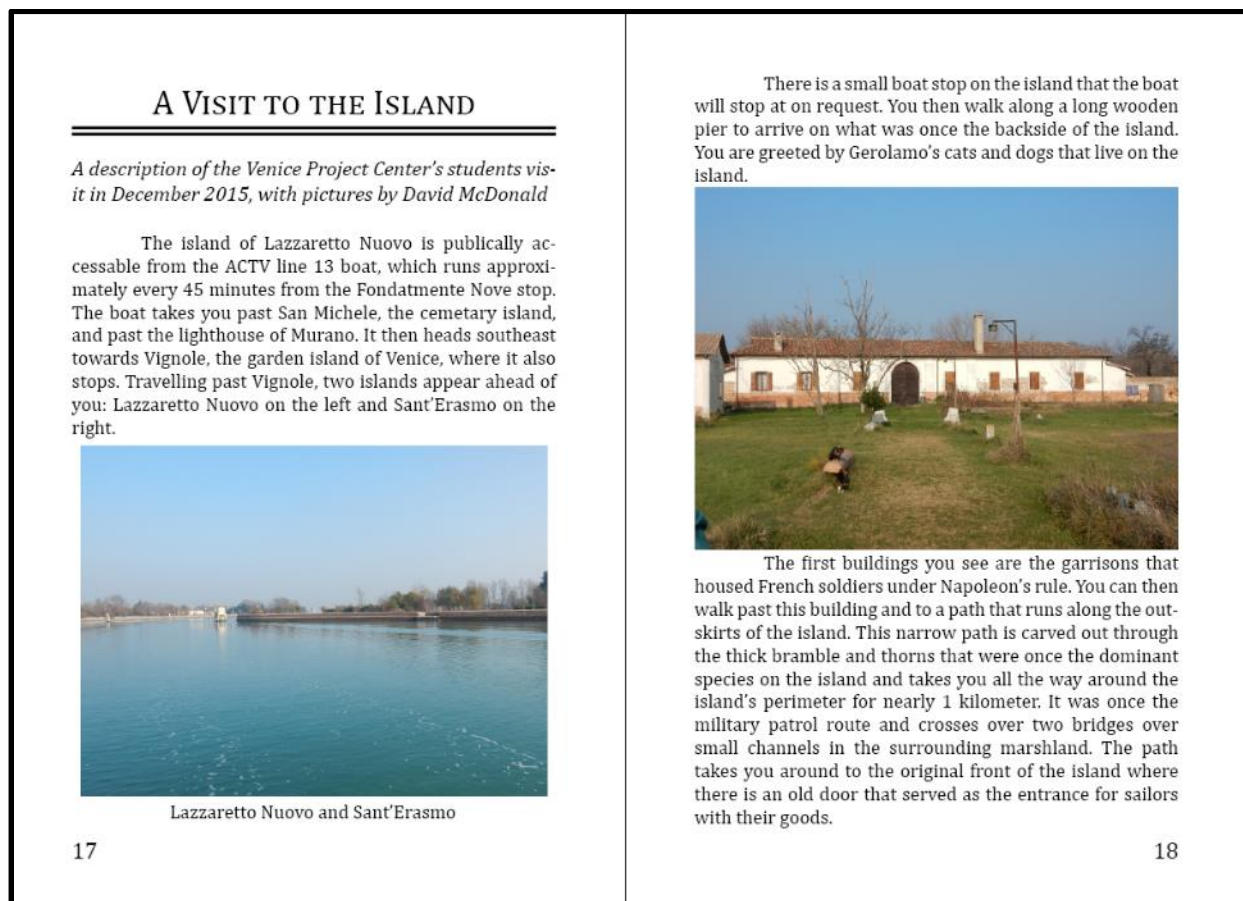


Figure 21. Sample Spread from the Booklet

4.3.4 Brochure on Poveglia

The team also produced an informative brochure on the island of Poveglia. The front cover, back panel, and inside flap of which are shown in Figure 22. A link to the brochure can be found in Appendix E: Print Publications. The brochure contained information on

- The island's history
- The island's present condition
- The organization Poveglia per Tutti and its attempts to save the island
- A timeline of important events in the island's history, number 1 in Figure 22
- A map showing where the island is in relation to the main city center, number 2 in Figure 22

- Links to other deliverables produced by the team including Venipedia and the *Isolario*, number 3 in Figure 22
- Cover page with aerial view of the island, number 4 in Figure 22

The goal of this brochure was to provide a condensed and more visual version of the booklets that could be produced on each island. This brochure could be distributed at the front desk of the museum on Lazzaretto Nuovo, the future museum of Lazzaretto Vecchio, and any other museum throughout the lagoon or city center. The association Poveglia per Tutti could also have these brochures at their meetings. The amount of text is small so it can easily be translated from English into many other languages to help create as much awareness as possible for this island.



<p>Timeline of Events ①</p> <p>400s Poveglia is first settled.</p> <p>1379 During the war of Chioggia, the island is evacuated and the fort Ottogono Poveglia is constructed.</p> <p>1527 The island is settled again as a hermitage.</p> <p>1777 The Magistrate of Health is given control of the island.</p> <p>1793 Poveglia becomes a temporary military hospital.</p> <p>1806 The island is abandoned.</p> <p>1900s The island becomes a military hospital.</p> <p>1959-1970 L'Ospedale al Mare del Lido creates a hospice on the island.</p> <p>1979 L'Ufficio Tecnico Erariale di Venezia performs an inspection to confirm the poor conditions of the now abandoned island.</p> <p>Dec. 2013 The Ministry of Goods and Cultural Affairs allows the island of Poveglia and the Ottogono di Poveglia to be put up for auction.</p> <p>March 2014 A public call for bids for the island is released.</p> <p>April 2014 The association Poveglia per Tutti is formed.</p> <p>July 2015 The association's current bid is rejected, and work was started to submit a new proposal to the city.</p>	 <p>②</p> <p>For more information on Poveglia see:</p> <ul style="list-style-type: none"> • A detailed encyclopedia entry http://goo.gl/TUMKIX • A bibliography on Poveglia https://goo.gl/wpEbJW • Cultural information on the island http://www.terraantica.org • An interactive book on the island http://goo.gl/SFo4wg • An interactive map of Venice http://goo.gl/FG324b <p>③</p> <p>For more information on the association Poveglia per Tutti see: www.povegliapertutti.org Poveglia per Tutti @povegliaxtutti Or contact: associazionepoveglia@gmail.com</p> <p>Writing by: Jenna O'Connell, David McDonald Georges Gauthier, Nick Panzarino</p>	<p>④</p> <p>ISLAND OF POVEGLIA</p>  <p>VENICE, ITALY</p> <p>ENG</p> <p>Fact Sheet</p>
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Figure 22. Brochure Spread

4.4 Interactive Visualization Tools

In order to make the interactive visualization tools as useful as possible, their final designs have been created to satisfy the needs of two separate groups of people; users and developers. A user can be defined as any person who interacts with the application, while a developer is someone who plans to modify the application to suit their own needs. The user's experience with the page consists of interacting with its content to suit his or her needs. For example, a user may be a researcher looking to display a trend across all islands of the lagoon, or a tourist seeking to learn which islands are handicap accessible. A developer, on the other

hand, may be a student from the Venice Project Center who plans on modifying the source code of the *Isolario* so that it can display information from a newly created database.

4.4.1 Isolario Interattivo

The *Isolario Interattivo* has been designed so that any user can intuitively access all of its features, with each feature's underlying source code documented so that any future developer can easily understand and modify it.

4.4.1.1 User Features

In order to make the *Isolario* as intuitive as possible to a new user, the page has been designed so that it contains as little clutter as possible. All the user-interactive tools available through the application are made available through the key features shown in Figure 23.

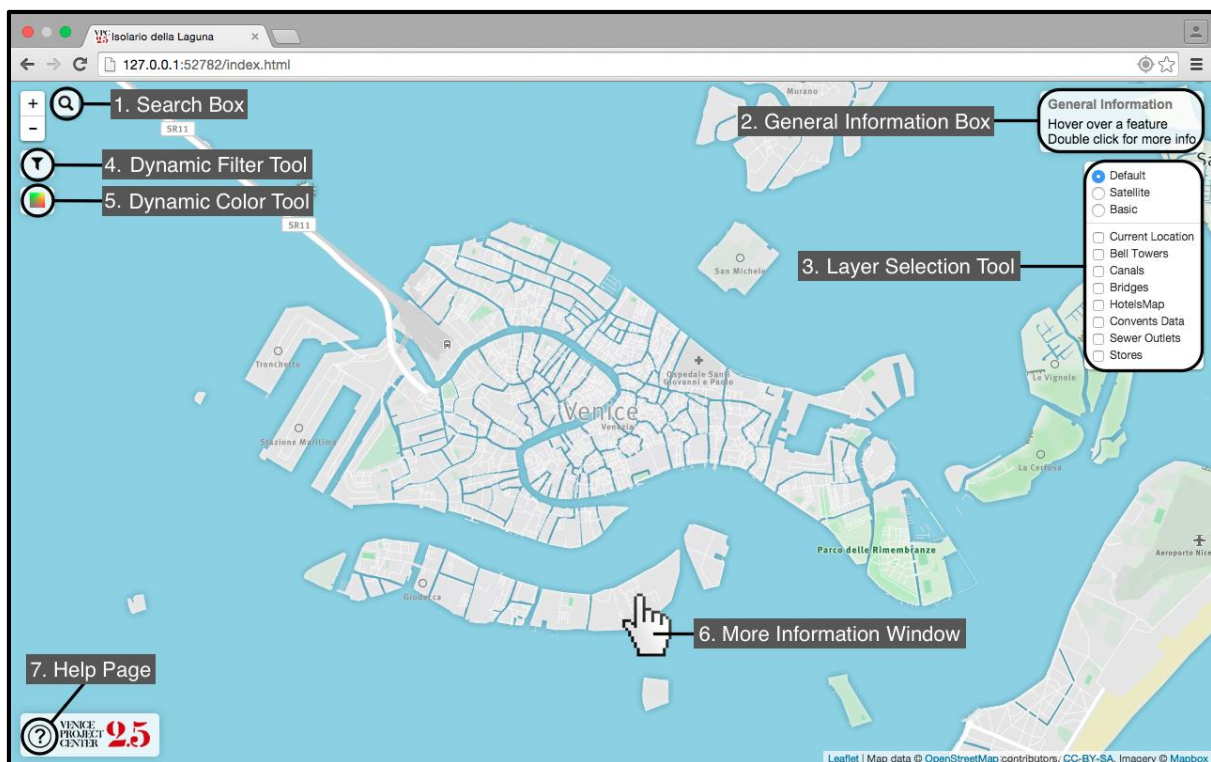


Figure 23. Key Features

The *Isolario* features shown in the figure above can be outlined as follows:

1. Search Box: The search box gives the user the ability to search for islands contained within the map. As the user types in information, the search box will provide autocomplete options for the user to choose from. They do not have to spell it correctly, the application will automatically display the closest matching results. When a user enters a field in the search box, the map will zoom to the feature that the user has searched for.

2. General Information Box: The general information box shows information on a feature when the user's mouse hovers over it. This box is updated automatically as the user

interacts with the application, and can display information on both islands and overlays. The box displays all feature names, and will also show additional information depending on the feature. For example, if the user were to load bridges into the application as an overlay, hovering over a bridge would show the bridge's name, while hovering over an island would show its name and identification records.

3. Dynamic Filter Tool: The Dynamic Filter Tool gives the user the ability to filter content being shown on the map. It is possible to filter by all demographic data stored within the map, as well as by identification fields for islands and island groups. This is a useful feature in that it allows for users to show only information relevant to the area on the map that they are interested in. For example, if the user has loaded in information on bell towers, bridges, and hotels and wishes to only items located in the sestiere of San Marco, he or she can use the filter tool to do so. The filter tool also contains a button labeled “Info” that allows for a user to display all information that has made it through a filter. In the case of the previous example, this window would contain relevant information on the islands, bell towers, bridges, and hotels contained within the sestiere of San Marco. An example of what this window would look like is shown in Figure 24.

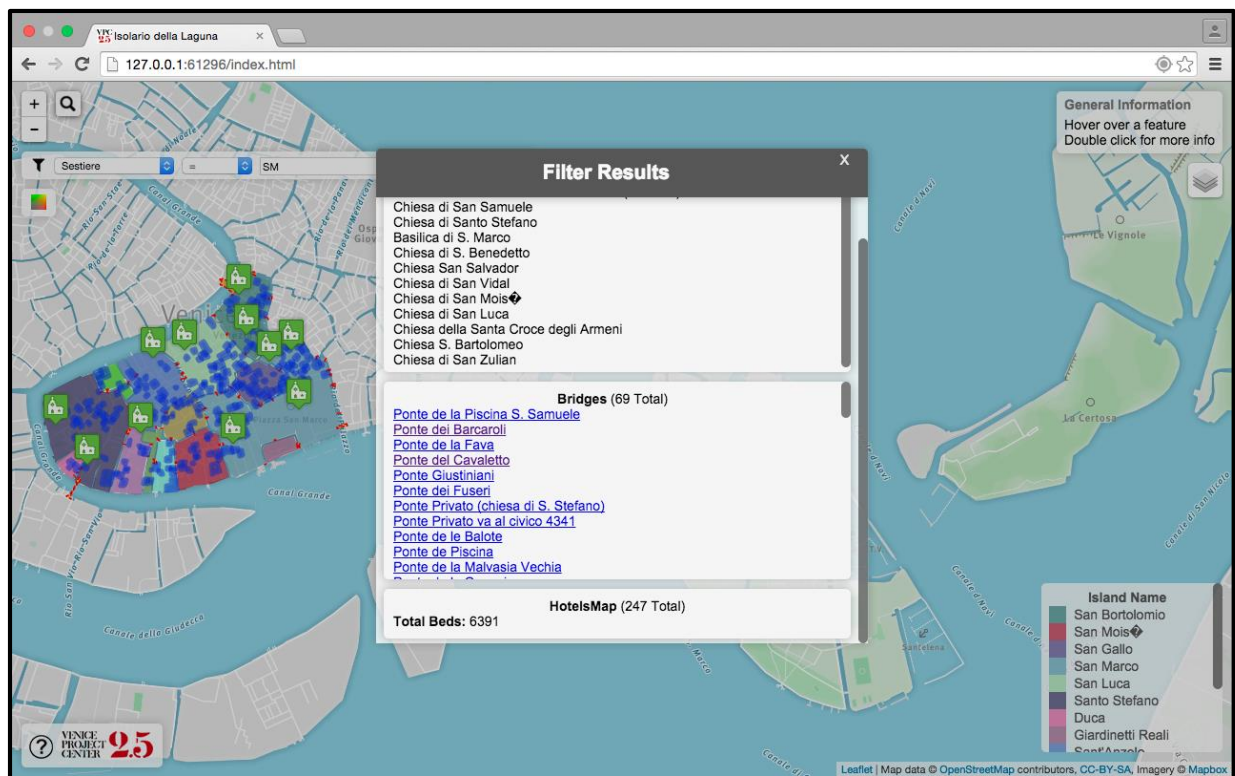


Figure 24. Example of Filter Results

4. Dynamic Color Tool: The dynamic coloring tool gives the user the ability to recolor content being shown on the map. This tool changes the colors of each island on the map based on a selected input. For example, if given gender ratio as an input, the coloring tool can be used to show gender ratio trends across the islands of Venice as shown in Figure 25. The coloring

tool is useful in that the user has the option to either color each island randomly, or to use a gradient to show trends across multiple islands. Random colorization is useful in cases where the user seeks to color by arbitrary trend, such as neighborhoods throughout the city. Coloring by gradient is useful in situations where the user seeks to display data trends.

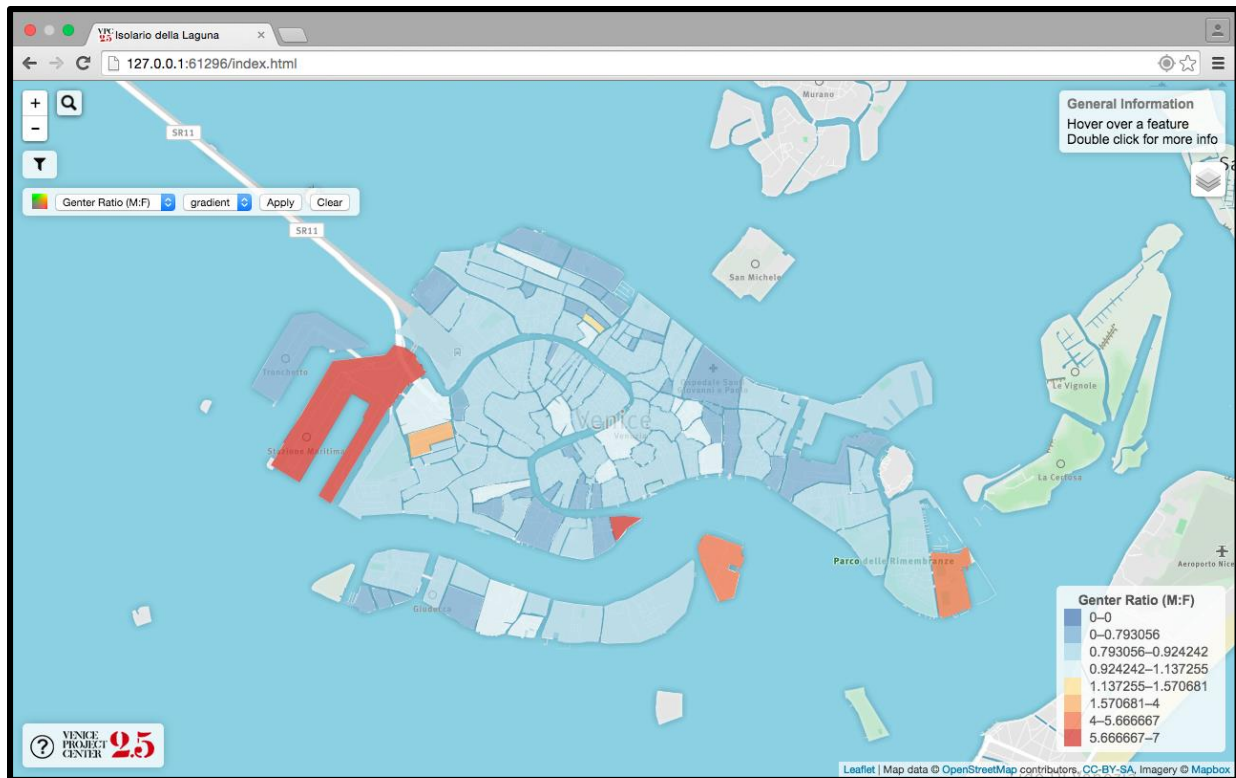


Figure 25. Example of Coloring Based on Gender Ratio

5. Layer Selection Tool: The Layer Selection Tool gives the user to select which layers are currently on display in the map. These layers are divided into two categories: base layers and map overlays. The map's base layer contains background information on the map that can't be modified, while the map overlays can be turned on or off by the user to display different geographic objects and data points.

The default base layer for this map shows an animation of the Venetian lagoon that



Figure 26. Base Maps

contains basic street, terrain, and naming information on the islands of Venice and their surrounding bodies of water. Since base maps can't be modified by the user, the *Isolario* contains the option to select either a "Satellite" or "Basic" base map as alternatives to the default.

Each map overlay contained within the *Isolario* contains a set of data from the Venice Project Center's online repositories. Map overlays include, but are not limited to, the following sets of information:

- Bell towers
- Bridges
- Canals
- Convents
- Shops
- Hotels

The *Isolario Interattivo* has been designed so that the user must manually select which map overlays to load into the map for display. This makes it so that the application is faster to load, and allows the user to change the map's content to contain only the information that he or she desires to view.

6. More Information Window: The more information window is used to show a summarized version of all information available on an island when the user double clicks on it. This window contains relevant information on the selected island from the tables shown in Appendix G: *Isolario API Documentation* and the base map layer, as well as clickable links for viewing the island's Venipedia page, Zotero Bibliography page, and showing the island on the

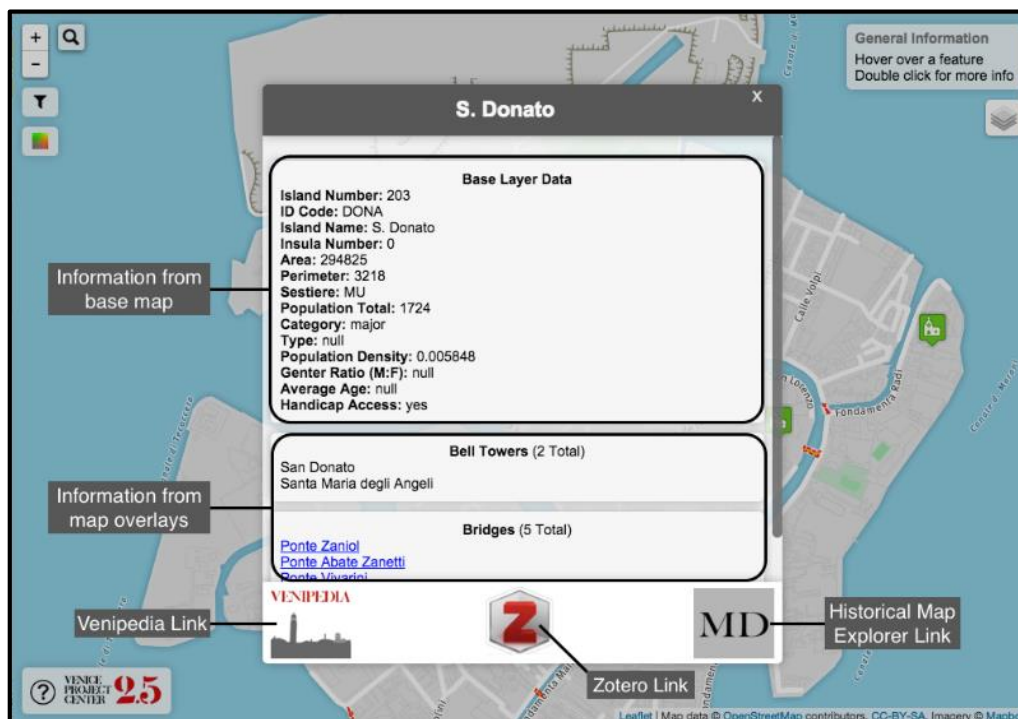


Figure 27. Example of the More Information Window

Historical Map Explorer. An annotated screenshot of a More Information window is shown in Figure 27.

7. Help Page: In order to make the application as intuitive as possible, the *Isolario* also contains a help page for showing users how to use and interact with the page. This page can be accessed by clicking on the picture of the question mark located in the bottom left hand corner of the screen.

8. Current Location (Not Numbered): Upon loading the page, the user's current location will appear as a marker on the map. This marker changes position to reflect the user's movement, and clicking on the marker will create a popup window showing nearby map features, as shown in Figure 28. This is a useful feature in that it allows for users such as

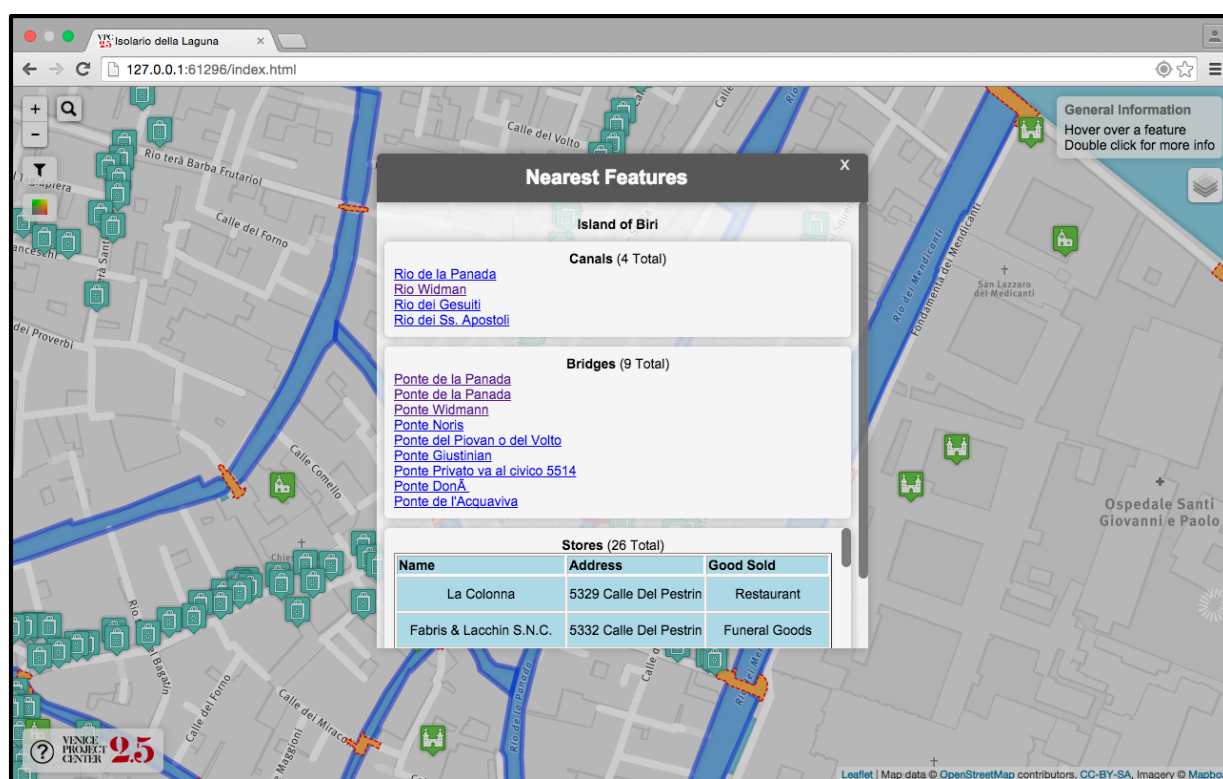


Figure 28. Example of Nearby Features

tourists to find their current location using a web-enabled phone, and to view important attractions located in their vicinity.

4.4.1.2 Developer Features:

Throughout the development of the *Isolario Interattivo*, the team tried to add as much functionality as possible for the end user. However, since the project is likely to be continued by others, many “behind the scenes” features were also added which the user isn't aware of, but will be helpful for future developers who wish to modify or update the application. Briefly, these features include:

1. Adding or modifying island Layers
2. Adding or modifying feature Layers
3. Appearance Options
4. Property Dictionary
5. URL Parameters

Full descriptions of these features along with explanations on how to use them are given in Appendix H: Developer Features.

4.4.2 Use Cases

The following sections provide some examples of potential users of the *Isolario Interattivo* and outlines how they might use different features.

4.4.2.1 Tourist

Suppose a tourist walking around Venice wanted to find something to do. They can open



Figure 29. Current Location

the *Isolario Interattivo* and use the Layer Selection Tool to show their “Current Location”. The current location marker will appear and track their location as they walk.

Next, the tourist can select any layer that interests them and show it on the map. They could do things such as find a hotel to stay in, or bell towers to look at. For this example, let’s

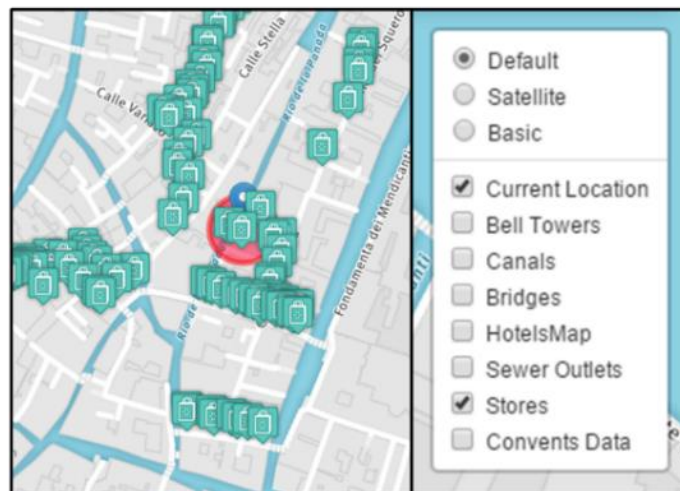


Figure 30. Layers as seen on a Map

assume they want to find places to go shopping and then eat dinner at a restaurant. In this case, they can select the “stores” layer and stores will begin to appear on the map.

By clicking on the Icon of any store, they can see basic information about that store. They can also click the Current Location Icon to see a summary of nearby features, including shops. Since shops have information such as: name, address and good sold; the tourist can find nearby souvenir stores or restaurants or anything else they would like.

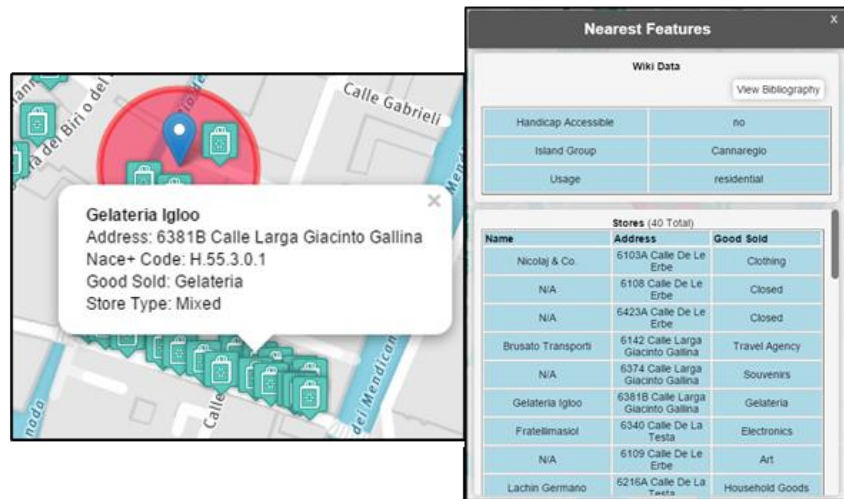


Figure 31. Nearby Attractions and Amenities

4.4.2.2 Elder

Mobility is an important concern in any city, however Venice in particular faces unique mobility constraints. The prevalence of canals and bridges can make navigating very difficult if stairs are an obstacle. In this example, we will suppose that a native Venetian is looking for information on accessibility in the area they live. After opening the *Isolario*, they would start by using the “Dynamic Color Control” to color the islands based on Handicap Access. To do this, expand the color control by clicking the color icon on the left. Next, select “Handicap Access”



Figure 32. Dynamic Color Filtering

from the first dropdown, “random” from the second dropdown. Then click “Apply”.

This will color the islands with random colors based on Handicap Accessibility and generate a legend which defines each color for the user. The legend can be minimized by



Figure 33. Handicap Accessibility Color Filtered

clicking on it. If the user doesn't like the colors selected, they can click "Apply" again to choose new random colors.

Next, if the resident is only interested in islands near where they live, they can use the "Dynamic Filter Tool" to only show those islands. To view the sestiere of Castello, click the filter icon on the left to expand the filter control. Next, select "Sestiere" from the first dropdown, "=" from the second drop down, and type "CS" into the text box. The text box has an autocomplete

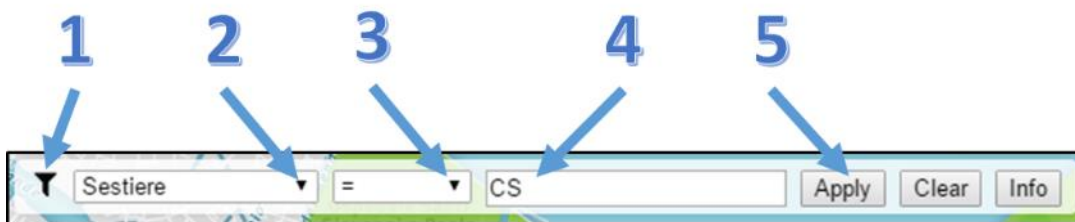


Figure 34. Dynamic Filtering

feature, so as soon as they start typing, available options will show up for them to select. Once all fields are filled out, click "Apply" to update the map.

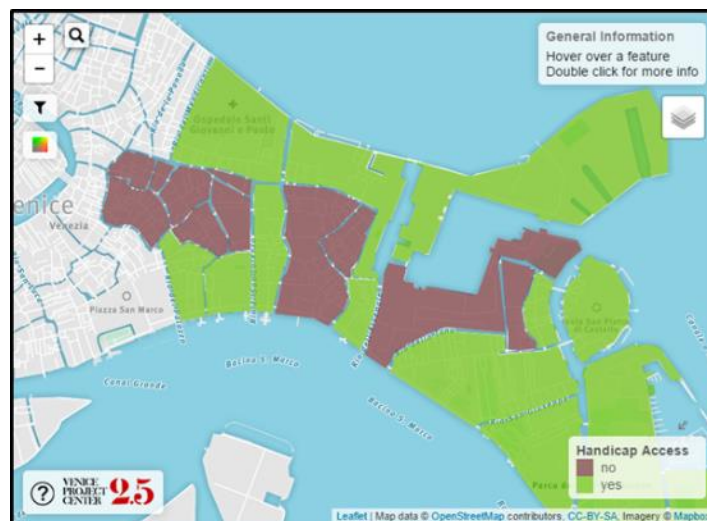


Figure 35. Castello Filtered

This will remove all islands from the map which are not in the sestiere of Castello. It will also remove all features such as Bridges, Shops, etc. which are not on islands in Castello.

4.4.2.2 Researcher

Since Venice is such a unique city, research is constantly being done on the dynamics of the city, including its demographics. By aggregating 2011 census data by island and adding it to the *Isolario*, we were able to provide powerful tools for researchers interested in the dynamics of the city. A researcher interested in the demographics of Venice can use the “Dynamic Color

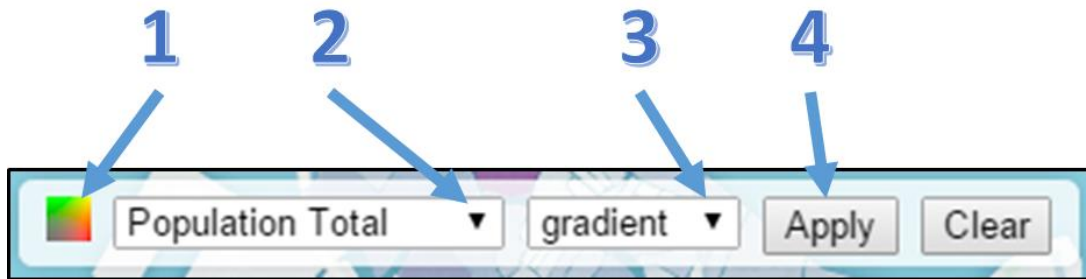


Figure 36. Coloring by a Gradient

Control” to color the islands based on Population Total. To do this, expand the color control by clicking the color icon on the left. Next, select “Population Total” from the first dropdown, “gradient” from the second dropdown. Then click “Apply”.

This will color the islands based on population total from the 2011 census. The islands

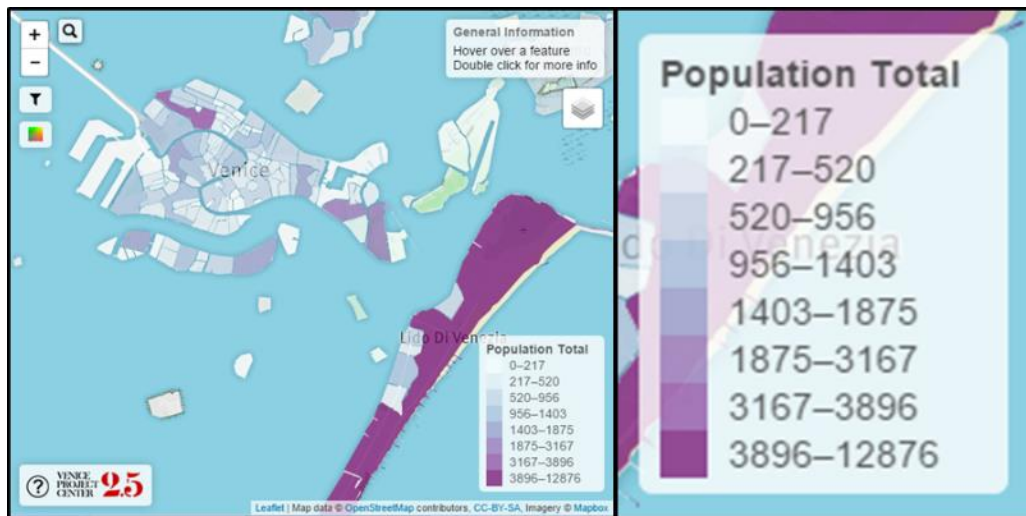


Figure 37. Total Population Gradient

will be categorized into 8 distinct color groups, using a Jenks Classification method. A legend also appears which shows the user what property the coloring is based on, and what values define each range. The legend can be minimized by clicking on it.

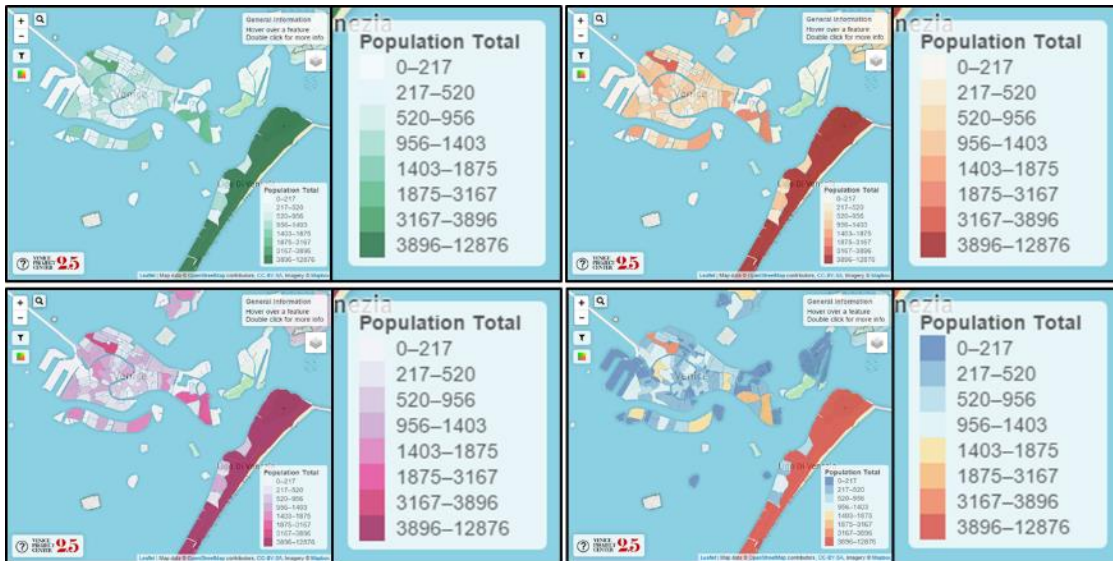


Figure 38. Changing Gradient Colors

By continually clicking the “Apply” button without changing the settings the color of the gradient changes. There are 5 color gradients which will cycle: purple, green, orange, pink, and blue-red.

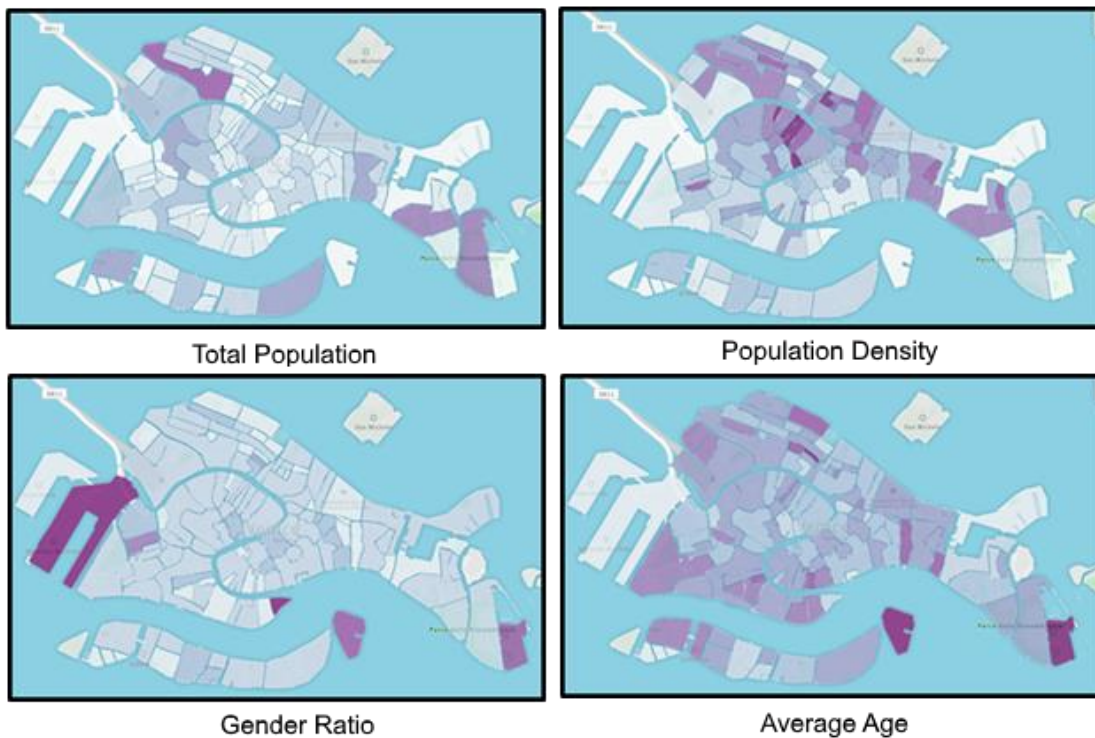


Figure 39. Example Demographic Fields

The researcher can also choose to color by other demographic fields such as population density, gender ratio, and average age, which have also been aggregated from 2011 census data.

4.4.3 Updated Historical Map Explorer

While the *Isolario Interattivo* is a visualization of the islands of Venice as they are today, the de'Barbari Explorer application gives a user the ability to view islands as they were in the past. To improve the functionality of the de'Barbari explorer and to give the user a better experience when using it, the application had to be updated. The existing islands had obscure and unhelpful names such as "Island 23". Each island feature in the de'Barbari explorer was analyzed and the modern-day equivalent of that island was determined from the *Isolario*. Then the old island was renamed to have the same name as the modern-day one. This allows the user to have a more consistent experience across Venice Project Center applications. It also allows developers to connect historical islands to modern islands, so that information can be transferred between applications. For example, since the *Isolario* knows the name of an island, it can link a user directly to the same island in the de'Barbari explorer. Similarly, since island



Figure 40. Updated de'Barbari Explorer

names are now correct, the de'Barbari explorer can link to the Venipedia page of an island. The last contribution to the de'Barbari explorer consisted of adding new island features as well as modifying existing islands to make them more accurate. The results of these efforts can be seen below in Figure 40.

4.5 Additional Compatibility Between Online Platforms

In order to make all of the information published through this project as accessible as possible, well-placed links were created between the Historical Map Explorer, *Isolario*, island Venipedia Pages, and online island bibliography. These links allow for users to easily find all existing information on the islands of Venice as easily as possible, and to explore this information using the platform of their choice.

5. Conclusions and Recommendations

5.1 Project Outcomes

The mission of this project was to assemble a single, complete, and easily accessible set of information on all islands of Venice, and to promote the preservation and revitalization of the abandoned Lagoon islands. These goals were successfully achieved through the team's collection, organization, and publication of data and information on each island of Venice.

The first step in achieving this mission was to gather extensive information on all islands of the Venetian Archipelago. This information included demographic, dimensional, and historical data for each island, as well as a detailed bibliography of scholarly sources. Once this information had been collected and organized by island, it was transposed to spreadsheets that could be easily uploaded to the Venice Project Center's online data repositories. Bibliographic sources for each island were also uploaded to an online citation manager in order to make them as accessible as possible.

In order to promote the preservation and revitalization of Venice's abandoned Minor Lagoon islands, a booklet on the revitalized Minor Lagoon island of Lazzaretto Nuovo was created. The aim of this booklet was to demonstrate the effects of restoration efforts to create a valuable cultural site for the city and to make an easily accessible guide on the island. The team also created a smaller brochure on the abandoned island of Poveglia with the hopes of creating more awareness for this island so that it can be revitalized like Lazzaretto Nuovo.

Along with creating printed information to raise awareness on the abandoned islands of Venice, this project also focused heavily on making the collected records on each island as electronically accessible as possible. The team designed and created Venipedia pages for each individual island, as well as several categorical pages on the Venice Project Center's definition of an island, island types, and island groups. These pages are automatically generated from online repositories of island information, and will update their content as the repositories are added to in the future.

Another important outcome of this project was the creation of the *Isolario Interattivo*. The *Isolario* allows for its users to interact with data and information Venice that has been organized by island. The application contains tools that make it easy to filter and recolor the information being displayed, as well as easily accessible links to each island's bibliography and Venipedia page. In order to provide *Isolario* users with the option of viewing what an island looked like in the past, the team also updated the "Islands" layer of the 2014 Historical Map Explorer application to include an accurate name and Venipedia link for each island.

5.2 Recommendations

Although the deliverables created by this project succeeded at their goals of making information on the islands of Venice more accessible and creating tools to promote the preservation and revitalization of abandoned Lagoon islands, each deliverable has room for potential improvements. During the planning and implementation stages of these deliverables, the team had several ideas that could be developed in the future to create an even more complete experience.

5.2.1 Publications

Brochures and booklets similar to the respective deliverables on Poveglia and Lazzaretto Nuovo can be produced following the templates created in this project. Team visits to the islands chosen for these future publications are strongly recommended so that pictures and descriptions of the islands' current conditions can be included. Prospective islands for these publications should include those that are no longer functional but do have some recent history to report. For example, many of the islands in the southern part of the lagoon were recently staged to be developed into luxury housing, but these plans fell through. These islands would be interesting choices for future brochures and booklets.

Additionally, further collaboration with Giovanni Distefano of Supernova Publishing and Lorenzo Bottazzo of Insula to create and publish future booklets is recommended. Other associations and individuals that are working to revitalize the Minor Islands could also be collaborated with to create these publications. Some examples are Poveglia per Tutti, Archeoclub Italia, Gerolamo Fazzini, and the EKOS Club. Coordinating the VPC's efforts with these associations will help to make the publications as meaningful as possible.

5.2.2 Isolario Interattivo

5.2.2.1 Correcting Inaccuracies in Layers and Datasets

While most of the layers and data used in the *Isolario* are highly accurate, there are slight errors present in some areas. Most islands layers, for example, reasonably line up with satellite images of the island, although there are a few cases where the island shapes are shifted or shaped differently than the actual island's shape. Other feature layers loaded from the VPC database are prone to similar inaccuracies: some churches, bell towers and other features appear in a slightly different place than their true location. Due to the large amount of data, the team was not able to find and correct all these inconsistencies. This is something that future teams should be aware of and correct as inconsistencies are encountered.

5.2.2.2 Adding New Data

By design, the *Isolario* is meant to display datasets from the VPC database on a per-island basis. In the future, the *Isolario* can be improved by linking it to additional datasets. For most cases, this can be done using the "getGroups" function—see Appendix H: Developer Features. Information can also be added to the island GIS layers. To do this, the layers can be edited, saved as geoJSON files, and re-uploaded to the *Isolario* website. The original layer files can be downloaded from the ve15.isles Google Drive or the VPC database. Some suggestions for improvements are as follows:

- Add municipality data for each island to the map layers
- Add a layer containing locations and detailed information on each boat stop
- Add 'Watershed' data for boat stops for each island: even if an island does not have a boat stop, where is the nearest one?

Another possible source of data for the *Isolario* is the *Atlante della Laguna*. While the *Isolario* does not have any functionality for interfacing with *Atlante della Laguna*, past project

teams have worked with data from the publication before. If integrated with the *Isolario*, the *Atlante della Laguna* application would create a rich source of data and add a lot of useful functionality.

5.2.2.3 Improving the Filter Control

As it stands, the filter feature of the *Isolario* is powerful, but limited. Currently the *Isolario* can only filter islands by a single property at a time, and only uses information from the island geometry layer. In the future, the following improvements could make the filter control more flexible and powerful:

- Incorporate multiple properties: ex. “Accessible = true AND type = city”
- Dynamically filter CK data: ex. Allow the user to show all shops, then only 2015 data, then only restaurants from 2015, without changing the code
- Add more functions/options to filter by: ex. “startsWith, endsWith, matchCase, NOT _____”

5.2.2.4 Improving the Color Control

The Color feature can create excellent visualizations using data from island layers. The usefulness of these features could be potentially improved by doing the following:

- Add more classification options: ex. Quantile, equal interval, standard deviation, etc.
- Allow the user to manually select classification ranges
- Allow the user to choose how many ranges to classify the data into
- Allow the user to choose specific colors for gradients and for Unique Value Classification
- Incorporate multiple properties: ex. Color gradient by “Area / Perimeter”

5.2.2.5 Analyzing Values over Time

In many cases, entries in a dataset are best visualized as they change over time. Currently, the *Isolario* treats properties of each island as singular entities. In the future, however, the *Isolario* could have features which recognize and display values over time:

- If data exists for the same value at different times, find these variables and treat them differently than singular entries
- When coloring or filtering by a time-dependent variable, display a slider which the user can use to show information from the time period they are interested in

5.2.2.6 Connecting Islands and Features

Currently, in the *Isolario*, functions such as search, filtering and coloring only work using information provided with the island map layers. To make the *Isolario* more useful and flexible, these functions can be modified to also incorporate data from feature layers loaded from external sources. As an example, this would allow users to search for a specific church by name, color islands based on the number of bridges they have, or filter islands to show only those around a specific canal.

5.2.2.7 Deep Linking

Currently, the *Isolario* accepts URL parameters to zoom directly to a specific island or feature once the webpage loads. This functionality can be expanded upon in the future to accept additional parameters controlling different functions. For example custom URLs could be created to control the color and filter functions as well as open popups or more information windows. Additionally, the user may be able to generate a link containing the current state of the application and share it with someone else or be able to quickly return to the same state later on.

5.2.2.8 Live Photo Library

The *Isolario* displays photographs that the team has collected and uploaded to the VPC database for each island. While most islands have at least one photograph, collecting photos from additional sources would ensure each island has a wealth of photographs to help users learn about each island. Using libraries provided by web services such as Instagram or Flickr, it may be possible to gather and display photos of each island taken by anyone who has posted them online and given permission to access them.

5.2.2.9 Exporting Data and Visualizations

While the *Isolario* can be very useful as a map-based visualization tool, it can also be modified to create other types of visualizations, and to let users download and save the information it presents. Some examples of these functions include:

- Allow the user to display a graph of selected data
- Allow the user to download a spreadsheet containing data filtered and sorted as desired

5.2.2.10 Geocoding

When features are loaded into the *Isolario*, the application displays the feature on a map, determines which island(s) the feature belongs to, and saves this information so it can be used later. Currently, this only works on data which are already tagged by island, or contain geometry such as Latitude and Longitude. To improve this functionality, future projects could explore the possibility of using geocoding to determine the location of objects with no coordinates. Geocoding is the process of converting a street address (as text) into geographic coordinates (latitude and longitude). This would allow a wider range of data to be added to and displayed in the *Isolario*. Similarly, reverse-Geocoding (determining an address given coordinates) can be determined from features with known geometry. This might be more intuitive for users to read than simply geographic coordinates. It could also be used to allow users to search for an address and find the islands and features nearby.

5.2.3 Further Updates for the Historical Map Explorer

The Historical Map Explorer is a valuable tool to view what different islands looked like during different points of Venice's history. To further develop and update this application, future teams could label each island with the historical name for the islands rather than the modern

names. Teams could also add more islands to each map to ensure that all islands will appear and display information on each of the maps on the explorer. Links were provided from the *Isolario* to the Historical Map Explorer, but for future development a link from the Explorer to the corresponding island on the *Isolario* could be added. A link to the island's Zotero bibliography could also be added on the Explorer. This would ensure that all islands in both the *Isolario* and Historical Map Explorer were linked to all other applications.

Overall, this project has helped to make island-specific information available in a variety of formats. The booklet and brochure make different types of information available in print formats and can serve as templates for similar publications on other islands. The *Isolario Interattivo* and Venipedia pages make information available online. Additionally, the *Isolario* can be expanded to provide new features and more information. While these publications are valuable on their own, the most important feature is that each laid the groundwork for future development. It is our hope that future teams will continue to develop the resources we created.

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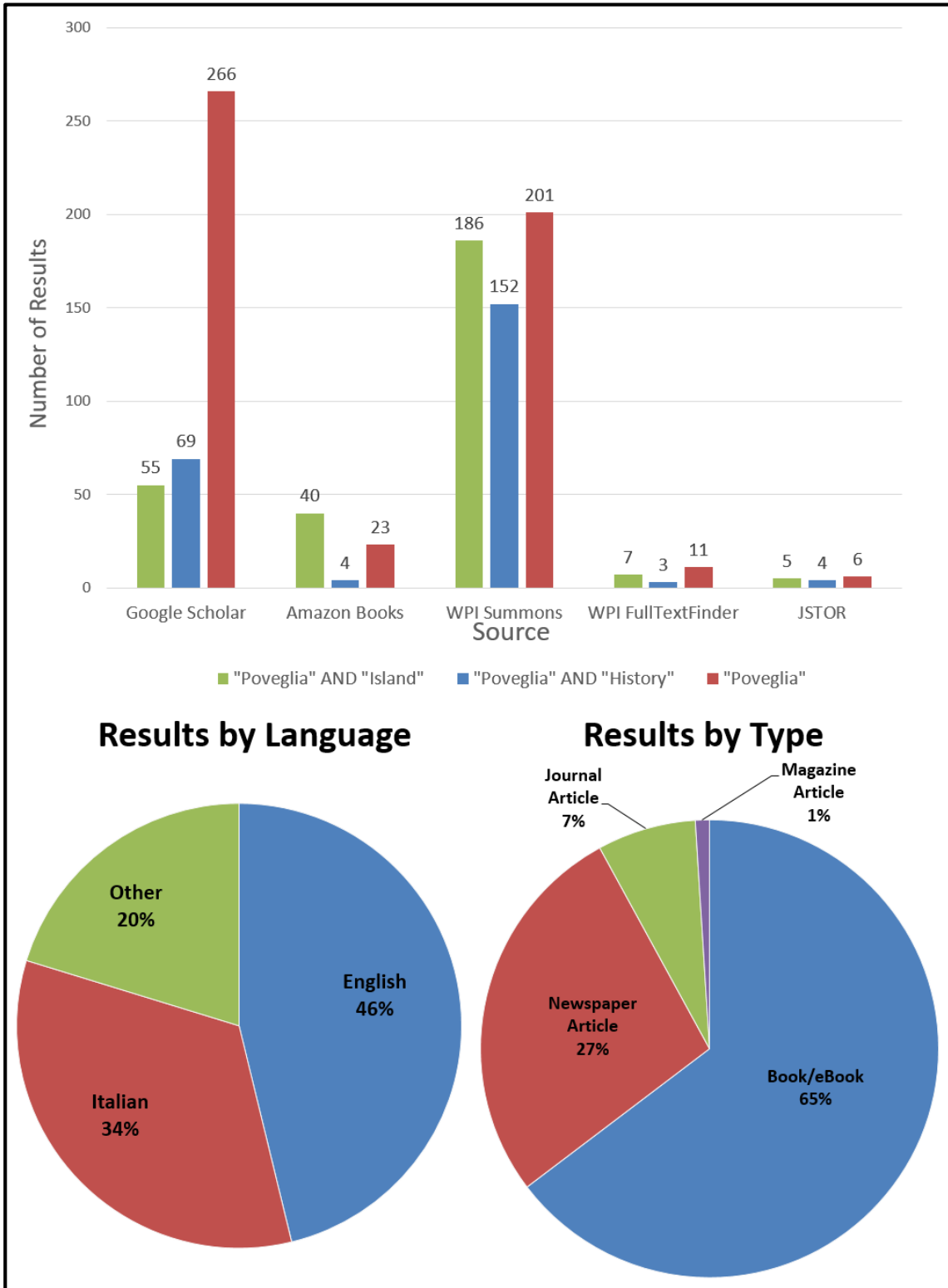
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Appendices

Appendix A: Search Results for a Lesser Known Island



Appendix B: List of the Venetian Islands

ID Num	ID Code	Island Name	ID Num	ID Code	Island Name
1	ALVI	Sant'Alvise	39	MAGG	Santa Maria Maggiore
2	ORTO	Madonna dell'Orto	40	MALC	Malcanton
3	SENS	Sensa	41	PANT	San Pantalon
4	BRAZ	Brazzo	42	RIZZ	Ca'Rizzi
5	MORI	Mori	43	RAGU	Ragusei
6	VALV	Santa Maria di Valverde	44	CERE	Cereri
7	GIRO	San Girolamo	45	NICO	San Nicolò dei Mendicoli
8	ORME	Ormesini	46	SEBA	San Sebastiano
9	MISE	Misericordia	47	CARM	Carmini
10	CHIO	Chiovere San Girolamo	48	BARN	San Barnaba
11	GHET	Ghetto	49	ROMI	Romite
12	SERV	Servi	50	CERC	Cerchieri
13	MARZ	San Marziale	51	TROV	San Trovaso
14	VEND	Ca'Vendramin	52	ACCA	Accademia
15	LEON	San Leonardo	53	SVIO	San Vio
16	MADD	Maddalena	54	SPIR	Spirito Santo
17	FOSC	Santa Fosca	55	GREG	San Gregorio
18	FELI	San Felice	56	SALU	Salute
19	MACE	Macello	57	GESU	Gesuiti
20	GERE	San Geremia	58	RACC	Racchetta
21	ZAND	San Zan Degolà	59	ANDR	Sant'Andrea
22	ORIO	San Giacomo da l'Orio	60	SART	Sartori
23	MEGI	Megio	61	BIRI	Biri
24	STAE	San Stae	62	CORR	Corrente
25	MOCE	Ca'Mocenigo	63	2POZ	Do Pozzi
26	MATE	S.M. Mater Domini	64	APOS	Santi Apostoli
27	2TOR	Do Torri	65	PANA	Panada
28	CASS	San Cassian	66	ZANI	San Zanipolo
29	SILV	San Silvestro	67	VIGN	San Francesco de la Vigna
30	BOLD	San Boldo	68	BACI	Bacini Arsenal
31	POLO	San Polo	69	CANC	San Cancian
32	MELO	Meloni	70	MIRA	S.M. dei Miracoli
33	TOLE	Tolentini	71	GRIS	San Zuane Grisostomo
34	FRAR	Frari	72	MARI	Santa Marina
35	NOMB	Nomboli	73	BORG	Borgoloco
36	ROMA	Piazzale Roma	74	FORM	Santa Maria Formosa
37	PAPA	Giardini Papadopoli	75	LATE	San Zuane Laterano
38	MART	Santa Marta	76	SEVE	San Severo
ID Num	ID Code	Island Name	ID Num	ID Code	Island Name
77	BORT	San Bortolomio	119	GIOR	San Giorgio

78	FAVA	Santa Maria della Fava	120	INCE	Inceneritore
79	QUER	Querini Stampalia	121	PORT	Stazione Marittima
80	LUCA	San Luca	122	TRON	Tronchetto
81	ANZO	Sant'Anzolo	123	GIOB	San Giobbe
82	GARZ	Ca'Garzoni	124	DIPO	Diporto Velico
83	STEF	Santo Stefano	125	DGIO	Darsena San Giorgio
84	DUCA	Duca			
85	MAUR	San Maurizio	201	MATM	Sacca S. Mattia
86	DUOD	Ca'Duodo	202	CONV	Del Convento
87	ZOBE	Santa Maria Zobenigo	203	DONA	S. Donato
88	FANT	San Fantin	204	NAVA	Navagero
89	MOIS	San Moisè	205	SERE	Sacca Serenella
90	REAL	Giardinetti Reali	206	PIEM	S. Pietro
91	GALL	San Gallo	207	STEM	S. Stefano
92	MARC	San Marco	208	MICH	S. Michele
93	FILI	San Filippo e Giacomo	301	MAUB	S. Maurizio
94	ZACC	San Zaccaria	302	MARB	S. Martino
95	LORE	San Lorenzo	303	TERR	Terranova
96	BRAG	Bragora	304	GIUD	Giudecca
97	TERN	Santa Ternita	401	MARI	S. Maria di Valverde
98	MRTN	San Martin	402	GRAZ	S. Maria delle Grazie
99	ARSE	Arsenale	403	MATM	SS. Mattia e Margherita
100	DANI	San Daniel	404	BORT	S. Bortolo
101	RUGA	Campo Ruga	405		
102	PIER	San Piero	406		
103	ANA	Sant'Ana	407		
104	ISEP	San Isepo	501	BORG	Borgognoni
105	ELEN	Sant'Elena	502		
106	STAD	Stadio Sant'Elena	503		
107	FISO	Sacca Fisola	504		
108	AMAV	AMAV	505	FOSC	S. Fosca
109	PISC	Piscina Comunale	506	ANTO	S. Antonio
110	SACB	Sacca San Biagio	507	ANDT	S. Andrea
111	STUC	Molino Stucky	508	GIOV	S. Giovanni Evangelista
112	BIAG	San Biagio	509		
113	CONV	Convertite	601	LIDO	Lido di Venezia
114	EUFE	Sant'Eufemia	602	TIRO	di Via Tiro
115	PALA	Palada	603	PART	di Via O. Partecipazio
116	JUNG	Junghans	604	BRIN	di Via M. Bragadin
117	REDE	Redentore	605	MARO	di Via L. Marcello
118	ZITT	Zittelle	606	CAND	di Via Candia
607	IPAT	di Via T. Ipato			
609	FORT	Ex Forte			

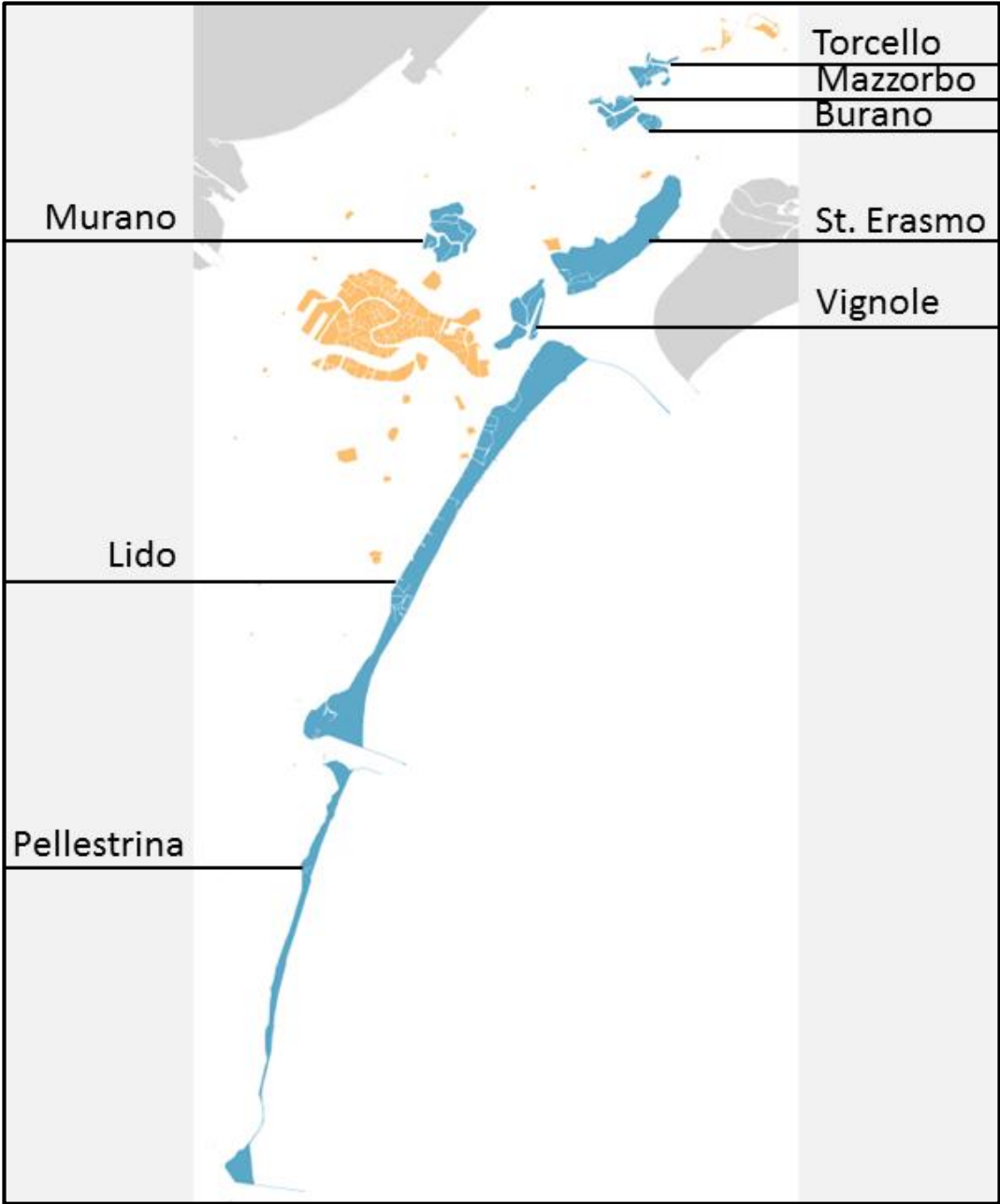
701	PELE	Pellestrina			
801	VIGN	Vignole Nuove			
802	ANDR	Sant'Andrea			
803	VIGV	Vignole Vecchio			
804	CERT	La Certosa			
805					
901	ERAS	Sant'Erasmo			
902					

Appendix C: Maps of Islands in the Venetian Lagoon

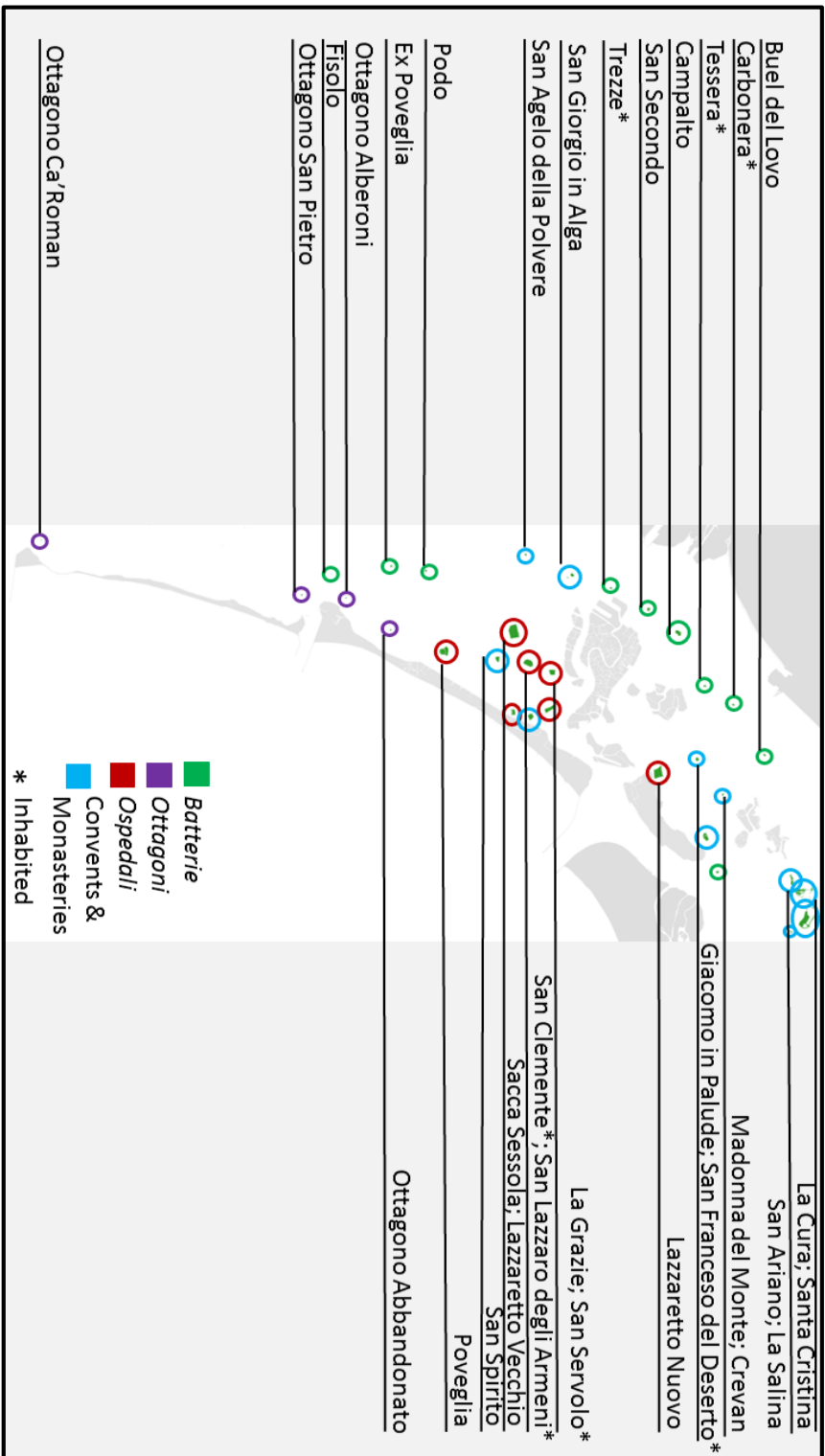
Appendix C.1: Labeled Map of the Lagoon



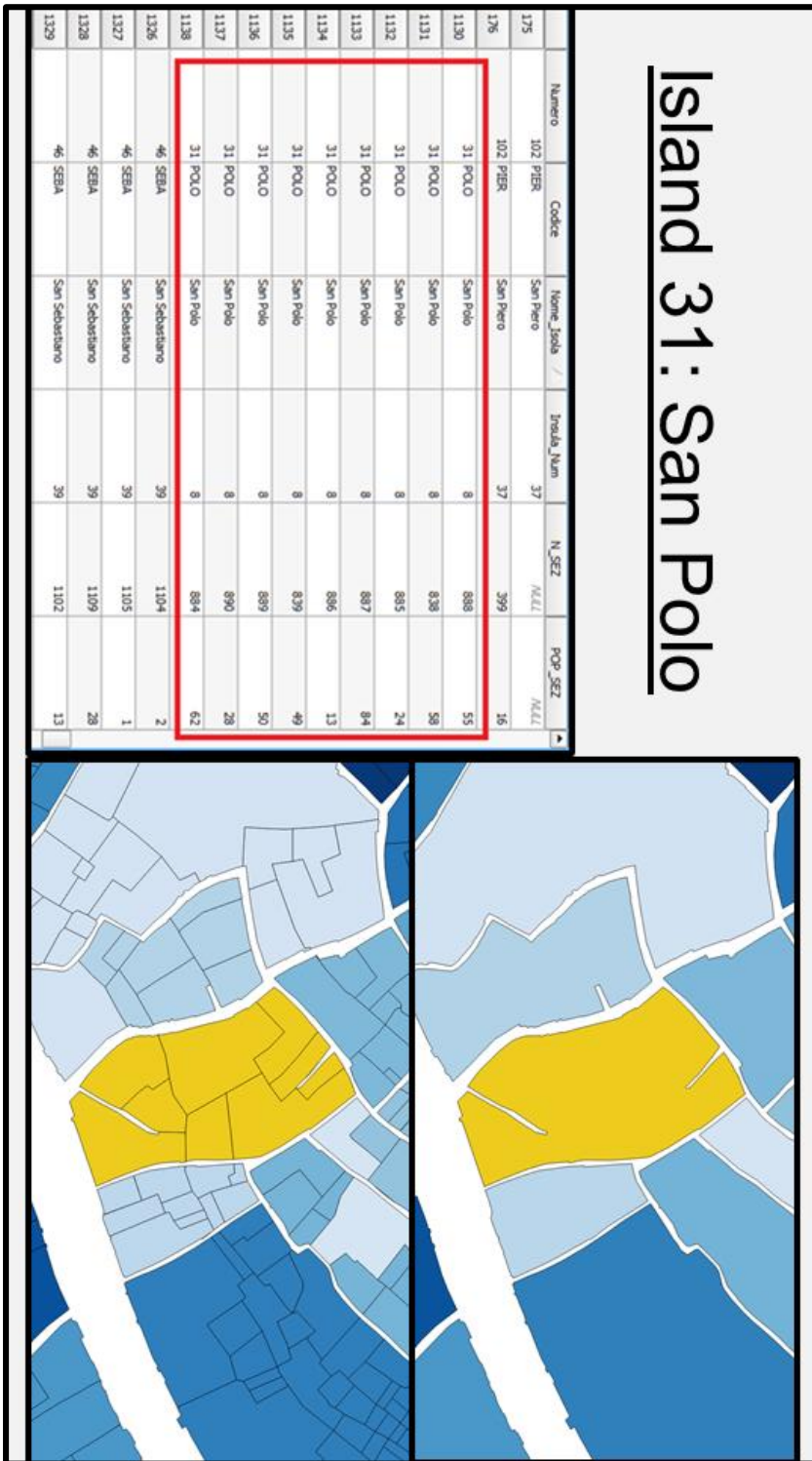
Appendix C.2: Labeled Map of the Major Lagoon Islands



Appendix C.3: Labeled Map of the Minor Lagoon Islands



Appendix D: Example of Census Tracts by Island



Appendix E: Print Publications

Brochure on Poveglia

https://drive.google.com/file/d/0BwgiS_Fw4aOxQXNfS184WVBpVFU/view

Booklet on Lazzaretto Nuovo

https://drive.google.com/file/d/0B_p7yl-zJQKIQmIMMUTRTmxWaHM/view

Appendix F: Tools Used for the Development of the *Isolario Interattivo*

Appendix F.1 Brackets

Brackets is a text editor/development environment for the web. The team decided to use Brackets as a common development environment for several reasons:

1. It is very simple, and designed solely for web development. Because of this, there are no unnecessary features or buttons which slow down computers.
2. It provides all the features required of a development environment, including: applying different text colors to keywords such as functions and variables; code folding, the option to minimize sections of code that are no longer needed to be seen; and parallel windows, which allow different files to be compared side by side.
3. It allows the application to be launched directly from the environment, and has a feature called live preview which allows for changes to be seen in real time without needing to re-load the page.
4. It is cross platform, which means it can work on Windows, Mac, and Linux machines. This allows everyone on the team to work in the same environment regardless of their operating system.

Appendix F.2 GitHub

GitHub is a web-based repository service which utilizes the git version control system. Using GitHub allows all of the members of the team to work on the same code at the same time, on different computers. All of the code is backed up in the cloud, so everyone can access it from anywhere. In addition, GitHub tracks all changes made to the code and allows users to revert to previous versions if something is accidentally deleted something or commit a change which breaks part of the application. Lastly, GitHub is cross platform, so again, all members of the team can use it regardless of operating system.

Appendix F.3 Firebase

Firebase is an online real-time database. It allows developers to store data online and access it from several applications. If the data is modified or updated in the database, these changes will be automatically reflected in the applications that reference it. The VPC Database, also known as the CK Console, hosted by the Venice Project Center, utilizes a Firebase repository to make data available to all applications developed by project teams. Since the new *Isolario* requires information from the CK Console, Firebase is an integral part of the application.

Appendix F.4 Leaflet.js

Leaflet is a simple but powerful JavaScript library which contains many features for visualizing maps on the web. While there are several options for visualizing maps, Leaflet was chosen for the following reasons:

1. It is simpler than most other similar libraries such as Google.maps and openLayers. This makes it easier to understand and utilize, while also making the application faster and more responsive for the user.

2. It provides nearly infinite customizations in terms of styling and appearance. Pre-defined styles and map backgrounds can be used as well as custom styles designed by the team. The map style chosen was from openstreetmap.org.
3. There are many plugins available for it which add new features, such as heat maps and custom buttons.
4. Other project teams in the past have utilized Leaflet. Their projects could be used as examples to expedite the process of learning how to use the library. This also ensures that this new application is similar enough to other projects that someone in the future will be able to understand it and change or update it easily.

Appendix F.5 Leaflet-search.js

Leaflet-search is a library which serves as a plugin to the Leaflet Library. It allows developers to add a functional search bar to a leaflet map. The library handles all functional and visual aspects of the search bar, including auto show/hide, autocomplete, and moving to the found feature. This library is used to search through islands and direct the user to the island they are interested in.

Appendix F.6 Fuse.js

Fuse.js is a JavaScript library which allows developers to perform a “fuzzy-search” on a list of strings. The term “fuzzy” means that the input text does not have to exactly match any of the items in the list being searched. Search results are listed in order of how close they are to exactly matching the input text. This library is used in conjunction with the Leaflet-search library to allow the user to find islands by name, even if they spell it incorrectly.

Appendix F.7 Awesocomplete.js

Awesocomplete is a JavaScript library which attaches autocomplete popups to text boxes. This library is used in the filter control window to inform the user as to which values they can filter by.

Appendix F.8 Geostats.js

Geostats is a JavaScript library which contains helpful functions for visualizing data on a map. It allows developers to classify features into different ranges using a variety of techniques. Layers can then be colored according to these ranges to make them visually sensible to the user. The Geostats library is used to perform a jenks classification on the islands when coloring by a gradient.

Appendix F.9 Spin.js

Spin.js is a JavaScript library which allows developers to place a moving spinner object in a window. The properties of the spinner (from size to shape to color) can be adjusted. This library is used in the loading screen to let the user know that the application is working on some task.

Appendix G: Isolario API Documentation

Appendix G.1 Methods

Method	Returns	Description
getIslands(<URL String> path,< islandOptions > options?)	null	Load an Island layer from an external source
getIslandsGroup(<URL String> path,< islandOptions > options?)	null	Load an island layer from the CK console. The “url” parameter should point to a JSON file containing individual objectIDs for each island.
getGroup(<URL String> url,< groupOptions > groupOptions?,< geojson-options > customArgs?)	null	Load a feature layer from CK console. The “url” parameter should point to a JSON file containing individual objectIDs
CKtoGeoJSON(< CKObject >	GeoJSON object	Converts CK console data to GeoJSON objects which can be turned into map Layers for leaflet.

Appendix G.2 Data Types

Appendix G.2.1 Leaflet

See <http://leafletjs.com/reference.html>

Appendix G.2.2 groupOptions

Option	Type	Default	Description
Tag	String	null	tag used to identify this layer. Used Internally and shown to the user
useNearest	bool	null	flag indicating method to be used for spatially indexing features (assigning an island number). -false: only geometry within the polygon of an island or overlapping the polygon will be considered “on the island” -true: each object will be considered “on” the island closest to each point of its geometry.
filter(<object> obj)	function	{}	function to choose which CK console objects will be added to the map and displayed. return true/false

moreInfo(<Array> targets,<String> tag)	function	{}	function returning an HTML representation of a series of properties , as a string. To be displayed in the More Info overlay window.
generallInfo(< properties > target)	function	{}	function returning an HTML representation of a single object. To be displayed in the General Info window.

Appendix G.2.3 islandOptions

Option	Type	Default	Description
searchInclude	Array	null	array of island properties to be indexed in the search. Takes precedence over searchExclude.
searchExclude	Array	null	array of island properties to be excluded in the search. If searchExclude==null, all properties except those here will be indexed.
moreInfo(<Array> targets,<String> tag)	function	{}	function returning an HTML representation of a series of properties , as a string. To be displayed in the More Info overlay window.
generallInfo(< properties > target)	function	{}	function returning an HTML representation of a single object. To be displayed in the General Info window.

Appendix G.2.4 CK Console Object

Any Object of any format pulled from the CK Console. Typical Objects generally have a structure similar to the following:

Property	Type	Description
birth_certificate	object	determines the type of the GeoJSON object
shape	object	contains information about the geometry of the feature. Usually formatted as a GeoJSON geometry object
data	object	Only required for Feature types. see link below

Appendix G.2.5 GeoJSON Object

All CK Console data is converted to GeoJSON format before being used by the application. Geometry data is extracted from the “shape” field or Latitude/Longitude fields. The original object is saved as “feature.properties”. Below is a brief description of some of the GeoJSON formatted objects used in the Isolario. For a more detailed description of the GeoJSON format, see <http://geojson.org/geojson-spec.html>

Property	Type	Description
type	String	determines the type of the GeoJSON object
coordinates	Array	contains information about the geometry of the feature
geometry	*Varies*	Only required for Feature types. see link above
properties	*Varies*	Required for Feature types. see link above
features	Array	Required for featureCollections. Each object in the array is a GeoJSON feature
_____	*Varies*	Any additional properties with any values may be added
properties.islands	Array	Array containing Island numbers associated with this feature. This is added by the application to relevant features.

Appendix G.3 URL Parameters

The Isolario supports URL parameters to automatically zoom to any island or feature once the application loads.

Property	Type	Default	Description
layerTag	String	null	Determines the layer to search for the desired feature. If none is given, "Islands" will be assumed
_____	String	null	The name and value of this input determines the property and value to search for in the layer defined by the tag above. If more than parameter is found, the first matching feature will be selected

Examples

- <http://islands.veniceprojectcenter.org/index.html?Numero=45>
- http://islands.veniceprojectcenter.org/index.html?Nome_Isola=Santa%20Marina
- http://islands.veniceprojectcenter.org/index.html?layerTag=Bridges&Nome_Ponte=Ponte%20de%20Rialto
- http://islands.veniceprojectcenter.org/index.html?layerTag=Bridges&Codice_Ponte=ANDREA
- <http://islands.veniceprojectcenter.org/index.html?layerTag=Bell%20Towers&NAME=Chiesa%20S.%20Giobbe>

Appendix H: Developer Features

Appendix H.1: Adding or Modifying Island Layers

Island layers are imported into the application using the “getIslands()” or “getIslandsGroup” function in the “getData.js” file. The functions takes in an argument representing the path to a file containing the island data. The files containing the island layers can be modified at any time and the application will automatically adjust to show all island properties. Additionally old files can be replaced with new ones, and additional files may be added. Important notes:

- For the getIslands() function, the file being imported must be in GeoJSON format. Shapefiles can be saved as GeoJSON objects in qGIS by right-clicking the layer, then selecting “save layer as” and choosing “geoJSON” from the dropdown.
- For the getIslandsGroup() function, the path must be to a url pointing to a JSON file with a members property. The members property must contain properties corresponding to ID numbers of JSON files located at “__from_original_URL__/data/___ID___.json”. Each of these JSON files should represent a single island. The getIslandsGroup function takes care of requesting, receiving and adding each to the map.
- Multi-polygon layers and single-polygon layers cannot be saved in the same geoJSON object (no idea why). They must be separated into different GeoJSON files and imported separately.
- The “path” parameter can be either a url or a path to a geoJSON file on the local file system

Appendix H.2: Adding or Modifying Feature Layers

Feature Layers are imported using the “getGroup()” function in the “getData.js” file. The function takes in an argument representing the url of a group of objectIDs in the CK Console. The function will download the list of IDs, and then present an option allowing the user to download the Objects corresponding to those IDs. The options parameter of this function allows the developer to specify how the information from this new dataset will be presented to the user. This allows developers to format information in a way that is visually pleasing, the customArgs parameter will be passed to the leaflet layer generated by this function to determine the appearance and behavior of the layer, such as color and popup content. More detailed documentation about the “getGroup()” function can be found in Appendix G: Isolario API Documentation.

Appendix H.3: Appearance Options

Many aspects of the *Isolario*’s appearance are set from files in the “css” folder. Existing appearance settings can be modified at the developer’s discretion at any time, without affecting the *Isolario*’s functionality. The user can also add custom styling options for new layers or data which they are adding.

Appendix H.4: Property Dictionary

While datasets are often labeled with meaningful, descriptive titles, sometimes these titles are not necessarily intuitive for the end user to recognize. To fix this problem, the “dictionary.js” file contains a function which translates ambiguous property labels to more user friendly ones. Developers can add to or modify this file as necessary. For debugging, they can also remove statements from this file and see the original property names in the Isolario.

Appendix H.5: URL Parameters

The Isolario can be linked to so that it automatically loads features and zooms to specific items upon loading the page. There are several ways of configuring these links:

- Zooming to a specific island can be achieved by passing in any variable name that is included in the base geoJSON layers. The following links are an example of this feature
 - <http://islands.veniceprojectcenter.org/index.html?Numero=45>
 - http://islands.veniceprojectcenter.org/index.html?Nome_Isola=Santa%20Marina
- Loading a dataset and zooming to a specific item in said set can be achieved by passing in the name of the dataset and an identifying feature of the item to zoom to. In a similar manner to selecting an island to zoom to, a feature can be selected by passing in any variable contained in the feature’s properties. Examples of these types of links are shown below
 - http://islands.veniceprojectcenter.org/index.html?layerTag=Bridges&Nome_Ponte= Ponte%20de%20Rialto
 - http://islands.veniceprojectcenter.org/index.html?layerTag=Bridges&Codice_Pon=AN DREA
 - <http://islands.veniceprojectcenter.org/index.html?layerTag=Bell%20Towers&NAME= Chiesa%20S.%20Giobbe>