

The Impact of Tourism on the Venice Public Transportation System

AN INTERACTIVE QUALIFYING PROJECT REPORT
WORCESTER POLYTECHNIC INSTITUTE

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Abstract

The number of tourists visiting the city of Venice every year has rapidly been increasing, verging on unsustainability, especially during the summer months. The public transportation network has become more congested. This project investigated the impacts of tourism on the public transportation system by collecting ridership data from the popular boat stops and comparing the counts to the number of cruise ships present for each day. The project concluded that cruise ship passengers increased public boat use by a factor of 2 at the least, and a factor of 4 at the most. These data may prove essential to further understanding how tourism, as well as the extensive public boat system, might be modified to insure the continuing health and prosperity of Venice.

Please visit our project websites at: sites.google.com/site/ve12trans/ and www.venipedia.org



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The team would like to thank the following individuals for all of their help: First, we would like to express many thanks toward our advisors, Professor Fabio Carrera and Professor John Zeugner, for their assistance and guidance throughout this project. We would also like to thank Kyle Miller for all of his help gathering information, as well as Ben Lichtner for his collaboration with the smartphone application. Without all of their help, our project would not have been nearly as successful.

Authorship

This project report, titled The Impact of Tourism on the Venice Public Transportation System, was created with equal, cohesive efforts by Marissa Capua, Jessica Guyette, Brian Hetherman, and Lindsay Hock. Each student deserves to earn equal credit for the authorship of this report.

Executive Summary

Beginning in the 1950s, Venice has been experiencing exponential growth in the number of tourists visiting the City each year. Back then, an average of 2 million people visited annually, but as time went on, more and more people--12 million in 1995, and over 16 million in 2011--have been travelling to Venice to see its many historic sites and experience the culture, which is unlike that of any other city. This rapid growth has also made up a very important part of Venice's total yearly income, and is therefore an extremely significant piece of the Venetian economy.

The tourist market has been a large wealth creator--providing more than two-thirds of the total income and generating at least half of the jobs--but it has also created negative effects on the City. With such large numbers of people, streets, bridges, boat stops, and boats have become very crowded. Attempting to navigate through the City becomes a severe frustration, even forcing some Venetian citizens to change their daily routes in order to avoid the crowds.

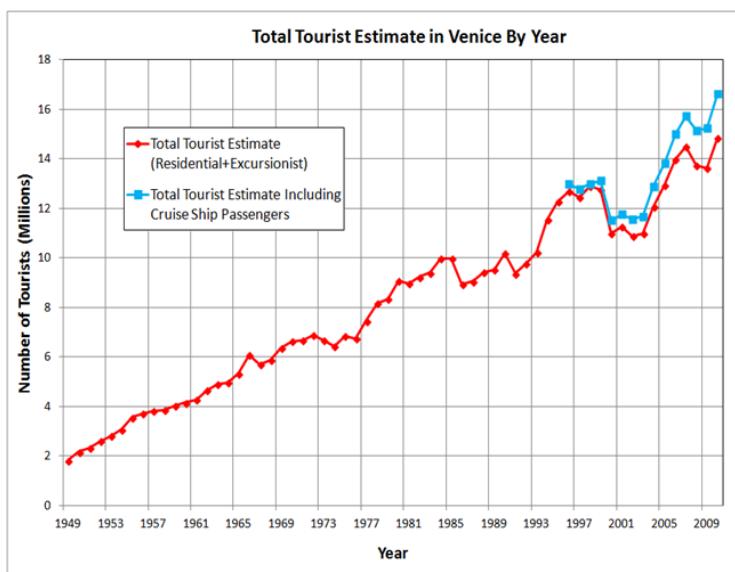


Figure I: Total Tourist Estimate in Venice By Year since 1949

A large portion of these tourists comes from cruise ships, which dock in the City's three main ports. Cruise ship passengers account for an additional 15% of tourists visiting the City, and the total number of cruise ship passengers has been steadily increasing annually, which can be seen in Figure I. As of 2011, nearly five times as many people cruised to Venice as did in 1997. These massive ships have carrying capacities of up to a few thousand people, and multiple ships visiting on the same day causes a spike in the total population of the City. A study completed in 2011 concluded that after disembarking from a cruise ship, approximately a quarter of the passengers continue onto the public boat transportation system in order to make their way into Venice.

Since the streets are too small to support the use of terrestrial forms of transportation other than walking, Venice's population--Venetian citizens as well as tourists--rely heavily on boats as the major form of public transportation. This system includes the use of *traghetti*, the *Alilaguna*, and the ACTV. The ACTV's *vaporetti*, shown in Figure II below, are the most common form of waterborne transportation.



Figure II: An ACTV vaporetto

Although most of these boats are able to hold over 200 passengers, they can still become extremely overcrowded upon the arrival of large groups of tourists, such as when a cruise ship docks. More specifically, main ACTV lines, such as Line 1 and Line 2, which have travel routes down Venice's Grand Canal, become overwhelmed with tourist passengers whose destinations are major landmarks or historic sites unique to Venice.

The ultimate goal of this project was to quantify and analyze the impact made on Venice's public transportation system by tourists visiting the City. This goal was completed using cruise ship passengers as an indicator of a tourist pulse, and the ACTV as the main provider of public transportation services.

In addition, the group organized information with the help of technology to facilitate the use of the public transportation system. This organization was done by the creation of Venipedia pages, which contain information about all aspects of the boat transportation system. We also aided the development of an interactive smartphone application that uses Google Transit to assist users in navigating via the ACTV public transportation system.

The group created and updated a total of 122 Venipedia pages, including those for ACTV and *Alilaguna* stops and lines, *traghetti* crossings, and general overview pages for the ACTV and *Alilaguna*. These pages are open to the public, which can help to educate English-speaking users on infrastructural information about Venice's public transportation systems, along with the ridership data collected during this project.



Figure III: Venipedia Site Banner

To determine the tourist impact on the public transportation system, a series of data was collected on the passenger flux at carefully selected boat stops on days with and without cruise ships in the City's port. The selected locations to study, shown in Figure IV below, were the *Piazzale Roma*, *Rialto*, and *San Marco* boat stops, due to their status as major tourist locations or city entry points. Cruise ships were specifically selected as a means of tourist entry and exit because they provide a measurable pulse of tourists within a short period of time, and Line 2 of the ACTV was selected for counting passenger ridership. This line was chosen because it is designed especially for tourist passengers, making fewer stops down the Grand Canal, mostly at popular stops, allowing for riders to reach their destination more quickly than if they were to take a different line.



Figure IV: Map of areas of study

Before collecting the data, a schedule had to be carefully created. Days were selected based on the number of cruise ships that would be in the port that day. For each of the three boat stops, three days were chosen for counting passenger flux: a day with 4 cruise ships in the port, a day with 1 cruise ship, and a day with no cruise ships.

Counting times were decided based upon the arrival and departure schedules of the cruise ships. On the selected days, all of the cruise ships arrived at approximately 9 AM and departed at approximately 5 PM. Therefore, counts were taken from 9 AM to 11 AM, allowing any lagging passengers to be accounted for, and again from 3 PM to 5 PM, to account for passengers returning to their cruise ships before departure.

When counting passengers, it was important to be able to distinguish between who was a tourist and who was a Venetian citizen. Before collecting the data to be used in our analysis, the group performed a series of tests to determine each group member's accuracy in identifying which passengers were tourists, based on appearance, possessions, clothing, language, and other criteria. The group achieved a collective tourist identification accuracy of approximately 97%. A chart displaying each member's percent accuracy is shown in Figure 3-8 in the Methodology Section 3.3.3.

After completing preliminary tests and determining a scheduled procedure, the group began counting at the ACTV boat stops. To obtain the necessary data, the group divided itself, and each group member counted passengers either embarking or disembarking for one direction of Line 2.

The data were collected between the months of October and December, with a total of 19,537 tourists and 12,250 Venetians counted at the three boat stops. With the collected data, we were able to determine that with a greater number of cruise ships, inevitably there are more tourists in the City using the public transportation provided by the ACTV. For example, on a day with 4 cruise ships, there are more than twice as many tourist passengers (a 120% increase) using Line 2 of the ACTV boats at the *Piazzale Roma* boat stop compared to when there are no cruise ships in Venice. Not only are there more tourists on the boats at *Piazzale Roma*, which is fairly close to the main cruise ship port, but there is also a rise in tourist passengers at other boat stops, beginning upon the arrival of a cruise ship and ending with its departure. An even greater increase was observed at *Rialto* with 182% more tourists, and *San Marco* had a staggering 424% increase of tourists on Line 2, as shown in Figure V below. This effect could even occur at other boat stops throughout the City.

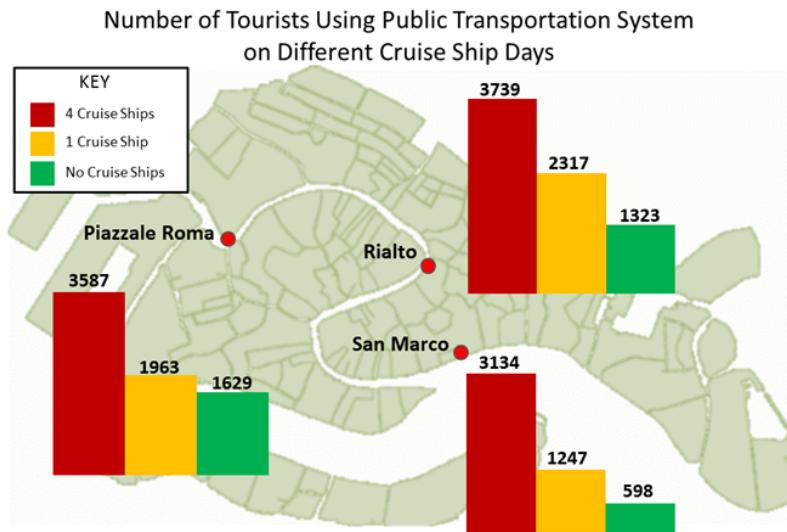


Figure V: Number of Tourists Using Public Transportation System on Different Cruise Ship Days

The group also compared the number of tourists to the number of Venetian citizens using the Line 2 boats at the three selected stops. Overall, the analysis shows that the combined percentage of tourists on these boats increases when cruise ships visit the City (Figure VI). In fact, on days with four cruise ships in the port, the percentage of tourists increased to about 82%—more than double of what it was on days with no cruise ships.

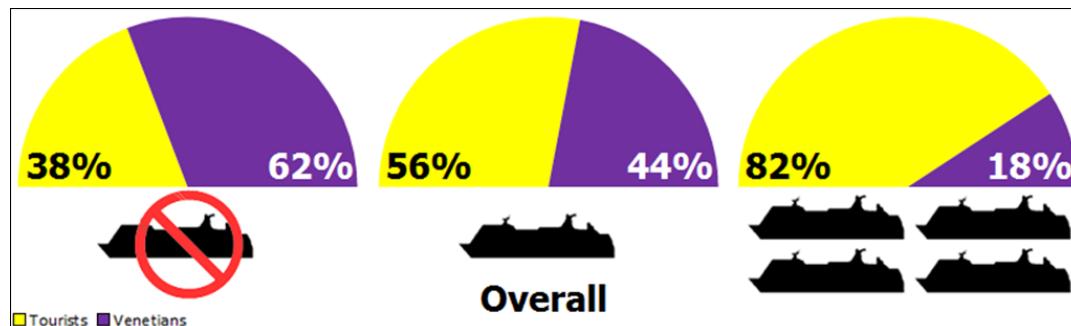


Figure VI: Percentages of Tourists vs. Venetians using Line 2 at 3 Combined Boat Stops

With this wave of tourists comes crowding and confusion at major boat stops. To alleviate these problems this project has also aided in the development of technological resources. The resources provide information about the ACTV public transportation system, which can assist passengers when traveling via this system. Along with creating the previously discussed Venipedia pages, the group made strides in further developing the prototype of a smartphone application that helps users navigate through Venice, either by walking or via public transportation. With this interactive application, users can select a desired destination to go to from their current location. The app is designed to use Google Transit and the ACTV schedules to select a specific boat that the user can take in order to reach his or her destination. It will display the time of departure for that boat, and also includes a countdown to when that boat will be leaving. Other features are included that make the application very useful when navigating on the ACTV's public transportation system.

In order for the public transportation feature of this app to work, feeds for the schedules are required. The current prototype of the application includes a map feature that finds the user's location, and it also contains the feed for Line 1 of the ACTV, giving the app full functionality for this line. For our project, schedules for 11 different ACTV lines were transformed into Google feeds, which will help to make the application more versatile and give more direction options to its users.



Figure VII: Smartphone Application Designs from 2010

This project was completed outside of Venice's tourism season, so it is expected and easy to imagine that these impacts would grow exponentially during the tourism season throughout the summer months. The informational resources that we have developed, however, may be used year-round to assist with navigating via the ACTV public transportation system.

In the future, more data collection is suggested. Counts can be completed more frequently, at different stops other than the ones done in this project, and for different lines that tourists often use other than Line 2.

Further studies can be done on smaller-scale public transportation systems as well, such as the *traghetti* crossings along the Grand Canal. In this project, these crossings were counted on days when there were no cruise ships in Venice, serving as a baseline. To determine the tourist impact on the *traghetti*, it is necessary for information to be collected on days when there are cruise ships, and to compare the data side by side with the data collected in this project. Another way to approach these studies would be to collect ridership information over a longer period of time and compare the data over the course of this time. Our group has already begun to do so by comparing the ridership data in our counts to the ridership data from a previous study, finding that the total number of people using the *traghetti* has decreased.

Studies should also be completed using other means of entry and exit to the City as an indicator of tourists. This includes trains, buses, airplanes, and other types of boats. In collaboration with another project group studying pedestrian movement, a study on train passengers was begun in order to determine their impact on the streets and on the ACTV boat network. These preliminary studies showed that the majority of people using the ACTV boats at the *Ferrovia* stop were tourists, but there is not yet enough data to fully support this conclusion.

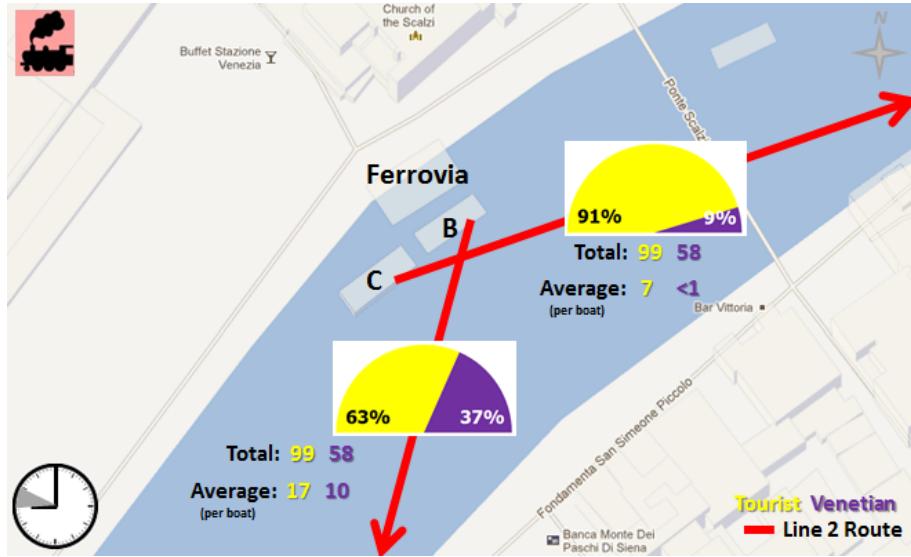


Figure VIII: Embarking Passenger Counts at *Ferrovia*

The collection of these data could be made much easier and more automatic if turnstile systems were installed at all of the boat stops. Currently, the ACTV has plans to install turnstiles at the entrances of all boat stops, but the group recommends that they do so at the exits as well. This way, passengers wanting to utilize the boats would be required to swipe before being allowed to pass into the boat dock, and again when they want to exit the boat dock at their destination. In collaboration with the ACTV, the data collected from the ticket scanners could be utilized to acquire a more accurate count, rather than counting by hand.

Our contribution to the study of tourist impacts on the Venetian public transportation system will be useful in continuing to monitor that impact, with hopes to potentially mitigate it, especially if tourism in Venice continues to rapidly grow at its current rate. In addition, the steps made toward better, more informative technological resources and applications will help in simplifying the use of the public transportation system, both for Venetian citizens and visiting tourists.

Table of Contents

<u>ABSTRACT</u>	2
<u>ACKNOWLEDGEMENTS</u>	3
<u>AUTHORSHIP</u>	4
<u>EXECUTIVE SUMMARY</u>	5
<u>1. INTRODUCTION</u>	16
<u>2. BACKGROUND</u>	19
2.1 TOURISM	19
2.2 TRAVELING INTO VENICE	22
2.2.1 ARRIVING BY AIR AND LAND	22
2.2.2 ARRIVING BY CRUISE SHIPS	23
2.3 VENICE PUBLIC TRANSPORTATION	25
2.3.1 THE PEOPLE MOVER	26
2.3.2 WATER TAXIS	26
2.3.3 <i>TRAGHETTI</i>	27
2.3.4 <i>ALILAGUNA</i>	28
2.3.5 ACTV BOAT SYSTEM	29
2.4 WPI SMARTPHONE APPLICATION DESIGN	33
<u>3. METHODOLOGY</u>	35
3.1 INVENTORYING THE PUBLIC TRANSPORTATION SYSTEM INFRASTRUCTURE	35
3.1.1 FAMILIARIZATION WITH ACTV OPERATIONS	36
3.1.2 CREATING WEB-PAGES FOR VENIPEDIA	36
3.2 DEVELOPING TOOLS FOR PUBLIC TRANSPORTATION RIDERS	37
3.2.1 IMPROVING THE WPI SMARTPHONE APPLICATION	37
3.3 COLLECTING PUBLIC TRANSPORTATION RIDERSHIP INFORMATION	38
3.3.1 DETERMINING WHERE TO COUNT	38
3.3.2 DETERMINING WHEN TO COUNT	39
3.3.3 DETERMINING HOW TO COUNT	40
3.4 ANALYZING THE IMPACT OF TOURISTS ON PUBLIC TRANSPORTATION	42
<u>4. RESULTS</u>	43
4.1 PUBLIC TRANSPORTATION INFRASTRUCTURE	43
4.1.1 INFORMATIVE VENIPEDIA PAGES	43
4.2 ADVANCEMENT OF WPI SMARTPHONE APPLICATION	45
4.3 PUBLIC TRANSPORTATION RIDERSHIP	46
4.3.1 ACTV RIDERSHIP	46
4.3.2 <i>TRAGHETTI</i> RIDERSHIP	48
<u>5. ANALYSIS</u>	50
5.1 IMPACT OF CRUISE SHIPS ON ACTV LINE 2	50
5.1.1 TOURISTS AFFECTING LINE 2 AT OBSERVED BOAT STOPS	50

5.1.2 ANALYSIS OF THE FLOW OF TOURISM THROUGHOUT THE CITY	51
5.2 IMPACT OF TOURISM ON TRAGHETTI	54
5.2.1 DECREASE OF TRAGHETTI RIDERSHIP	55
6. RECOMMENDATIONS	57
6.1 ADDING TO THE ACTV INFRASTRUCTURE	57
6.2 EXPANDING WPI SMARTPHONE APPLICATION	57
6.3 FURTHERING THE EVALUATION PUBLIC TRANSPORTATION COUNTS	58
6.3.1 EXPANDING ACTV COUNTING	58
6.3.2 MONITORING TRAGHETTI USE	59
6.3.3 ADDITION OF UNIVERSAL iMOB TURNSTILES	59
6.3.4 SEASONAL DIFFERENCES	61
6.4 ANALYZING TOURIST IMPACT WITH ADDITIONAL INDICATORS	61
6.4.1 ANALYZING PASSENGER DATA FROM SANTA LUCIA TRAIN STATION	61
7. BIBLIOGRAPHY	62
8. APPENDICES	64
APPENDIX A: ACTV BACKGROUND INFORMATION	64
A.1 CHANGES TO WATER SERVICES DURING HIGH TIDE	64
A.2 LINE CHANGES IN SPECIAL CONDITIONS	65
A.3 TICKET PRICING	66
A.4 BOAT TYPES	67
APPENDIX B: CRUISE SHIP CALENDAR	68
APPENDIX C: VENIPEDIA	69
C.1 LIST AND DIVISION OF VENIPEDIA PAGES	69
C.2 RIALTO BOAT STOP PAGE	70
C.3 ACTV LINE 12 PAGE	71
C.4 ALILAGUNA LINE ARANCIO PAGE	72
C.5 TRAGHETTO CALLE LANZA (<i>TRAGHETTO GIGLIO</i>) PAGE	73
C.6 ACTV COMPANY PAGE	74
C.7 INTERACTIVE MAP OF ACTV BOAT STOPS	75
APPENDIX D: ACTV RIDERSHIP DATA	76
D.1 PIAZZALE ROMA HIGH CRUISE SHIP DAY (10/27/12)	76
D.2 PIAZZALE ROMA LOW CRUISE SHIP DAY (11/05/12)	77
D.3 PIAZZALE ROMA NO CRUISE SHIP DAY (11/06/12)	78
D.4 RIALTO HIGH CRUISE SHIP DAY (11/03/12)	79
D.5 RIALTO LOW CRUISE SHIP DAY (11/12/12)	80
D.6 RIALTO NO CRUISE SHIP DAY (11/13/12)	81
D.7 SAN MARCO HIGH CRUISE SHIP DAY (11/04/12)	82
D.8 SAN MARCO LOW CRUISE SHIP DAY (11/19/12)	83
D.9 SAN MARCO NO CRUISE SHIP DAY (11/27/12)	84
APPENDIX E: FERROVIA RIDERSHIP DATA	85
E.2 FERROVIA RIDERSHIP- 9 AM	85
E.3 FERROVIA RIDERSHIP- 10 AM	86
E.4 FERROVIA RIDERSHIP- 11 AM	86
APPENDIX F: TRAGHETTI RIDERSHIP DATA	87
F.1 TRAGHETTO GIGLIO (11/07/12)	87
F.2 TRAGHETTO RIVA DEL CARBON (11/14/12)	88

F.3 <i>TRAGHETTO SAN TOMA'</i> (11/14/12)	89
F.4 <i>TRAGHETTO SANTA SOFIA</i> (11/07/12)	90

List of Figures

- Figure I: Total Tourist Estimate in Venice By Year since 1949
Figure II: An ACTV *vaporetto*
Figure III: Venipedia Site Banner
Figure IV: Map of areas of study
Figure V: Number of Tourists Using Public Transportation System on Different Cruise Ship Days
Figure VI: Percentages of Tourists vs. Venetians using Line 2 at 3 Combined Boat Stops
Figure VII: Smartphone Application Designs from 2010
Figure VIII: Embarking Passenger Counts at *Ferrovia*
Figure 1-1: Public transportation boats in Venice's Grand Canal
Figure 1-2: ACTV Company Logo
Figure 1-3: Cruise ship in Venice
Figure 2-1: Total Tourist Estimate in Venice By Year
Figure 2-2: Increasing Cruise Ship Passengers Over Time
Figure 2-3: *Rialto* Bridge
Figure 2-4: Tourism in Venice (2009 - Red; 2010 - Blue; 2011 - Green; 2012 - Yellow)
Figure 2-5: Tourist Arrivals per day by Origin and Type
Figure 2-6: *Ponte della Libertà*
Figure 2-7: Port facilities of Venice
Figure 2-8: Directions of cruise ship passengers
Figure 2-9: Different islands of Venice (in black) connected by bridges (in red)
Figure 2-10: Streets in Venice (shown in green)
Figure 2-11: Route of The People Mover in Venice
Figure 2-12: Water Taxi
Figure 2-13: A *traghetto*
Figure 2-14: Map of *traghetto* crossings on Venice's Grand Canal
Figure 2-15: Alilaguna Boat Lines and Stops
Figure 2-16: A *vaporetto*
Figure 2-17: An ACTV boat dock at the *Piazzale Roma* stop
Figure 2-18: Passengers boarding an ACTV *vaporetto*
Figure 2-19: Map of ACTV Boat Lines
Figure 2-20: Map of ACTV Line 2 Route
Figure 2-21: ACTV *Notte* logo
Figure 2-22: Smartphone Application Designs from 2010
Figure 3-1: Main Cruise Ship Port and 3 boat stops for data collection in Venice
Figure 3-2: Breakdown of Overview Pages (Green) & Specific Pages (Blue)
Figure 3-3: ACTV Line 2 Boat Schedule
Figure 3-4: Breakdown of Feed Functions
Figure 3-5: Line 2 routes at selected boat stops
Figure 3-6: High Ship Traffic, Low Ship Traffic, and No Ship Traffic Days
Figure 3-7: Distinguishing Tourists and Venetians
Figure 3-8: Percent Accuracy in Identifying Tourists
Figure 4-1: *Rialto* Boat Stop page on Venipedia
Figure 4-2: Smartphone Application Screenshots
Figure 4-3: Countdown Feature of Smartphone Application
Figure 4-4: Comparing Tourists at Boat Stops on Different Cruise Ship Days
Figure 4-5: Percentages of tourists versus Venetians at *Piazzale Roma*

- Figure 4-6:Percentages of tourists versus Venetians at *San Marco*
Figure 4-7:Percentages of tourists versus Venetians at *Rialto*
Figure 4-8:Percentages of Tourists vs. Venetians using Different *Traghetti* Crossings
Figure 5-1:Total Percentage of Tourists versus Venetians on All Days at Three Stops
Figure 5-2:Number of Tourists Using the Public Transportation System on Different Cruise Ship Days
Figure 5-3:Expected Flow of Tourists through Venice in the Morning
Figure 5-4:Expected Flow of Tourists through Venice in the Afternoon
Figure 5-5:Tourist Passenger Ranges and Averages at *Piazzale Roma*
Figure 5-6:Tourist Passenger Ranges and Averages at *Rialto*
Figure 5-7:Tourists Passenger Ranges and Averages at *San Marco*
Figure 5-8:Overall Tourist Passenger Ranges and Averages
Figure 5-9:Proportional Pies for *Traghetti* Crossings
Figure 5-10:Comparing total passenger counts between 2011 and 2012
Figure 6-1: QR Codes with Alilaguna Smartphone Application
Figure 6-2: ACTV Line Logos
Figure 6-3: iMob Turnstile at San Marco Giardinetti Boat Stop
Figure 6-4: *Santa Lucia* train terminal at *Ferrovia* boat stop

1. Introduction

Public transportation plays a vital role in the day-to-day functions of cities and towns.

Transportation systems mostly rely on terrestrial transportation methods, such as taxis, buses, trains, subways, and to a lesser extent, on marine transportation. In large cities, the transportation system must be able to handle very large numbers of people annually. In Tokyo, for example, over 28.5 million people rely on public transportation every day.¹ Without the public transportation network, moving around these cities could become very difficult, or even impossible. Therefore, these systems are extremely important in keeping cities functional, both economically and socially.

Unlike most other popular cities, which rely on terrestrial transportation methods, the only means of transportation within Venice are by walking or by the use of the boat transportation system. Essentially, there are two categories of people navigating the streets and canals of Venice: Venetian residents or tourists. On a daily basis, the boat system services an average of 59,000 tourists,² in addition to about 62,000 Venetians.³



Figure 1-1: Public transportation boats in Venice's Grand Canal

Tourism has been continually growing in the city of Venice ever since the 1950s.⁴ Many tourists come visit the beautiful city because of its unique location as well as its cultural history. Because it is so popular, many cruise ships dock in Venice's three ports which allow an easy entrance to the City. Passengers coming from the cruise ships are one major reason for this large surge of tourism. The number of cruise ship passengers has increased by about 400% just since 1997 and each tourist adds stress to pedestrian traffic, as well as to the boat transportation system. Over 500 cruise ships dock per year,⁵ and on busy days can deposit as many as 13,500 passengers into the City, which alone increases Venice's normal population by 22%. This influx of tourism causes confusion and overcrowding at the boat stops as well as on the streets.⁶

To handle the Venetian population, as well as the millions of tourists who come to Venice every year, an intricate pattern of 28 transportation lines and over 70 stops was developed. However, the complexity of that system can make it difficult for those who are unfamiliar with the boat system to maneuver from place to place.⁷ One of the organizations controlling boat transportation in the City is the *Azienda del Consorzio Trasporti Veneziano*, also known as the ACTV. The company (logo shown in

¹ Tokyo Metropolitan Government. (2010). *Principal policies of the Tokyo Metropolitan Government*.

² Nicola, COSES, *Turismo sostenibile a Venezia*

³ Pesco, Giuseppe, *Una Stima Della Popolazione Presente nel Comune di Venezia*. (16)

⁴ Musu, Ignazio. *Sustainable Venice: Suggestions for the Future*. (162).

⁵ Saari, Erin. *Cruise control -- cruise ships influencing the city of venice*. (1).

⁶ Quinn, B. *Performing tourism venetian residents in focus*. (467).

⁷ ACTV. (2011). *Water Routes*.

Figure 1-2) has created a series of schedules for the transportation system, but they are very complex for the public to use because of their current organization and presentation on the ACTV website.



Figure 1-2: ACTV Company Logo

Previous research teams have collected passenger data as well as other pedestrian data throughout the City, which aided the group in establishing a method for collecting new information.⁸ Studies have been conducted on the impacts of cruise ships, but only on an environmental level. It was determined that an average of 3,000 passengers per vessel enter the harbor via cruise ship, with about 25% of them entering the boat network.⁹ The network is made up of the ACTV transportation system, the *Alilaguna* boat system, *traghetti*, and water taxis. Some of the data that have been collected previously can be found using Venipedia, which is an online Venice-themed resource modeled after the popular online encyclopedia, Wikipedia. These pages are beneficial in that they are useful in educating the public about the boat transportation systems, as well as other main topics surrounding Venice. Additionally, a smartphone application was designed to assist travelers in navigating the boat system by putting the schedules into a more understandable format.

Although previous studies have been conducted, there were still some key elements missing that are essential to understanding the effect of tourism on public transportation and alleviating the possible effect with technology. Unfortunately, data that were collected were not current or complete, in the sense that they have not been collected on a regular basis at popular stops. There was also no convenient way that the data could be accessed. No data on the impact of the passengers from cruise ships had been collected, nor their impact on the boat transportation system or pedestrian tourist traffic.

Although Venipedia contained pages about public transportation and a few of the boat lines, it lacked updated information about the ACTV company or about different types of boats that are used. Similarly, the smartphone application contained data feeds for 6 out of the 28 different boat lines throughout Venice, but it was only operational for Line 1 of the ACTV, and it was still being developed.



Figure 1-3: Cruise ship in Venice

⁸ Fogarty, C. (2012). Traversing the labyrinth: A comprehensive analysis of pedestrian traffic in venice. (34).

⁹ Saari, Erin. *Cruise control -- cruise ships influencing the city of venice*. (1).

This project has analyzed the effects of tourism on public transportation by using cruise ship passengers as an indicator. The team has collected and organized data from popular boat stops around Venice and compared the results to days on which no cruise ships were present. To help relieve the congestion and confusion at boat stops, we also created Venipedia pages to educate the tourists further about the Venice transportation system, as well as the traditional *traghetti*. In addition, we updated an interactive smartphone application which will help travelers navigate through Venice more easily by creating feeds to incorporate more boat lines and stops into the current application prototype. With such information, the city of Venice could organize the boat systems to better accommodate the tourists visiting the City.

2. Background

This project's goal is to determine the impact of tourism on the public transportation system based on cruise ship passengers, and to organize information with the use of technology to facilitate the use of the public transportation system. To aid in the understanding of this project and development of a procedure, the team compiled information on tourism, boats, cruise ships, and the boat network, which will be discussed in this chapter.

2.1 Tourism

Ever since the economic boom of the 1950s and 1960s, tourism has been on the rise in Venice. In the early 1950s, about 2 million people per year traveled to the city of Venice.

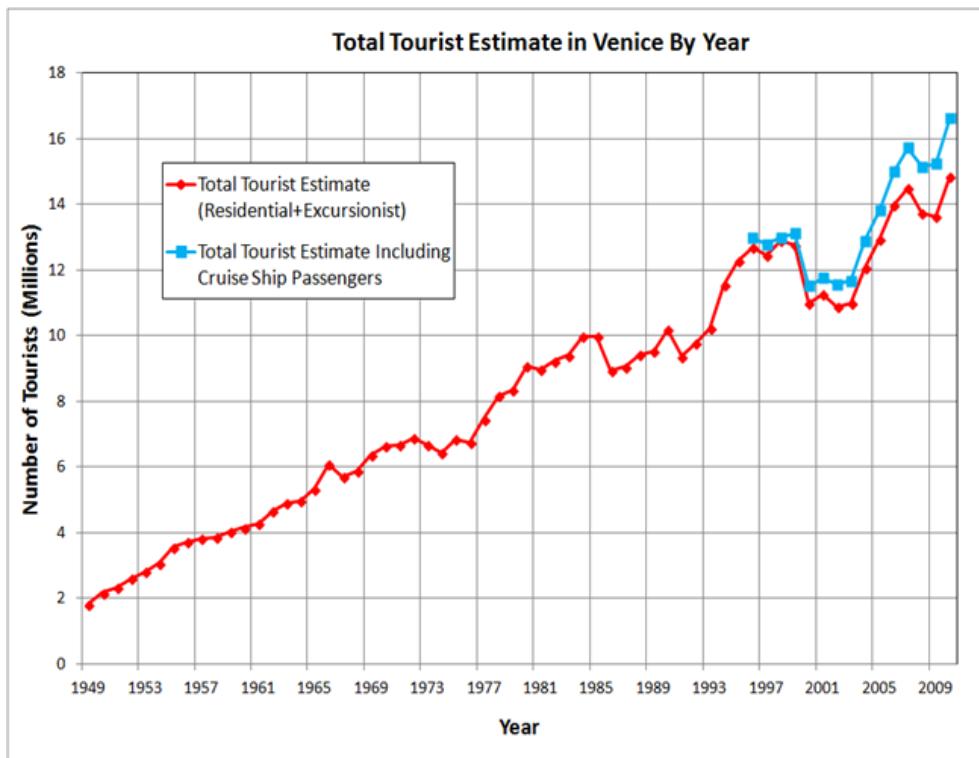


Figure 2-1: Total Tourist Estimate in Venice By Year¹⁰

This rate continually grew through 1995, when 12 million tourists visited.¹¹ This trend of increasing tourism can be seen in Figure 2-1 above. The figure is an estimate of total number of tourists based on the number of residential and excursionist tourists, as well as the addition of cruise ship passengers starting in 1997. The term “residential tourists” refers to tourists who stay at least one night in Venice, such as at a hotel or a bed and breakfast. Excursionist tourists are more commonly known as “day-trippers,” and these are the tourists who come to Venice for the day, but do not stay overnight. Based off this estimate, there are currently around 16.5 million people visiting Venice every year. However, less conservative estimates such as a poll taken in 2008, show that over 22 million people

¹⁰ T01 Time Series 1949-2010 The Movement in the Tourist City of Venice- non-hotel and hotel businesses

¹¹ Musu, Ignazio. *Sustainable Venice: Suggestions for the Future*. (162).

currently visit Venice every year.¹² This wide range of estimates is due to the challenge of monitoring all the different ways to enter and exit Venice.

The popularity of the cruise ship industry has added an additional 15% of tourists in recent years, and is only becoming more popular as time goes on. This trend, which has increased by 400% since 1997, can be seen by the graph below (Figure 2-2). It shows the total number of passengers arriving by cruise ships to Venice's ports each year.



* In 1999 the cruise passenger traffic was undermined by the political events in the Balkans.

** In 2002 the cruise passenger traffic was undermined by 11th September 2001 political events.

Figure 2-2: Increasing Cruise Ship Passengers Over Time¹³

As a result of this large rise in visitors in the City, tourism has become a very important piece of the Venetian economy.¹⁴ The economy currently relies greatly on profit made from hotels, restaurants, stores, and public transportation.¹⁵ In 2007, over 54% all of the money that was spent in the Veneto region was spent solely in the city Venice.¹⁶ Estimates made in 2007 suggested that tourism provides 70% of the total income of Venice, and it is responsible for the generation of at least 50% of the jobs.¹⁷

The economic influence caused by tourism can be broken down by the residential and excursionist tourists. Every year, millions of residential tourists arrive in Venice, accounting for 25% of all tourist arrivals in the City. The median expenditure of residential tourists in 2007 was approximately €182.4 a day, accounting for about 60% of all tourist income, while a typical excursionist spent anywhere between €34 and €46 a day on average, accounting for the remaining 40%.¹⁸ These numbers prove that tourism is a vital part of the Venetian economy.

¹² Zannini, F. *Effects of Tourism on Venice: Commercial Changes Over 30 Years*. (4).

¹³ Venezia Terminal Passeggeri S.p.A. (2011). Venezia terminal passeggeri S.p.A. guide book.

¹⁴ Saari, Erin. *Cruise control -- cruise ships influencing the city of venice*. (27).

¹⁵ Anonymous. (2010). *Travel research; studies from V. minghetti et al provide new data on travel research*. (1).

¹⁶ Shomorony,Ilan. Pressing Issues: A Venetian Socioeconomic Overview IQP (26)

¹⁷ Shomorony,Ilan. Pressing Issues: A Venetian Socioeconomic Overview IQP (26)

¹⁸ Shomorony,Ilan. Pressing Issues: A Venetian Socioeconomic Overview IQP (26)

Tourists travel from all over the world to visit Venice because of its culture, history, and unparalleled beauty. Tourists flock into the City to see the iconic sites such as St. Mark's Square, the *Rialto* Bridge (Figure 2-3), and the Grand Canal. People are enthusiastic to see the intricate structures and allure of "The Floating City." Venice's major celebrations and traditions, such as *Carnevale*, the *Regata Storica*, and film festivals, are also main reasons why tourists visit the City.



Figure 2-3: *Rialto* Bridge

The majority of these events occur between the months of April and October, resulting in the tourism season in Venice.¹⁹ Within this time period, a large influx of tourists is usually found during the months June through August. This increase can be seen in Figure 2-4 below.

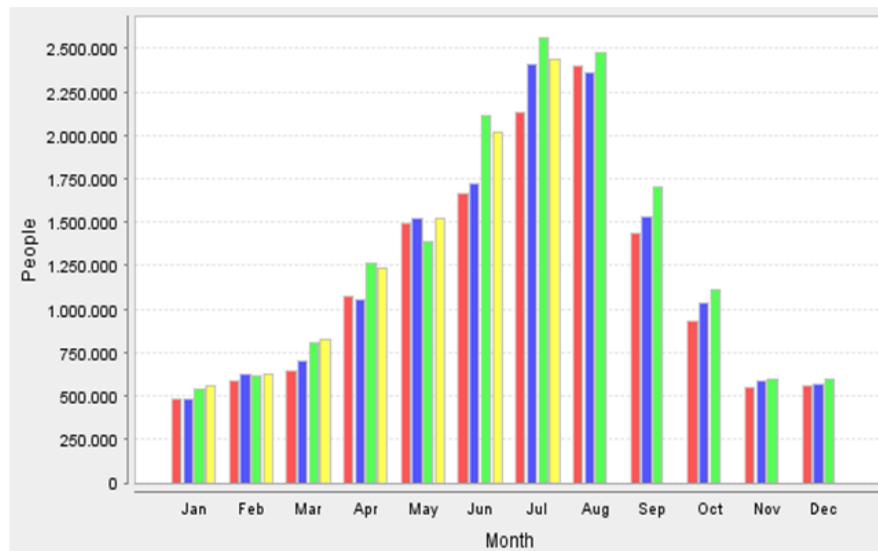


Figure 2-4: Tourism in Venice (2009 - Red; 2010 - Blue; 2011 - Green; 2012 - Yellow)²⁰

The chart shows that the months of November through February have less than 25% of the number of tourists that are seen in the summer months.

¹⁹ Zannini, F. *Effects of Tourism on Venice: Commercial Changes Over 30 Years*. (4).

²⁰ <http://statistica.regione.veneto.it/ENG/>

Such a massive increase in tourism also has negative impacts. Large volumes of tourists can cause crowding in the streets, which makes it more difficult for Venetians to get around the City and go about their daily routines. It was reported that 56.3% of Venetians said that the presence of tourists influenced the routes they chose to move around the City.²¹

2.2 Traveling Into Venice

Although the transportation methods are limited to walking or the use of boats within the City, there are five main ways to travel into Venice: by cars, train, buses, planes, and cruise ships. The graphic shown below (Figure 2-5) displays the usage of each method per day as of 2007.

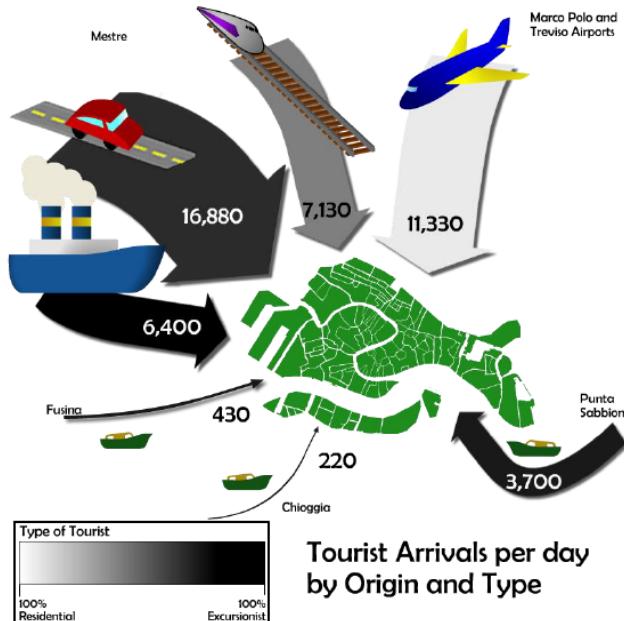


Figure 2-5: Tourist Arrivals per day by Origin and Type²²

Buses and cars are the most heavily used--with 16,880 passengers--and are composed of mostly day-trippers. Next, the airport, which supplies 11,330 residential tourists, followed by trains with 7,130 passengers. Finally, cruise ships bring in 6,400 passengers, which are almost all day-trippers. Together, these four different methods make up most of the ways tourist are able to reach Venice; other small boat routes make up the remainder.

2.2.1 Arriving by Air and Land

There is a 3.85-kilometer bridge, called the *Ponte della Libertà* (Figure 2-6) that connects Venice to the mainland of Italy. It contains four lanes for cars, as well as four sets of train tracks to allow a direct route straight into Venice.²³ Upon arrival, cars must be parked in the parking garage, located at *Tronchetto* (an area adjacent to the bridge). The streets in Venice are not large enough to accommodate automobiles and thus, they are forbidden inside the City. Trains coming from the *Ponte della Libertà* enter

²¹ Quinn, B. *Performing tourism venetian residents in focus*. (467).

²² Shomorony, Ilan. Pressing Issues: A Venetian Socioeconomic Overview IQP (24)

²³ Tassinari, Matthew. *Mobility in the floating city -- a study of pedestrian transportation*. (22).

Santa Lucia, the train terminal, which is located in *Cannaregio* near the Grand Canal. Buses are also dependent on the connecting bridge, and arrive at the bus terminal that is located in *Piazzale Roma*.²⁴



Figure 2-6: *Ponte della Libertà*

There are two airports near Venice that are both located on the mainland of Italy: the Venice Marco Polo International airport, located only 8 kilometers away, and the *Treviso* Airport, located about 20 kilometers away. Once at the airport, travelers can reach Venice by taking a personal water taxi, an *Alilaguna* boat, or a bus to *Piazzale Roma*, from where they can utilize public boat transportation.²⁵

2.2.2 Arriving by Cruise Ships

Venice has become a very popular destination for cruise ships. From 1997 to 2011, Venice's ports have seen an increase of 396.57% in the number of passengers embarking and disembarking (see Figure 2-2 in Section 2.1).²⁶ In 2011 alone, 1,786,416 people passed through Venice by way of cruise ships, which is an increase of more than 160,000 passengers, or 10.48%. Venice is visited by cruise ships hundreds of times a year; in 2012, cruise ships docked in Venice 573 times, mostly during the spring to early autumn months.²⁷ To accommodate such frequent visits from large ships, Venice has three separate areas where cruise ships can dock. The largest ship terminal is the *Marittima*, which can handle several cruise ships at a time. *San Basilio* is used mostly for smaller cruise ships and large yachts. Lastly, *Riva dei Sette Martiri* is used almost exclusively for yachts, because nearby residents object to large ships blocking the view. A map of the city of Venice with the cruise ship ports is shown below in Figure 2-7.

²⁴ Birmingham, B. *DK eyewitness travel guide: Venice & the veneto*. (279).

²⁵ Tassinari, Matthew. *Mobility in the floating city -- a study of pedestrian transportation*. (22).

²⁶ Venice Terminal Passeggeri. *Statistics*.

²⁷ Venice Terminal Passeggeri. *Statistics*

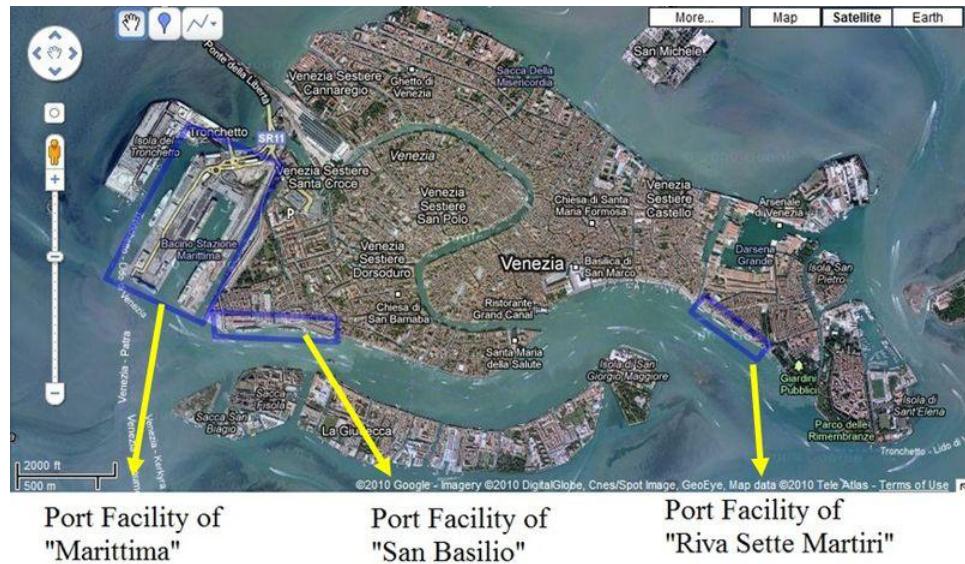


Figure 2-7: The port facilities of Venice²⁸

Some cruise ships are port of call ships, meaning that they come in the morning to let passengers off and leave in the evening when all of the passengers have returned to the ship. This means that the passengers are exploring the city of Venice all day. Other ships are home port ships, or turn-around ships. Turn-around ships imply that all the passengers get off and new passengers get on, meaning that the amount of people brought to Venice by each ship, both directly and indirectly, is doubled, resulting in a large volume of people in the same area during the time between arrival and departure.

With so many cruise ships and passengers traveling in and out of Venice, it is important to know where people are going to help understand their impact on the City. On five separate days in late October and early November of 2011, a team of students counted 15,438 passengers from 14 different turn-around cruise ships.²⁹ According to the data, 39% of those cruise ship passengers took the buses, 21% took land taxis to the mainland, and 25% took various boats because of their effective way of maneuvering through Venice. The remainder of the people either took the People Mover (9%) or walked (6%). A previous team created a graphic to display these findings, and their graphic is shown below in Figure 2-8.

²⁸ Saari, Erin. *Cruise control -- cruise ships influencing the city of venice*. (7).

²⁹ Saari, Erin. *Cruise control -- cruise ships influencing the city of venice*. (vii).



Figure 2-8: Directions of cruise ship passengers³⁰

2.3 Venice Public Transportation

The City is divided into more than 150 islands that are connected by over 400 bridges, which can be challenging to traverse for those who are unfamiliar with the area (see Figure 2-9).



Figure 2-9: Different islands of Venice (in black) connected by the bridges (in red)

There is also a network of around 4,000 roads (see Figure 2-10) that are very narrow and winding. Because of all the people maneuvering through Venice—an estimated 22 million people in 2008—not even bicycles are allowed due to their danger to other pedestrians.³¹ Together, winding roads and numerous bridges make Venice a confusing and difficult place to traverse.

³⁰ Saari, Erin. *Cruise control -- cruise ships influencing the city of venice*. (vii).

³¹ Tassinari, Matthew. *Mobility in the floating city -- a study of pedestrian transportation*. (23).



Figure 2-10: Streets in Venice (shown in green)

Since Venice is made up of islands and canals, boats are a necessity for transportation. Many types of boats travel through the canals, but the most common ones used for public transportation are *vaporetti* and *motoscafi*, which will be discussed later in this chapter, along with the less common boats.

2.3.1 The People Mover

To assist in transporting people between the parking garage, the harbor, and the bus terminal, the city of Venice created a tram called the People Mover. It is an automatic tram that connects *Tronchetto*, *Piazzale Roma*, and *Marittima*.³² It has the capability of transporting an average of 3,000 people per hour, and it has been extremely successful in connecting the three main entrance points of Venice to the rest of the City.³³ The People Mover route is shown below in Figure 2-11.



Figure 2-11: Route of The People Mover in Venice

2.3.2 Water Taxis

Water taxis, or *lance*, shown in Figure 2-12, are also common modes of transportation in Venice. *Consorzio Motoscafi*, the company that regulates the taxi service, has over 100 boats that run 24 hours a day for the public to use.³⁴ Each boat can carry up to 10 people, including luggage, and all contain a GPS navigation system, which allows the drivers to use the most strategic route for delivering passengers.

³² Fornasiero, E. *Evaluation of the effectiveness of “innovative” and “unconventional” systems in urban areas.* (327).

³³ Tassinari, Matthew. *Mobility in the floating city -- a study of pedestrian transportation.* (23).

³⁴ Consorzio Motoscafi Venezia. (2012). *The consorzio motoscafi.*

Since the cost for using these taxis can range from an upwards of €110, they are mainly used by tourists simply because of their convenience and because they are too expensive for Venetians.³⁵



Figure 2-12: Water Taxi

2.3.3 *Traghetti*

Traghetti, shown in Figure 2-13, or “ferries,” are one of the only forms of non-motorized boat transportation still in use in Venice. Although these ferries look much like the traditional Venetian *gondole*, they are used for different reasons. While *gondole* are used for tourist purposes—mainly for the Venetian riding experience—the *traghetti* are used for public transportation in crossing the canals.



Figure 2-13: A *traghetto*³⁶

They are very similar in their design, because *traghetti* are simply hollowed out versions of the traditional *gondole*, and can carry a maximum of about 20 people.³⁷ With only four bridges spanning the Grand Canal, the use of *traghetti* also saves time since they continually taxi back and forth.³⁸ Also, traveling in the *traghetti* is a significantly cheaper option than the *vaporetti*, with one ride to cross the canal costing only €0.50 for locals, and €2 for tourists.

San Marcuola, Santa Sofia, Riva del Carbòn, San Samuele, San Tomà, Giglio, and Santa Lucia are all of the different *traghetti* lines that span the Great Canal. A map displaying these lines with red arrows is shown below in Figure 2-14.

³⁵ Consorzio Motoscafi Venezia. (2012). *Our boats*.

³⁶ Miller, Kyle. (2011). *Traghetti*. Venipedia.

³⁷ Tassinari, Matthew. *Mobility in the floating city -- a study of pedestrian transportation*. (28).

³⁸ Calatrava bridge to barge up the grand canal in venice during the night of july 27-28. (2007).



Figure 2-14: Map of *traghetti* crossings on Venice's Grand Canal

2.3.4 Alilaguna

The *Alilaguna* is a water taxi system that is composed of 5 different lines that bring people from the Marco Polo International Airport to the center of Venice (shown in Figure 2-15). The company was founded in Venice in 1999, originating with *Linea Rossa*, and now it has expanded to travel to *Murano*, *Fondamente Nuove*, *Santa Giustina*, and *Piazza San Marco*.³⁹ Its 34 boats make traveling from the airport or around Venice very convenient and direct, while also having a relatively inexpensive price.

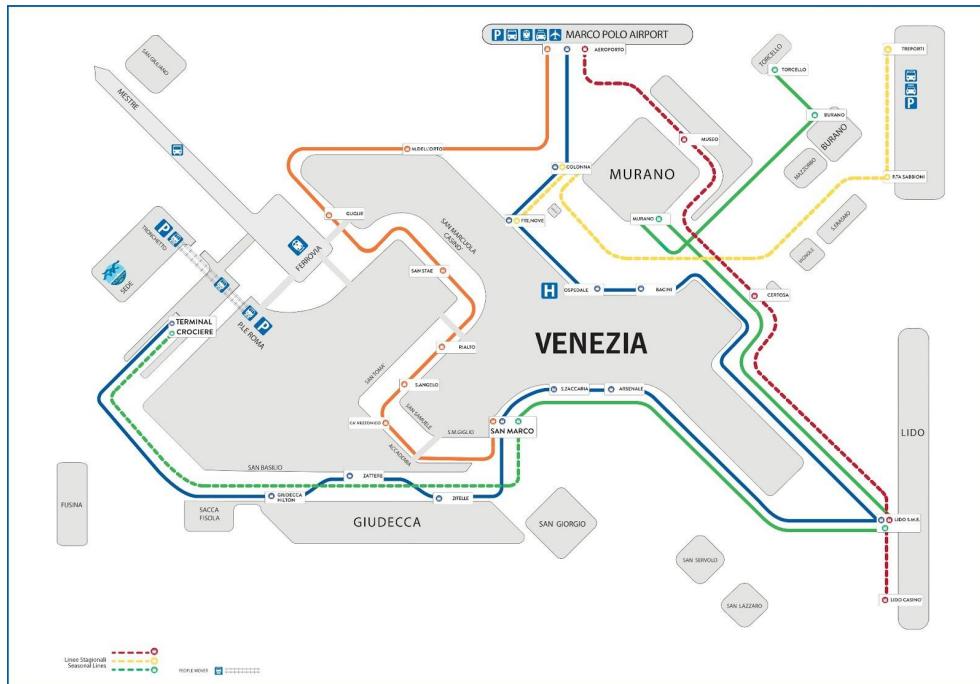


Figure 2-15: Alilaguna Boat Lines and Stops

³⁹ Alilaguna. (2012). Our history.

2.3.5 ACTV Boat System

With the lack of traditional methods of transportation, Venice must rely on a public transportation system of waterborne vessels. The ACTV is Venice's main provider of public transportation services through the canals, and it also helps the Venetian economy with the income that comes from each ticket sold. For an outline of the pricing for different types of tickets, see A.3 in the Appendix. In this section, the history of the ACTV, an explanation and map of the routes and stops, and a description of the various vessels will be provided.

History of The ACTV

The first public transportation system in Venice with mechanically propelled ships began in 1881, followed by the debut of “*Regina Margherita*,” the first waterbus, on Venice’s Grand Canal. Nearly 100 years later, the *Azienda del Consorzio Transporti Veneziano* – the Venice Public Transport Company—was founded on the first of October in 1978. It was formed as a combination of *Azienda Comunale di Navigazione Interna Lagunare* (ACNIL), *Società SVET*, *Società Veneta Lagunare* (SVL), and other smaller water transportation companies later on. As of 2010, the ACTV owns about 600 land buses and 160 water vessels, which combined carry approximately 194 million passengers on 28 different lines.⁴⁰

ACTV Boat Types

There are 4 different types of boats used by the ACTV’s public transportation system. The most common ACTV boats are the *vaporetti* and *motoscafi*, which are used for transporting passengers along the Grand Canal and around the perimeter of the City. The other two boat types are *motonave* and *nave traghetti*. The table in A.4 of the Appendix details the different boat types.

Vaporetti

Vaporetti, which translates into “steamer,” are the most dominant form of public boat transportation in Venice.⁴¹ These boats can hold up to 220 passengers and their luggage, and their routes wind through Venice’s center and outer circle. Two operators—a captain and a sailor—are needed to run a *vaporetto*.⁴² These boats are used for the larger, more popular lines of the public transportation system, such as Line 1 and Line 2, and one can be seen in Figure 2-16 below.



Figure 2-16: A *vaporetto*

Motoscafi

Motoscafi, or “motor boats,” are similar to the *vaporetti* in that they transport passengers along the Grand Canal. Although these boats are somewhat smaller than the *vaporetti*, the *motoscafi* still have

⁴⁰ ACTV. (2011). *Company*.

⁴¹ Tassinari, Matthew. *Mobility in the floating city -- a study of pedestrian transportation*. (32).

⁴² Urban, Jillian. *Evaluation of tourist use of venetian transportation*. (25-26).

a passenger capacity of up to 160 people. *Motoscafi* also require a captain and a sailor as operators, just like the *vaporetti*.⁴³ The *Alilaguna* also uses this boat type.

Other ACTV Boat Types

The ACTV also has two other types of boats called *motonave* and *nave traghetti*. The *motonave* are much larger than the *vaporetti* and *motoscafi*, and they are mainly used for traveling to different islands in the lagoon. Therefore, they must carry a larger number of passengers, ranging from 1,000 to 1,200, since their routes do not cycle through as often.⁴⁴

The *nave traghetti* are different from the *motonave* in that these boats are not used as much for transporting people, but cars instead, with a carrying capacity of 28 to 30 motor vehicles that can be delivered from the mainland to islands such as the *Lido* or *Pellestrina*.⁴⁵

ACTV Boat Stops

The ACTV public transportation system has over 70 different boat stops, both on the main island of Venice, and on surrounding islands such as *Lido* and *Murano*. The stops are made up of a rectangular dock with a metal overhead covering and walls, and each dock is labeled with the stop name. An image of a dock at the *Piazzale Roma* boat stop is shown below in Figure 2-17.



Figure 2-17: An ACTV boat dock at the *Piazzale Roma* stop

Depending on the popularity and how many different lines drop off and pick up, some boat stops may be split into multiple docks. For example, the *Piazzale Roma* boat stop is split into 5 docks to account for the 7 different lines that stop there, while many stops along the Grand Canal only have one dock due to the lack of popularity.

Much like the subway systems in New York City or Boston, the boats make brief stops at each boat station to load and unload passengers. When a boat arrives at the dock, it first allows any disembarking passengers to get off the boat and walk down the exit walkway. After these passengers leave, embarking passengers, who wait inside of the dock area after validating their tickets, are then allowed to get onto the boat, as shown in Figure 2-18. Typically, boats will leave as soon as all passengers have boarded, but if a boat arrives early, it will wait until its scheduled departure time to leave the dock.

⁴³ Urban, Jillian. *Evaluation of tourist use of venetian transportation*. (25-26).

⁴⁴ Urban, Jillian. *Evaluation of tourist use of venetian transportation*. (25-26).

⁴⁵ Urban, Jillian. *Evaluation of tourist use of venetian transportation*. (25-27).



Figure 2-18: Passengers boarding an ACTV vaporetto

ACTV Lines and Special Conditions

The ACTV water transportation system is made up of 28 different lines winding through Venice's many canals. Each ACTV boat line has its own route, winding through Venice's Grand Canal, around the perimeter of the islands, or even out to surrounding islands. Some of the major lines of the system are Lines 1, 2, 4.1, 4.2, 5.1, and 5.2. Each of the major lines consists of either *vaporetti* or *motoscafi*, which stop at the particular boat stops for each line, letting passengers on and off. The ACTV boat transportation system's different lines are mapped out in Figure 2-19 below.

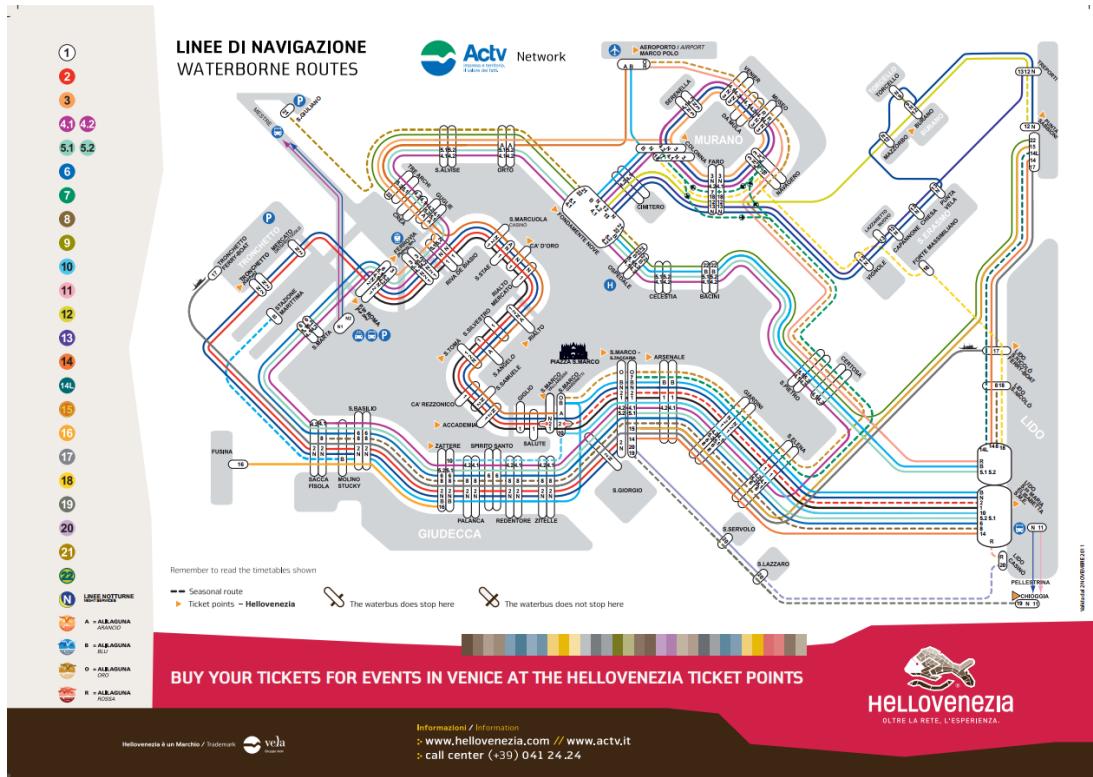


Figure 2-19: Map of ACTV Boat Lines

Line 1

Line 1 is one of the most popular lines and has a path traveling through the Grand Canal. Starting at *Piazzale Roma*, this line makes stops at nearly all of the boat stations along the canal, and then makes its way out to the *Lido*. It begins operating at 5 AM and continues until about midnight, making stops every ten minutes throughout most of the day.

Line 2

Line 2 is designed to be used more by tourists than Line 1, due to the fact that Line 2 has fewer stops along the Grand Canal, mainly making stops at major tourist locations. Because of the fewer stops, the Line 2 *vaporetti* are able to move more quickly along the Grand Canal than those of Line 1, so more tourists tend to make use of this line, as determined by this project's studies. Running from 5 AM until approximately midnight, with ten-minute intervals at each stop, Line 2 begins at *San Marco – Giardinetti* and moves up the Grand Canal, then loops out to *Tronchetto*, down to *Giudecca*, and then makes its final stop at *San Marco – San Zaccaria* before turning around and travelling the same route in the opposite direction. During summer months when there are the most tourists in Venice, Line 2 also travels out to the *Lido* and makes a few stops along the way. A map of the route for Line 2 is shown below in Figure 2-20.

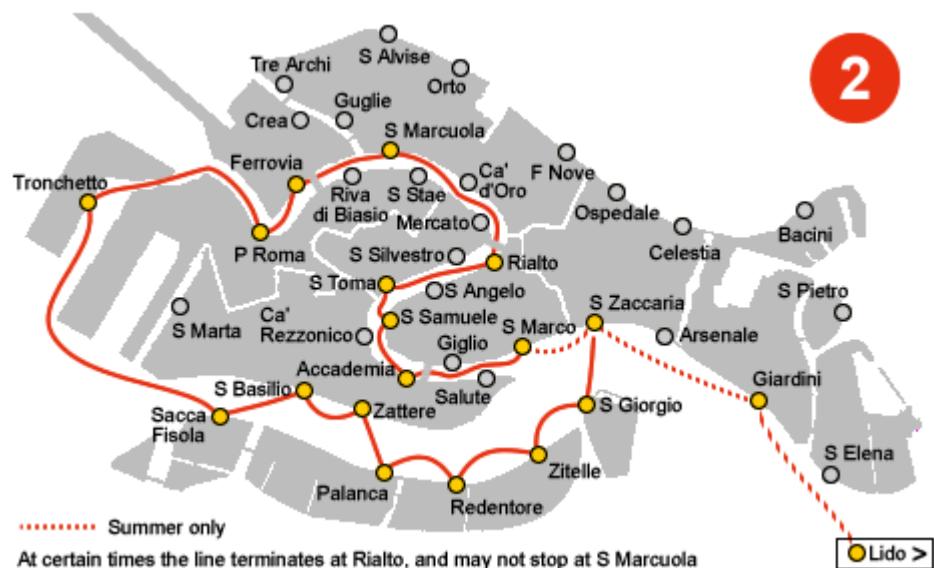


Figure 2-20: Map of ACTV Line 2 Route⁴⁶

Lines 4.1 & 4.2

Lines 4.1 and 4.2 circle around the main bulk of Venice and also make their way out to *San Michele* and *Murano*. The main difference between the two lines is that Line 4.1 travels in a counterclockwise direction, while 4.2 travels clockwise. These lines make stops at twenty minute intervals throughout the day.

Lines 5.1 & 5.2

Lines 5.1 and 5.2 are similar to Lines 4.1 and 4.2 because they also circle around the City making stops in twenty-minute intervals, with Line 5.1 traveling counterclockwise and 5.2 traveling clockwise. However, these lines have a detour out to the *Lido* instead of *San Michele* and *Murano*.⁴⁷

⁴⁶ Venetian Apartments. (2012). *Vaporetto Route 2*.

⁴⁷ Dunford, Martin. *The Rough Guide to Italy*. (for entire lines section)

ACTV Notte

The ACTV night service, known as ACTV *Notte*, began in September of 1996. With a crescent moon and an “N” as the logo (Figure 2-21), the ACTV *Notte* runs from midnight until 5 AM. The boat lines are coordinated with the mainland bus lines in the *Mestre* area and on *Lido*, making it easier for people to travel from place to place without having to wait. After a two-year test of the service, it was extended, and now includes lines from *Fondamente Nuove* to *Murano* and vice versa, the Northern Lagoon, and buses on the *Lido*.⁴⁸



Figure 2-21: ACTV *Notte* logo

Special Conditions

Flooding is a regular occurrence in Venice, and therefore, the public transportation system must make accommodations for high tide conditions. Passenger safety must be taken into consideration, especially when there is bad weather or strong waves in the canals, and as a result, many changes occur to the boat transportation system. A table and a figure to explain these changes can be found in A.1 and A.2 in the Appendix.

Venice also experiences fogginess in addition to flooding, and when there is fog in the canals, changes must be made to the routes depending on the visibility. Visibility in the canals during non-ideal weather is measured by twelve different electronic “eyes” that are placed in different locations to cover all of the ACTV’s transportation routes.⁴⁹ These changes can be viewed in the ACTV Line Conditions A.2 in the Appendix along with another table to indicate the changes to the lines due to low visibility.

2.4 WPI Smartphone Application Design

In 2010, a previous WPI group created designs for a smartphone application that would facilitate the use of the public transportation for all users. The design that was created includes special features for the application that will benefit the user, and will provide an easier understanding of the boat transportation system.

The plans from the design allow the application to give the user walking directions to the closest boat stop, followed by telling the user which boat to take and in what direction, then telling at which stop to disembark, and finally providing walking directions to his or her destination. In addition to directions, there will also be an alarm system, that will alert the user when their boat stop is approaching so it is ensured that he or she will know when to disembark, as well as a reminder for when to leave, if planning a route in advance. Lastly, for those riders who do not have time to buy an iMob ticket at the Hellovenezia ticket booth, the user would be able to buy a ticket straight from his or her smartphone, and produce a QR code for the boat operators to scan. Screenshots for these advancements that were developed by WPI students can be seen below in Figure 2-22.

⁴⁸ ACTV. (2011). *Night service*.

⁴⁹ ACTV. (2011). *Emergency service in foggy conditions and during high tide*.



Figure 2-22: Smartphone Application Designs from 2010

3. Methodology

This project is designed to further understand how tourism in Venice directly affects public transportation by measuring the number of people at popular boat stops. The group has taken advantage of cruise ships and the large influx of tourists that they bring to the City, and we have compared data from passengers at popular boat stops on days when cruise ships arrive, and with days there are no cruise ships. These measurements have allowed us to quantify the impact of cruise ship passengers on the boat transportation system. In addition, we have also helped to improve the structure and informational resources of the ACTV boat lines by creating Venipedia pages to further educate tourists about the City, as well as a smartphone application that will aid in navigating via boat throughout Venice.

In order to accomplish these goals, the team has developed the following objectives, which will be discussed in greater detail in this chapter.

1. Inventorying the public transportation system infrastructure
2. Collecting public transportation ridership information
3. Analyzing the impact of cruise ship passengers on public transportation
4. Experimenting with technology to facilitate tourists' use of the public transportation system

Our areas of study, mapped out in Figure 3-1 below, include the *Marittima* cruise ship port, and the boat stops at *Piazzale Roma*, *Rialto*, and *San Marco*.



Figure 3-1: Main Cruise Ship Port and 3 boat stops for data collection in Venice

3.1 Inventorying the Public Transportation System Infrastructure

Much of the information required prior to the group's arrival in Venice had already been presented in the Background chapter. This background information was essential for preliminary understanding of the Venetian public transportation system in order to create an initial method of data collection. Once in Venice, the group gained further understanding of the public transportation infrastructure, which allowed us to revise the original plan. During the first week in Venice, the team developed a new schedule to determine which days to count the passenger flux of the boats, the times at which to count, as well as stops at which to count.

However, more preliminary information was still required in order for the group to proceed with the completion of this project. We needed to familiarize ourselves with Venice's transportation system once we had arrived, and we also had to test our proposed data collection procedure.

Also, understanding the infrastructure of the boat network helped the team create Venipedia pages, which is an online source of information, in order to educate others about specific boat transportation topics in Venice.

3.1.1 Familiarization with ACTV operations

Although the team collected a large amount of information about the public transportation system, it was still necessary to gain a further understanding of how the public transportation system actually functioned. Upon arrival in Venice, the group devoted a few days to simply ride a few of the different lines of the ACTV, as well as visit ACTV and *traghetto* stops in order to get a more concrete idea of how the transportation system works. Being new to the city, much like tourists are, the group had a more realistic, hands-on experience of just how confusing the boat transportation system can be.

Along with becoming familiar with how the public transportation system works, it was important to become familiar with the stops at which we are counting the passenger traffic. The team counted at *Piazzale Roma*, *Rialto*, and *San Marco*. During the first few days of being in Venice, the group visited these stops in order to determine a proper place to set up where to count passengers, and to figure out which docks corresponded to the correct lines. Also, the group took pictures of all of the boat stops throughout the City and its surrounding islands to include in the Venipedia pages.

3.1.2 Creating Web-pages for Venipedia

Venipedia is an online encyclopedia resource, which displays a plethora of information about Venice. For this project, more web pages have been created to add to the growing site and educate people more about the boat transportation system. Two templates have allowed us to add our information so it is cohesive with the site. These templates are simple outlines for each page and it can easily organize information into different sections while still maintaining the same overall structure. Pages about the different boat lines, stops, *vaporetti*, *motoscafi*, and *traghetto* will help further educate tourists on their uses and how to navigate Venice while using them.

The two templates consist of a general overview page, and smaller, specific pages, which are more specific and uniform. The general overview pages that were created consist of: the ACTV and *Alilaguna* companies, the boat stops, *traghetto*, *motoscafi*, and *vaporetti*, cruise ships, and boat lines. A more detailed breakdown of the Venipedia pages are shown below in Figure 3-2.



Figure 3-2: Breakdown of Overview Pages (Green) & Specific Pages (Blue)

All of the overview pages are specific, and are designed differently to meet the information's needs, however, all of the specific pages that branch off of a particular heading are identical. The only difference between the two templates is the information displayed on each one, but the layout and the design of each page are all the same.

3.2 Developing Tools for Public Transportation Riders

In addition to Venipedia pages, the team has also created a tool that will help riders use the public transportation system more easily. Google Transit feeds were developed that will allow further development to a smartphone application designed to help travelers figure out the best route to their destination.

3.2.1 Improving the WPI Smartphone Application

Many people have a difficult time navigating Venice due to the complex boat system, as well as the narrow, winding streets. To help direct travelers, the group has updated an application that can be used on any smartphone, which will give the user a designated route to follow to get to their destination. The boat transportation system has also been incorporated into this system by adding information about the different lines, so a user will be able to easily understand how to maneuver through Venice.

The group updated the application by adding all of the schedule information from all of the popular lines into the application feed, and also made the app functional for the public to use. To do this, the team first deciphered how to read the different boat schedules, by looking at the ACTV map and viewing the different times. An example of one of the boat schedules is shown below in Figure 3-3.

LINEA 2 S.ZACCARIA - GIUDECCHA - TRONCHETTO - P.ROMA - FERROVIA - RIALTO - S.MARCO GIARDINETTI

	L-V											
S.MARCO-S.ZACCARIA (M.V.E) "B"	4.59	5.19	5.39	5.49	5.59	6.09	6.19	6.29	6.39	6.49	6.59	7.09
S.GIORGIO	5.02	5.22	5.42	5.52	6.02	6.12	6.22	6.32	6.42	6.52	7.02	7.12
ZITELLE	5.05	5.25	5.45	5.55	6.05	6.15	6.25	6.35	6.45	6.55	7.05	7.15
REDENTORE	5.08	5.28	5.48	5.58	6.08	6.18	6.28	6.38	6.48	6.58	7.08	7.18
PALANCA	5.10	5.30	5.50	6.00	6.10	6.20	6.30	6.40	6.50	7.00	7.10	7.20
ZATTERE	5.14	5.34	5.54	6.04	6.14	6.24	6.34	6.44	6.54	7.04	7.14	7.24
S.BASILIO	5.16	5.36	5.56	6.06	6.16	6.26	6.36	6.46	6.56	7.06	7.16	7.26
SACCA FISOLA	5.19	5.39	5.59	6.09	6.19	6.29	6.39	6.49	6.59	7.09	7.19	7.29
TRONCHETTO	5.27	5.47	6.07	6.17	6.27	6.37	6.47	6.57	7.07	7.17	7.27	7.37
(*)TRONCHETTO (Mercato)	5.29	5.49	6.09	fer	6.29	6.39	Sab	6.49	6.59	Sab	7.09	7.19
P.ROMA (S.Chiara) "D"	5.37	5.57	6.17	6.27	6.37	6.47	6.47	6.57	7.07	7.17	7.27	7.37
FERROVIA (Scalzi) "C"	5.41	6.01	6.21	6.31	6.41	6.51	6.51	7.01	7.11	7.11	7.21	7.31
S.MARCUOLA Casinò	-	-	-	-	-	-	-	-	-	-	-	-
RIALTO "C"	6.31	6.41	6.51	7.01	7.01	7.11	7.21	7.31	7.41	7.41	7.51	7.51
S.TOMÀ												
S.SAMUELE												
ACCADEMIA												
S.MARCO (Giardinetti)												

L-V = FERIALE DA LUNEDÌ A VENERDI.

fer = FERIALE DA LUNEDÌ A SABATO.

Sab = SOLO AL SABATO FERIALE.

Sab e FES = AL SABATO E NEI FESTIVI.

(*)= FERMATA EFFETTUATA SOLO NEI GIORNI FERIALI DALL'INIZIO DEI SERVIZI FINO ALLA CORSA DELLE 10.39. ALLA CONCLUSIONE DEI LAVORI NEL PIAZZALE ANTISTANTE L'APPRODO TUTTE LE CORSE (DALL'INIZIO ALLA FINE DEI SERVIZI) FERMANO NEI GIORNI FERIALI E FESTIVI.

Figure 3-3: ACTV Line 2 Boat Schedule

From there, each stop was analyzed along with the times and was incorporated into a Google feed that is responsible for creating the schedules in the application. To create the feed for new lines, a Google feed template was used, and the new information was added in the current format. A breakdown of each portion of the feed is shown below in Figure 3-4.

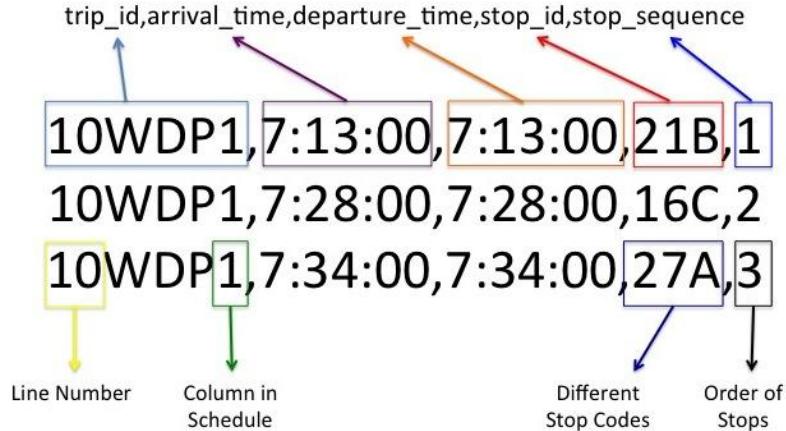


Figure 3-4: Breakdown of Feed Functions

This method of coding occurs throughout the different lines for the ACTV schedules as well as the *Alilaguna* schedules. A separate list, that was previously created, contains the different codes for each boat stop, and that is matched up with each stop's longitudinal and latitudinal coordinates so it can be easily placed on a map. The application created utilizes a Google Transit interface, which allows users to navigate the streets of Venice with ease. With more of the line schedule feeds added to the application, the user will be able to easily use the boat system without the need to decipher complicated boat schedules.

3.3 Collecting Public Transportation Ridership Information

In order to determine the impact that cruise ship passengers have on the public transportation system, a series of data was collected over the course of a month. These data collection days included those with and without cruise ships, and counting was performed at three selected stops. To get the most useful and accurate information from these counts, the group formed strategies for how to split up when counting, and for distinguishing tourists from Venetians, which will be discussed in this section.

3.3.1 Determining Where to Count

In order to determine tourists' impact, it is imperative that the counting locations are near popular tourist spots, or near tourist entry points into the City. The group chose three stops throughout the City to count passengers embarking and disembarking *vaporetti*: *Piazzale Roma*, *Rialto*, and *San Marco*. These particular boat stops were chosen because of their location near popular icons or near the drop-off points for entering the City. *Piazzale Roma* is the first ACTV stop off of the cruise ships, as well as the main bus stop location in Venice, and a stop for The People Mover. The other chosen locations, *Rialto* and *San Marco*, have major tourist attractions such as the Rialto Bridge and Saint Mark's Square, as well as being popular urban centers.

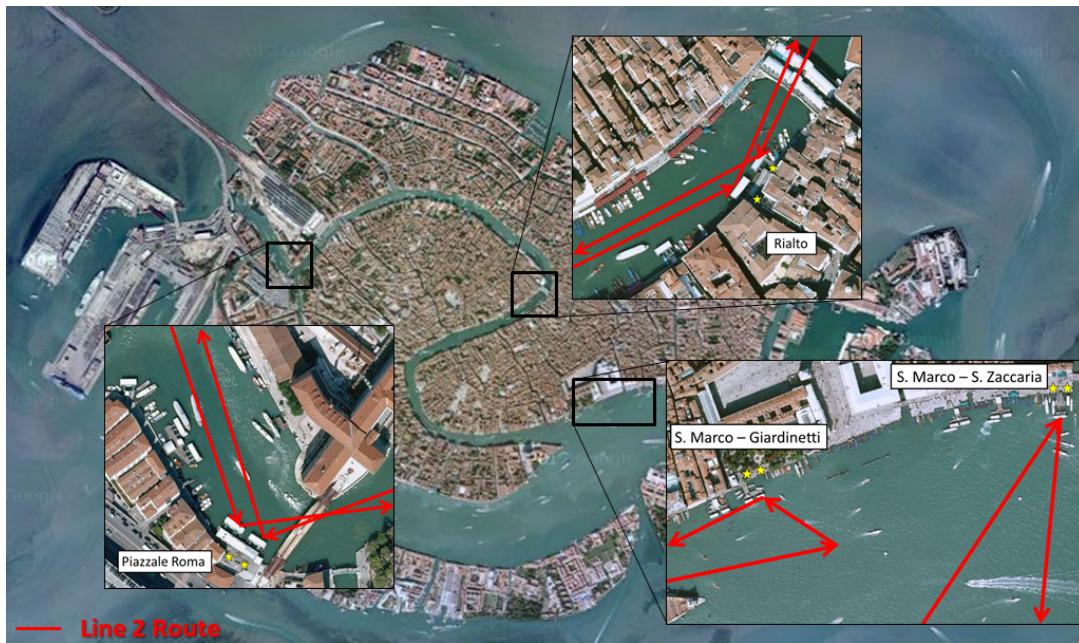


Figure 3-5: Line 2 routes at selected boat stops

Due to a limited number of group members, the team also had to decide on a single line to count. All lines except for Line 1 and Line 2 were eliminated since they do not make stops at all three of the selected locations. During our preliminary tests, the group counted the passenger flux for Line 1 and Line 2 and recorded a much larger number of tourists--and passengers altogether--on Line 2. This observation makes sense because, as stated in the Background chapter, Line 2 is designed for tourists, only making stops at important locations and tourist attractions along its part of the route down the Grand Canal. A map of Venice with zoomed-in windows of the Line 2 route at selected boat stops can be seen above in Figure 3-5.

3.3.2 Determining When to Count

In order to determine the peak tourist times during the course of the day at the boat stops, the team counted from 8 AM to 5 PM at the *Piazzale Roma* boat stop. By these counts, the group could see which hours during the day the stop was mostly populated by tourists, and the hours that it was the busiest overall. In the morning hours, from 8-9:30 AM, there were mostly Venetians riding the boats, and it is hypothesized that it was mainly because they were traveling to work or the grocery store in the morning. This idea was confirmed with the large amount of Venetians carrying shopping carts and briefcases. Around 9:30 AM is when tourists became more prevalent at the boat stops, which correlated with arrival of the cruise ships for that day. This pulse of tourism lasted until about 11 AM, and then numbers overall dropped until around 3 PM, when the numbers spiked again. The second pulse, lasting until just before 5 PM, also correlated to the cruise ship departing. From this data, the team decided to count from 9-11 AM and 3-5 PM.

Along with counting times, counting dates also had to be determined. The team researched the maximum capacities for each cruise ship arriving in Venice and then created a schedule based on number of people arriving on each ship. The group decided to count on High Cruise Ship Traffic days, Low Cruise Ship Traffic days, and No Cruise Ship Traffic days. On each of the High days, 4 ships were in port, carrying a combined total of over 7,000 passengers. On the Low days, only 1 ship with 3,780

passengers was in port. On No Ship days, no ships were in port, meaning no cruise ship passengers were in the City.

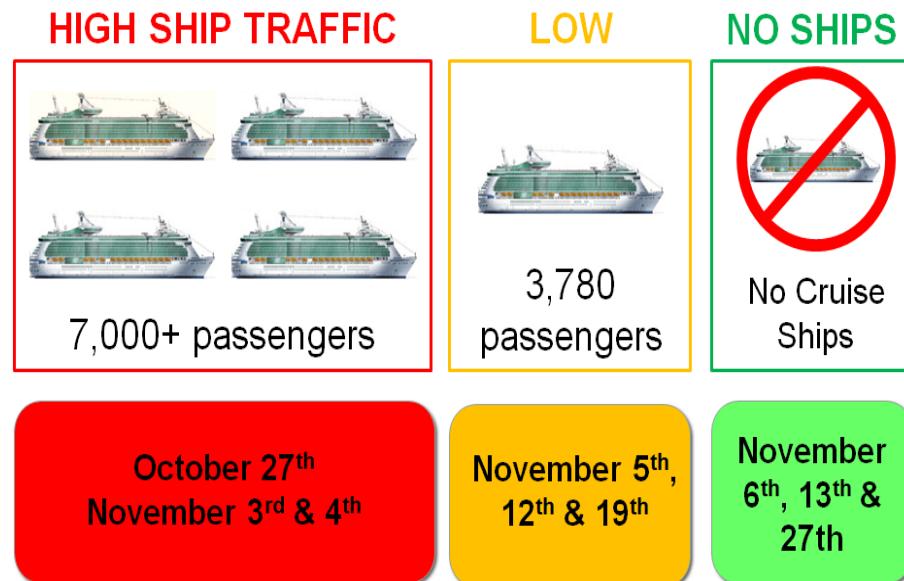


Figure 3-6: High Ship Traffic, Low Ship Traffic, and No Ship Traffic Days

The team decided to count at each stop for 3 days: one for High, one for Low, and one for No Ships, meaning a total of 9 days of counting. Once this was determined, a final cruise ship schedule was created, telling which ships would be in port, when they would be arriving and departing, and the total capacities, as well as outlining when the group would be counting to collect data. Our cruise ship and counting schedule is shown in Appendix B.

Due to the scheduling restriction of cruise ship arrivals in Venice, all of the High Cruise Ship Traffic days were counted on the weekend, while the Low Cruise Ship Traffic and No Cruise Ship Traffic days were counted on weekdays. The variation in the number of cruise ships on the other weekdays and weekends prevented us from counting on all weekdays or all weekends. However, the group determined that because Venice has significantly less tourists in the early winter, most of the increase in tourism can be attributed to the cruise ship passengers.

3.3.3 Determining How to Count

To obtain accurate results, it was first important to be able to properly distinguish between tourists and Venetians. In order to do this, the group created guidelines that would allow for differentiation. The team noticed that tourists will generally be unfamiliar with their surroundings and will carry maps, cameras, and suitcases. It is also common to find tourists in groups since they are usually on vacation. Venetians generally carry briefcases, shopping carts, and newspapers. They can be seen traveling alone more often than tourists. Also, when it rains, Venetians typically have higher rain boots to prepare for the occasional flooding that occurs. Figure 3-7 shows examples of items that tourists and Venetians will generally be carrying.

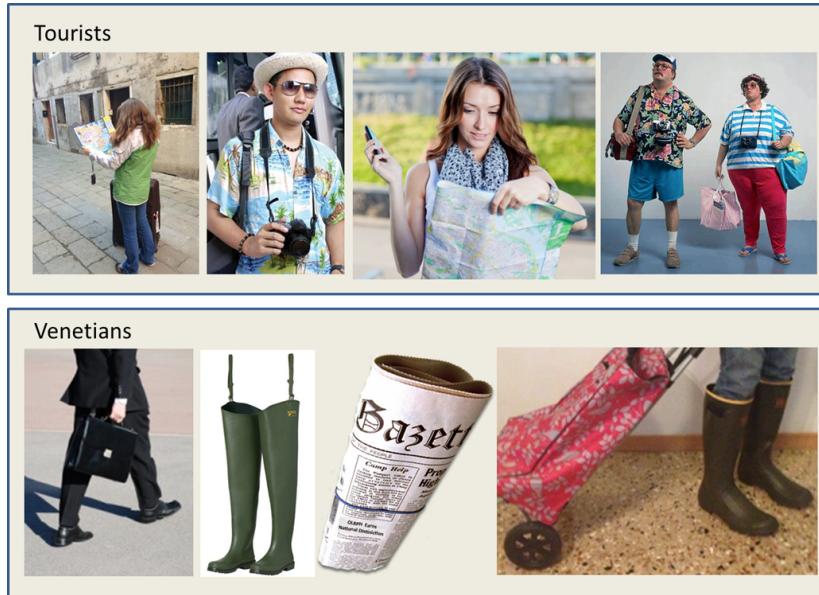


Figure 3-7: Distinguishing Tourists and Venetians

To test accuracy, the team performed two different tests. First, the team sat on a street and differentiated between tourists and Venetians as they walked by. Each group member asked ten people whether they were a tourist or Venetian, and their answers were compared to the group members' hypothesis. This procedure allowed the group to determine each team member's percent accuracy, showing whether or not we were competent in our differentiation. Once all of the team was accurate with distinguishing, it was time to move on to the second test. For this, the group counted boat passengers disembarking from Line 2 for an hour at *Piazzale Roma* to practice distinguishing between tourists and Venetians. Each person used two pitch counters to keep track of how many tourists and how many Venetians were leaving the boat stop. The team also videotaped the passengers leaving the boat stop simultaneously to have a baseline to which numbers could be compared. After counting, the group viewed the video and collectively distinguished which passenger was a Venetian, and which was a tourist, to serve as their actual count. From there, the numbers collected by the team were compared to the camera's actual counts and percent accuracy and percent errors were calculated. The data that were collected during the test days were not used in the final set of data, they were only used to determine accuracy of distinguishing between tourists and Venetians. A graph displaying the group's accuracy is shown below in Figure 3-8.

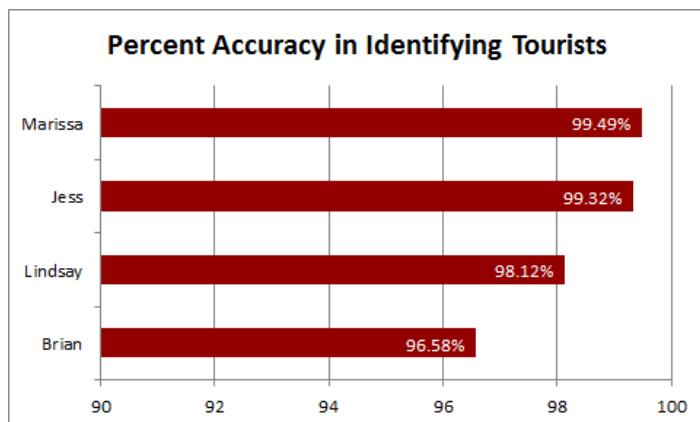


Figure 3-8: Percent Accuracy in Identifying Tourists

After finalizing the passenger differentiation tactics, the team focused on how to count at boat stops. Since Line 2 travels in both directions, the whole group counted at each stop with all four people counting Venetians and tourists: two counting embarking passengers in both directions, and two people counting disembarking passengers in both directions. To do this, each person held a pitch counter in each hand to distinguish between tourists and Venetians. Once each boat left, the totals for that particular boat were recorded.

Passenger data were also collected for *traghetti* crossings along the Grand Canal. A previous IQP group collected data for 3 of the 7 crossings and determined an average number of passengers for each *traghetti*. However, since the group did not differentiate between tourists and Venetians, the only data used from their counts was the total number of passengers using each crossing during the counting periods. The procedure for counting the *traghetti* passengers was very similar to that for ACTV boat passengers, in that passengers were counted getting on and off the boats from 9 AM to 12:30 PM. These times were picked based on the general hours of operation for each line.

The group spent one day at each *traghetti* stop counting passengers getting on and off of the boat, and that information provided the total number of people using the *traghetti* during that time period, which could be compared to the data collected by the previous IQP group. The percentage of tourists versus Venetians who make use of the *traghetti* was also calculated. Again, the group used pitch counters in each hand to keep track of these passengers and then record the values on a data collection sheet.

3.4 Analyzing the Impact of Tourists on Public Transportation

Once all of the data were collected, it was important to use the information by analyzing it and determining what the real impact of tourists on public transportation is. To do this, the group organized all of the data that were collected to show the flow of cruise ship passengers throughout the city of Venice. This information is vital to the understanding of tourist movements in the City, as well as how the cruise ship passengers are affecting the public transportation system.

In order to do this, the team analyzed the tourism differences between high, low, and no cruise ship days to see the changes in the number of tourists in the City. The different days show the various number of cruise ship tourists in Venice at once, with over 7,000 cruise ship passengers on high ship days, about 4,000 passengers on low ship days, and no passengers on no ship days. By comparing the different number of tourists on the public transportation system, one can easily see when the boat network is crowded compared to when traffic is sparse.

Similarly, when tourists come into a city, they can create a flow of traffic, which shows patterns of their movements and popular locations that they generally flock to. The group decided to analyze the patterns of tourist traffic to further understand this flow. Viewing the data in this way is important in that it will show the peaks of tourists traveling throughout the City by using the public transportation system due to the cruise ship's arrival. The typical trend that can be seen by analyzing the data in this way is that the cruise ship passengers embark the ACTV boats at *Piazzale Roma* in the morning, the boat stop near the ship port, and disembarking later at the popular tourist attractions. Later in the day, when the ship is ready to leave the port, the passengers board the public transportation boats at the iconic sites and then get off of the boats at *Piazzale Roma*, in order to get back on the cruise ship before its departure.

4. Results

After gathering the proper information about the public transportation system and its operations, it was submitted into an online encyclopedia known as Venipedia. Upon completing the collection of necessary ridership data at the three boat stops, the results were compiled and presented in a series of charts and graphics. This section discusses those results and findings of the collected project data.

4.1 Public Transportation Infrastructure

The project could not be completed without a full grasp of the public transportation system. Such grasp required visiting various boat stops, riding the boat lines, and keeping track of which lines visit which stops. The group also explored various boats, including those of the ACTV, the *Alilaguna*, and *traghetti*, to gain a fuller knowledge behind the operations of the public transportation system. After completing these tasks and conducting additional online research, the group organized the information into various Venipedia pages that will help to inform the public about details of Venice's transportation system.

4.1.1 Informative Venipedia Pages

The informational data that was collected during the beginning of the term was catalogued in the form of multiple Venipedia pages. The pages included those of more general terms, such as the ACTV company, the *Alilaguna* company, and different boat types. Pages for more specific information—for example, each of the different boat lines and boat stops—were also created. A complete list and division of pages completed by each member is shown in C.1 in the Appendix.

Overview Pages

The overview pages that were created consist of the ACTV and *Alilaguna* companies, as well as pages for boat stops, boat lines, cruise ships, *motoscafi*, *vaporetti*, and *traghetti*. The ACTV and the *Alilaguna* pages contain a brief history of their companies, as well as a list of their different lines and how they operate. The cruise ship page contains information about how many cruise ships come to visit Venice, as well as information about how many passengers are being dropped off in the City. This is useful to other tourists in that they will see when Venice is heavily populated by other tourists and may try to schedule trips around those times. The *traghetti* page has been updated with more current information about their services, and also has links to the different *traghetti* crossings on Venice's Grand Canal. The pages about *vaporetti* and *motoscafi* contain information about the capacity, crew, and example lines that use these types of boats. Lastly, the boat stops and lines pages have an overview of their functions and contain links to the specific pages for the individualized lines and stops.

Specific Pages

These pages are subsections of the general overview pages, and are all identical to each other, only differing in the information that is presented on them. For example, all of the boat lines and stops each have their own individual page, which look alike, but all of the information is specific to that particular boat line or stop. For the stop pages, the team has included a picture, latitudinal and longitudinal coordinates, which ACTV and/or *Alilaguna* line uses it, the times each line stops at that particular dock, as well as any other pertinent information relevant to the stop. The *Rialto* Boat Stop page, found in Figure 4-1 below, shows an example of a completed Venipedia page. Similarly, the boat line pages include a list of all of the stops in the line's route, as well as a schedule that shows its hours of operation. We have also

included an interactive map that shows where each boat stop is located, which is included in Appendix C.7. More examples of each type of page are included in Appendix C.

VENIPEDIA

Page Discussion Read View source View history Go Search

Rialto Boat Stop

The Rialto boat stop is located along the middle part of the Grand Canal, right next to the iconic Rialto Bridge. There are two Helloworldia ticket offices at this stop where passengers can purchase tickets to use the ACTV lines for boats and buses. The boat stop is made up of three different docks labeled A through C.

Contents [show]

Line 1

Line 1 is one of the most commonly used lines in the City that begins at Piazzale Roma, and terminates at Lido.

Boat Schedule Toward Lido (Dock A)

- Start Time: 5:20 AM
- Stop Time: 12:00 AM
- From 5:20 AM to 7:20 AM, every 20 minutes on the :00
- From 7:20 AM to 10:20 PM, every 10 minutes on the :00
- From 10:20 PM to 12:00 AM, every 20 minutes on the :00

Boat Schedule Toward Piazzale Roma (Dock A)

- Start Time: 4:55 AM
- Stop Time: 11:45 PM
- From 4:55 AM to 6:35 AM, every 20 minutes on the :05
- From 6:45 AM to 9:45 PM, every 10 minutes on the :05
- From 9:45 PM to 11:45 PM, every 20 minutes on the :05

Line 2

Line 2 is one of the tourist lines in the City that begins at San Marco Giardinetto, and terminates at San Zaccaria.

Boat Schedule Toward San Marco Giardinetto (Dock C)

- Start Time: 6:31 AM
- Stop Time: 11:51 PM
- Departs every 10 minutes on the :01

Boat Schedule Toward San Zaccaria (Dock B)

- Start Time: 6:32 AM
- Stop Time: 11:32 PM
- From 6:32 AM to 8:12 PM, every 10 minutes on the :02
- From 8:12 PM to 11:32 PM, every 20 minutes on the :02

Line N

Line N is one of the night lines in the City that begins at San Marco Zaccaria, and terminates at Lido.

Boat Schedule Toward Lido (Dock C)

- Start Time: 12:24 AM
- Stop Time: 5:04 AM
- Departs every 20 minutes, alternating on the :04 then :07

Boat Schedule Toward San Zaccaria (Dock B)

- Start Time: 11:55 PM
- Stop Time: 4:33 AM
- From 11:55 PM to 12:55 AM, departs every 20 minutes on the :05
- From 12:55 AM to 4:33 AM, departs every 20 minutes, alternating on the :03 then :05

Arancio

The Alilaguna Line Arancio begins at the Marco Polo International Airport, and terminates at San Marco.

Boat Schedule Towards San Marco (Dock C)

- Start Time: 8:57 AM
- Stop Time: 12:47 AM
- From 8:57 AM to 9:57AM, every 60 minutes on the :07
- From 9:57 AM to 7:27 PM, every 30 minutes on the :07
- From 7:27 PM to 12:47 AM, every 60 minutes on the :07

Boat Schedule Toward Marco Polo Airport (Dock B)

- Start Time: 7:03 AM
- Stop Time: 10:33 PM
- From 7:03 AM to 8:33 AM, every 60 minutes on the :03
- From 8:33 AM to 5:33 PM, every 30 minutes on the :03
- From 5:33 AM to 10:33 AM, every 60 minutes on the :03

Rialto Boat Stop

Map Satellite

Google Map Data - Terms of Use

General Information	
ACTV & Alilaguna Lines	1, 2, and N
Number of Docks	3
Docks	
Dock A	
Latitude	45.437024
Longitude	12.334769
ACTV & Alilaguna Lines	1
Dock B	
Latitude	45.437376
Longitude	12.335415
ACTV & Alilaguna Lines	2, N, and Arancio
Dock C	
Latitude	45.437544
Longitude	12.335584
ACTV & Alilaguna Lines	2, N, and Arancio

Figure 4-1: *Rialto Boat Stop* page on Venipedia

4.2 Advancement of WPI Smartphone Application

Navigating the public transportation system can be very frustrating to those who are unfamiliar with its schedules, so to aid travelers, a smartphone application prototype was further developed. With the help of this project, the application now contains the feeds for all of the Alilaguna lines, as well as the ACTV lines 1, 2, 3, 4.1, 4.2, 5.1, 5.2, 6, 9, 10, and Line N. Because of the additional lines, the application will now be able to help the user navigate the City with more boat transportation options, which will cut down on the amount of walking required.

To use this application, the user must first access the URL for the app on their smartphone, which will bring them to the home page with the user's location marked on a Google Map, as shown in the first image in Figure 4-2. In order to begin the navigation aspect of the app, the user must select "Route" tab, and then select "Vaporetto" as the means of transportation. From there, a map will appear that shows all of the different boat stops for that particular line (the middle screenshot in the figure below), and any one of them can be selected to use. Then, the user can select a boat stop that is nearest to them, which will bring them to another page to choose which boat to take, as shown in the third image in Figure 4-2.



Figure 4-2: Smartphone Application Screenshots

In addition to the lines, there is also a countdown feature incorporated to the feeds that will begin once a boat is selected. From there, a countdown will appear, shown in Figure 4-3, which will tell the user how much time they have until their selected boat leaves the boat dock. This feature ensures that the person using the application will be able to reach the boat stop before it leaves.



Figure 4-3: Countdown Feature of Smartphone Application

4.3 Public transportation ridership

Before beginning the analysis of the data, it was important to gain a full understanding of what the data demonstrated in its raw form. The group reviewed the collected data and determined totals, percentages, averages, maximum, and minimum numbers of tourists.

4.3.1 ACTV Ridership

The team collected data from the *Piazzale Roma*, *Rialto*, and *San Marco* boat stops for three days each: one with 4 cruise ships, one with 1 cruise ship, and one with no cruise ships, to compare the amount of tourists that are using the public transportation system.

The team compared the number of tourists that embark and disembark the boat stops on the different cruise ship days in order to determine how many more tourists are using the boat transportation system on days with 4 ships compared to days with no ships. The data that was collected was also from 9-11 AM and 3-5 PM.

On days with no cruise ships, *Piazzale Roma* had 1,629 tourists pass through, *Rialto* had 1,323 tourists, and *San Marco* had 598 tourists. On days with one ship, *Piazzale Roma* rose to 1,963 tourists, which was an increase of 20.5% people. Similarly, *Rialto*'s count rose 75.1% to 2317 tourists, and *San Marco*'s number increased 108.5% to 1247 tourists.

On days with 4 cruise ships, the increase was even greater. The traffic at *Piazzale Roma* increased 120.2% to 3,587 tourists, compared to the no cruise ship day, and the *Rialto* tourist traffic increased 182.6% to 3,739. Lastly, *San Marco* saw a sizable increase in the number of tourists, rising to 3,134, which was an increase of 424.1% compared to the day with no cruise ships. A figure displaying this data is shown below in Figure 4-4.

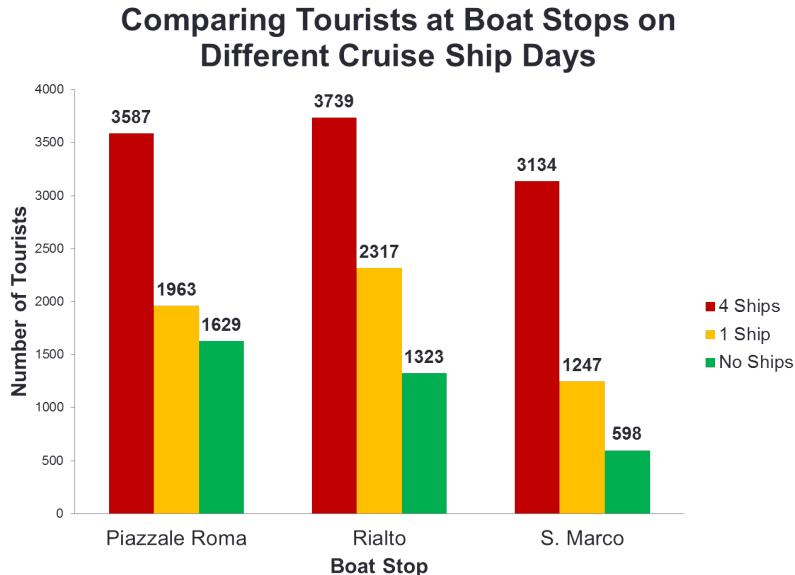


Figure 4-4: Comparing Tourists at Boat Stops on Different Cruise Ship Days

Since the group was able to accurately distinguish between tourists and Venetians, the team could determine not only how many people were at each stop, but also what percentage of that total were tourists and Venetians. By comparing these numbers over the different cruise ship days, the group was able to see how much the ratio between tourists and Venetians changed at the different boat stops.

At *Piazzale Roma* on a non-cruise ship day, the ratio between the two is almost even, with 47% tourists and 52% Venetians. However, as the number of cruise ships increase, so does the percentage of tourists, so on a 4 cruise ship day, the tourists outnumber the Venetians by a ratio of 6:1. This data is displayed below in Figure 4-5.

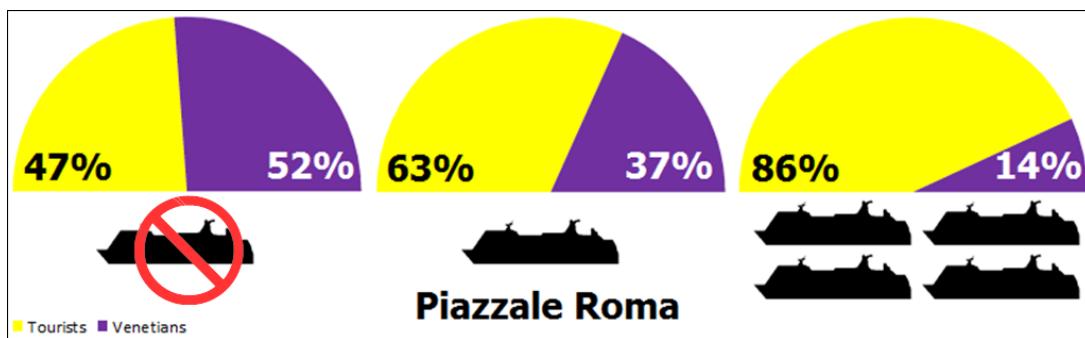


Figure 4-5: Percentages of tourists versus Venetians at *Piazzale Roma*

A similar trend occurred at *San Marco*, where the non-cruise ship day contained around a 50/50 split of Venetians and tourists, and the 4 cruise ship day consisted of 82% tourists and only 18% Venetians. Data showing this is displayed in Figure 4-6.

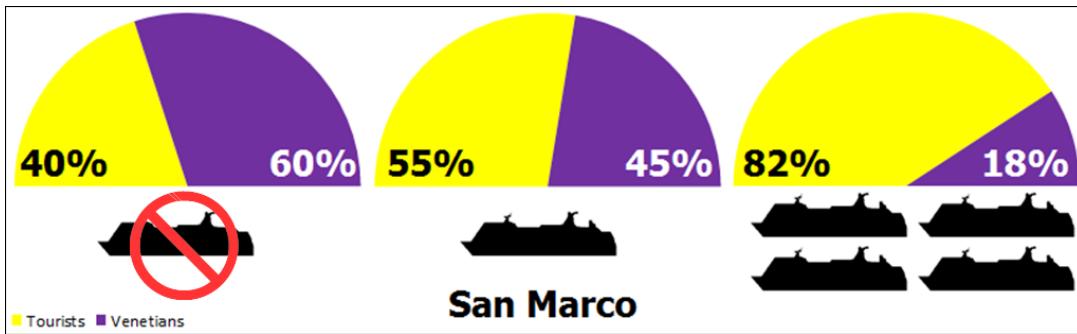


Figure 4-6: Percentages of tourists versus Venetians at *San Marco*

Lastly, the data from the *Rialto* stop was slightly different, with much more Venetians using the boat network at Line 2 than at the other boat stops. On the day with 1 cruise ship, the percentages of Venetians versus tourists were almost identical, with 49% tourists and 51% Venetians, as shown in Figure 4-7. Lastly, on the 4 cruise ship day, the boat transportation system was overwhelmed with over $\frac{3}{4}$ of all of the passengers being tourists, and less than $\frac{1}{4}$ being Venetians.

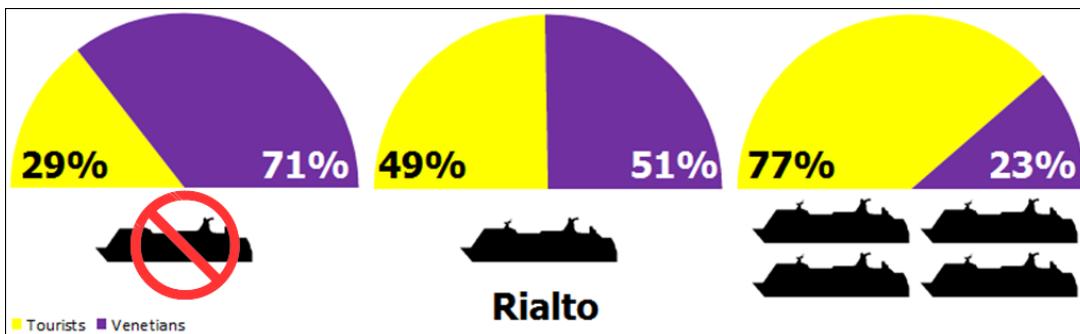


Figure 4-7: Percentages of tourists versus Venetians at *Rialto*

4.3.2 *Traghetti* Ridership

The team also collected *traghetti* ridership data at all of the current *traghetti* crossings in use along Venice's Grand Canal. The *San Marcuola*, *San Samuele*, and *Santa Lucia* crossings were suspended for the duration of the project, and data could not be collected. For each of the operational crossings, the number of passengers embarking and disembarking on each ferry was documented, with a distinction between tourists and Venetians. Based off of the hours of operation, each stop was counted from 9 AM to 12:30 PM to keep consistency throughout the data. These counts were completed on days when there were no cruise ships in Venice's ports. Graphs comparing the percentage of tourists versus the percentage of Venetians can be seen below in Figure 4-8.

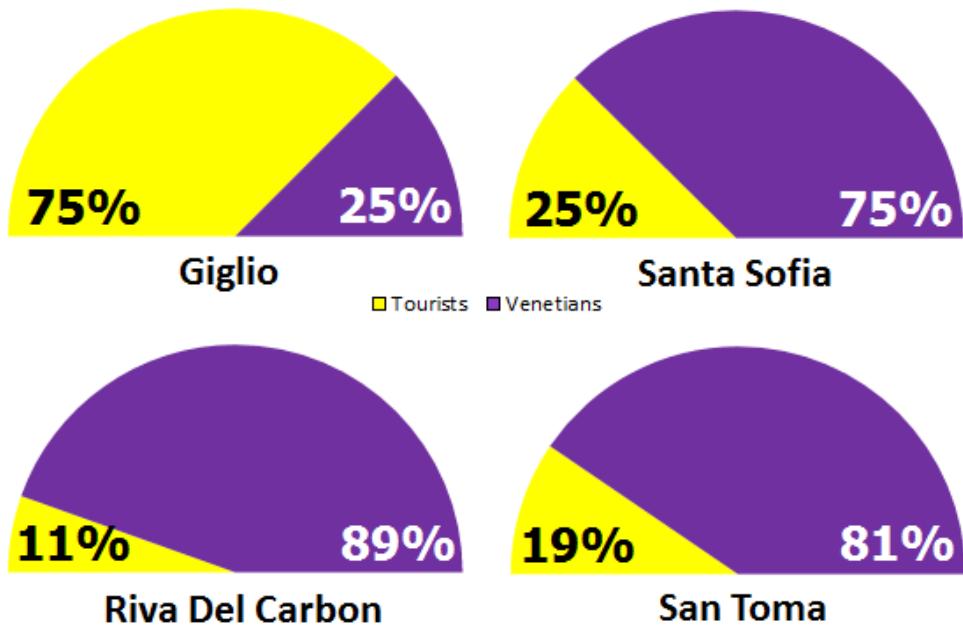


Figure 4-8: Percentages of Tourists vs. Venetians using Different *Traghetti* Crossings

At *Santa Sofia*, the group observed 632 total people, with 471 Venetians and 161 tourists. At *San Toma*, there were 263 people, with 213 of them being Venetians and 50 being tourists. At *Riva Del Carbon*, there were 90 Venetians and 11 tourists. Lastly, at *Giglio* there were 31 Venetians and 93 tourists.

5. Analysis

The intuitive conclusion to this project is that when an increasing number of tourists visit the city of Venice, more people--specifically, more tourists--will use the public transportation system. However, there is much more to the tourists' impact than just the quantitative results. Once all of the results were gathered and the group understood what was collected, it was necessary to determine the trends that the data was showing. The team determined the impact of cruise ship passengers on the ACTV transportation system and began to determine the impact on *traghetti* lines. This chapter includes discussion of analysis that the group performed upon completing the gathering of results.

5.1 Impact of Cruise Ships on ACTV Line 2

To analyze the impact of tourists on the ACTV boat network, the team was able to look at how much the tourists changed the overall percentage of people using the boat transportation system on Line 2, as well as the total number of tourists using each boat stop. Lastly, all of the tourist data was compiled by boat stop, and maximums, minimums, and averages were calculated to show how many extra people are found at these boat stops over the three different cruise ship days.

5.1.1 Tourists Affecting Line 2 at Observed Boat Stops

First, the group wanted to determine the overall percentage of Venetians versus tourists on the different cruise ship days, so the total numbers for each were analyzed and the data is shown below in Figure 5-1. All of these data were collected during the hours of 9-11 AM and 3-5 PM.

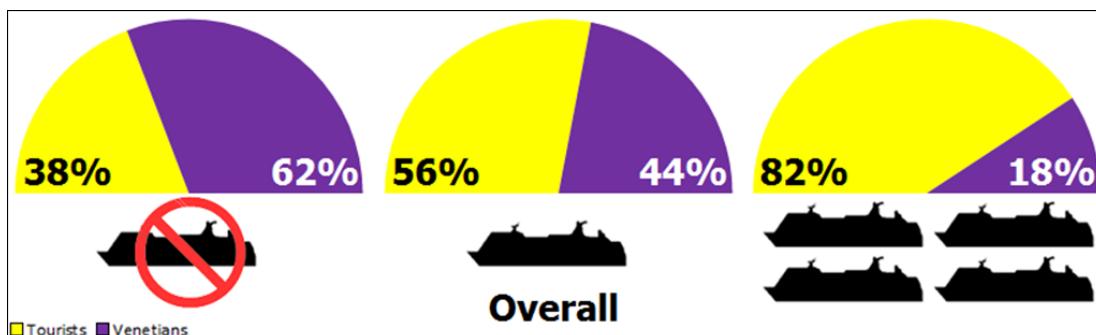


Figure 5-1: Total Percentage of Tourists versus Venetians on All Days at Three Stops

From the figure, on the non-cruise ship days, there were more Venetians overall compared to the number of tourists, which is due to the low amount of tourists in general during the early winter months. With the addition of just 1 cruise ship in port, the amount of tourists increased to 56%. Since the maximum capacity of the 1 cruise ship days was 3,780 passengers, it only took less than 4,000 passengers throughout the City to affect the overall population on Line 2 at all three boat stops. Lastly, with 4 cruise ships in the main port of Venice, the overall tourist percentage jumped to 82%, which is more than double the overall percentage of tourists on Line 2 on the days with no cruise ships. This massive increase extremely affects the public transportation system throughout the entire city, all within the course of a day.

The team then decided to analyze the number of tourists using the public transportation system at the three different boat stops—*Piazzale Roma*, *Rialto*, and *San Marco*—on different cruise ship days. The group determined that overall, on days with 4 cruise ships, there was a dramatic increase in tourists using Line 2 of the boat network all over the City. Just at *Rialto*, the amount of tourists nearly tripled from the

non-cruise ship day to the high cruise ship day. At Piazzale Roma, the tourists more than doubled between the two days, and finally at *San Marco*, the total amount of tourists multiplied by 5. The total number of tourists using the public transportation system at the three boat stops on different cruise ship days can be seen below in Figure 5-2.

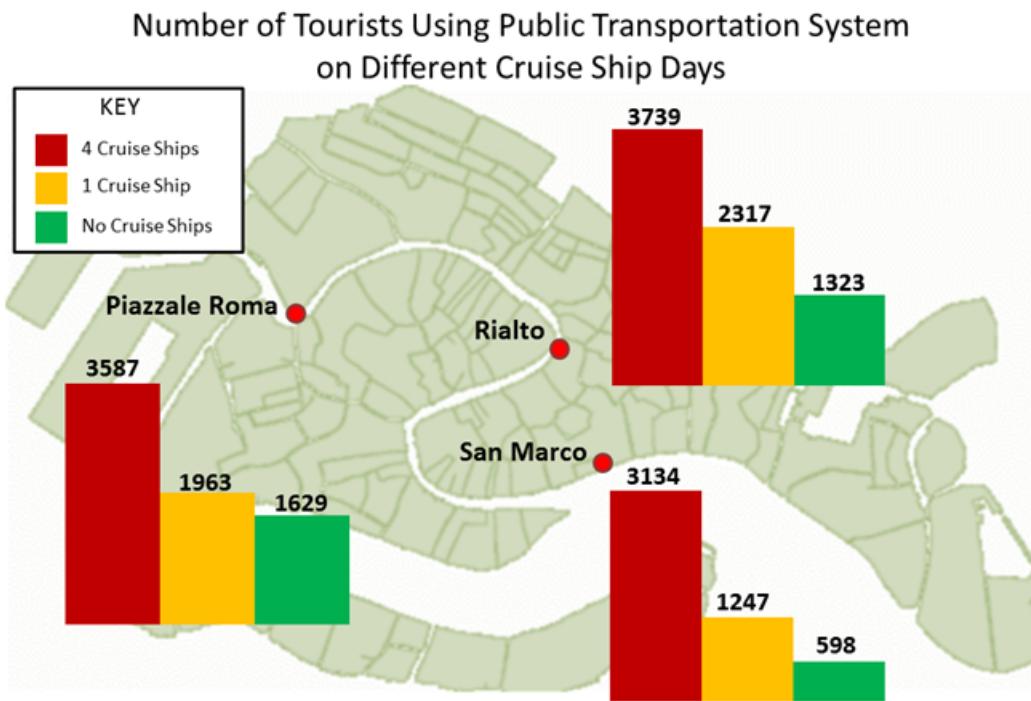


Figure 5-2: Number of Tourists Using the Public Transportation System on Different Cruise Ship Days

This large influx of people greatly impacts the boat transportation network and, as a result, sometimes crowds the *vaporetti* so much that multiple boats need to be sent to accommodate all of the people. This phenomenon occurred multiple times at *Rialto* on the high cruise ship days.

5.1.2 Analysis of the Flow of Tourism Throughout the City

On all of the days which counting was completed with cruise ships, the ships arrived around 9 AM and leave around 5 PM. Because of this, the group observed that the tourists had a distinct travel pattern. For example, in the morning, when the cruise ship passengers leave the ship, their main priority is usually to visit the iconic sites of that particular city. In order to get to these sites, people generally use public transportation because it is inexpensive and convenient. Since *Piazzale Roma* is the closest ACTV boat stop to the cruise ship ports, it is ideal for tourists to choose to enter the public transportation system there. Other forms of transportation located near the cruise ship port, such as the People Mover and shuttle buses, will also bring cruise ship passengers to *Piazzale Roma*, where they can then utilize the ACTV boats. Next, they would likely travel down the Grand Canal to the *Rialto* stop, which is next to the *Rialto Bridge*, or the *San Marco* Stop, located next to Saint Mark's Square. This flow of tourism is depicted below in Figure 5-3.

Expected Tourist Flow through Venice- Morning



Figure 5-3: Expected Flow of Tourists through Venice in the Morning

Similarly, in the afternoon, tourists need to get back to the cruise ship port in order to board their ship in time for its departure. To get back to the cruise ship port, the tourists, who are still enjoying the sites, decide to use the transportation system from where they are, generally *Rialto* and *San Marco*, and travel back up the Grand Canal until they reach *Piazzale Roma* for disembarking. This flow of tourists is shown in Figure 5-4 below.

Expected Tourist Flow through Venice- Afternoon



Figure 5-4: Expected Flow of Tourists through Venice in the Afternoon

To prove that this tourist flow was occurring, the group calculated ranges and averages of tourists for all of the days at each stop. At *Piazzale Roma*, these numbers represent the tourists embarking in the morning and disembarking in the afternoon. The group observed that more tourists board the boats at this stop in the morning, most likely due to the arrival of cruise ships or other methods of entry to the City. In

contrast, more tourists disembark from the boats in the afternoon. This pattern is expected because of the departure of cruise ships, so tourists who need to return to the ships must begin to make their way back to *Piazzale Roma* in order to get to the ship port on time for their departure. Therefore, the graph shown below in Figure 5-5 only represents tourists embarking in the morning, and disembarking in the afternoon at *Piazzale Roma*.

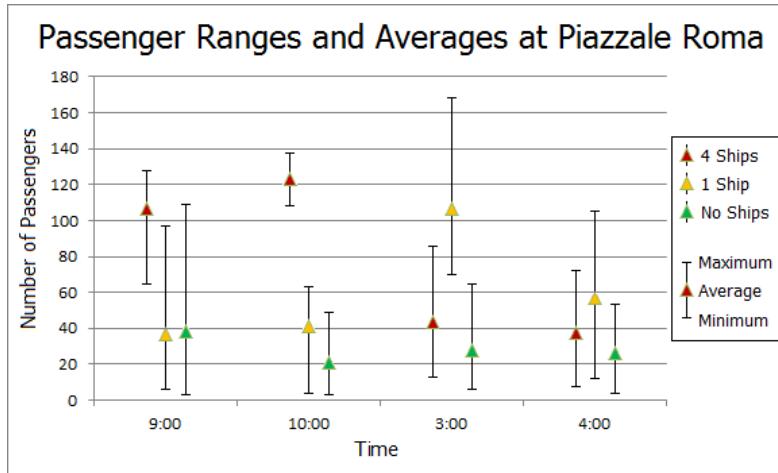


Figure 5-5: Tourist Passenger Ranges and Averages at *Piazzale Roma*

An opposing pattern occurred at the *Rialto* boat stop, with more tourists disembarking in the morning, and embarking in the afternoon. This trend is also based on the arrivals and departures of cruise ships. In the morning, tourists coming from cruise ships may utilize the public transportation system in order to reach other destinations, and in the afternoon, they must embark back on the ACTV boats to return to their ships. The following figure depicts the ranges and averages of tourists disembarking in the morning, and embarking in the afternoon at the *Rialto* boat stop.

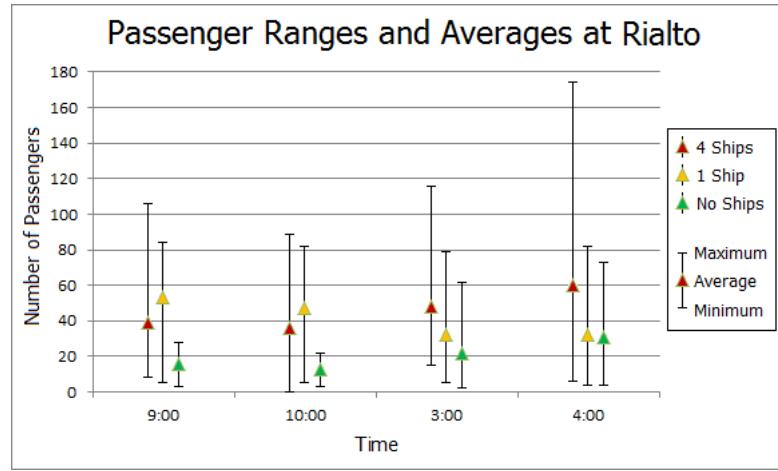


Figure 5-6: Tourist Passenger Ranges and Averages at *Rialto*

The *San Marco* boat stop saw the same pattern of tourist movement as the *Rialto* boat stop, and its graph of ranges and averages of tourist passengers on Line 2 is shown below in Figure 5-7.

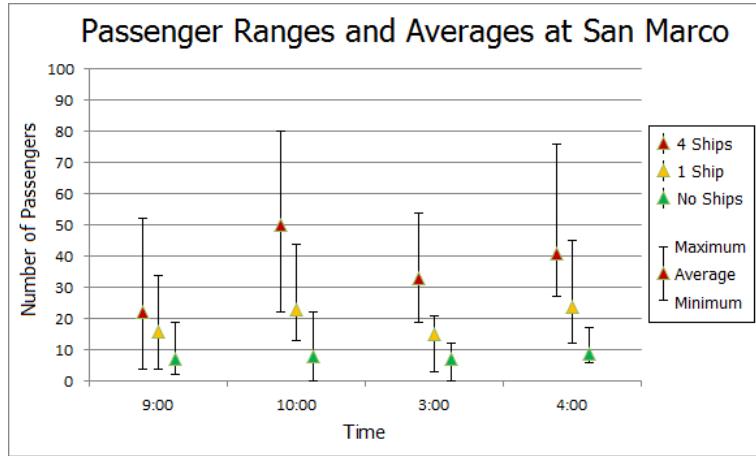


Figure 5-7: Tourists Passenger Ranges and Averages at San Marco

The general trend of these graphs is that the ranges and average number of tourists per boat per hour will increase on days when there are cruise ships visiting Venice. The combined ranges and averages are shown below in Figure 5-8.

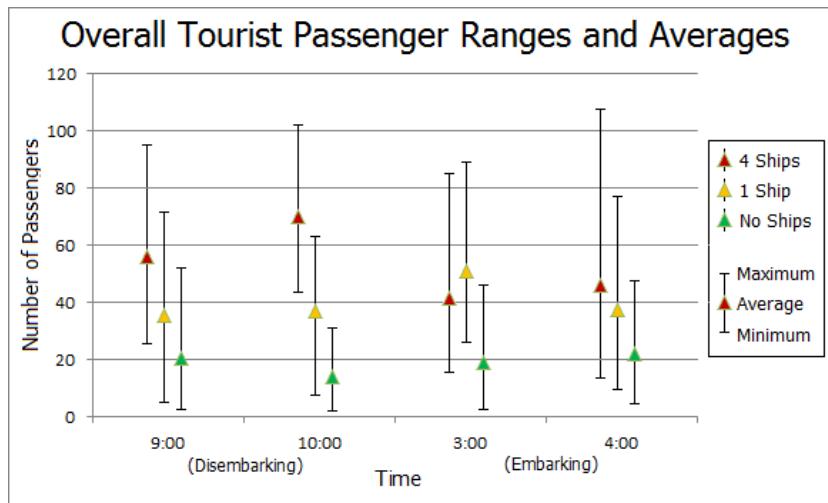


Figure 5-8: Overall Tourist Passenger Ranges and Averages

This graph shows that on days with 1 cruise ship in Venice, the total average number of tourists using Line 2 at *Piazzale Roma*, *Rialto*, and *San Marco* increases, along with the minimum and maximum number of tourists. When there are 4 cruise ships, the total average, minimum, and maximum number of tourists using Line 2 at these three stops increases even more, with the exception of the hour between 3 PM and 4 PM.

5.2 Impact of Tourism on *Traghetti*

Since the group distinguished between tourists and Venetians at each of the available *traghetti* crossings, it was easy to calculate the number of tourists using this method of transportation compared to the amount of Venetians generally using them. At almost all of the *traghetti* crossings, there were significantly more Venetians than tourists, simply because tourists are not as familiar with the *traghetti* and might mistake them for *gondole*. The only discrepancy for this trend was the *Giglio traghetto*, which

serviced more tourists than Venetians. However, on that day, a large tour group came through the square specifically to use the traditional *traghetti*, which is not a common occurrence. Since the total number of passengers using this *traghetti* crossing was fairly small, the tourist group had a notable effect on the comparison percentages.

The group also determined that out of the crossings for which data was collected, the most popular *traghetti* crossing is the *Santa Sofia* route. Its popularity is most likely due to its location near *Rialto Mercato*, or the Rialto Market. This area is very open, making the *traghetti* stand much more visible to those passing by, in relation to other *traghetti* stands like *Giglio*, which is much more hidden and difficult to find for those who are unfamiliar with it, or the *Riva del Carbon* crossing, which has a lower necessity due to its close proximity to the Rialto Bridge. Figure 5-9 below shows the different proportions of each pie, which represents the total number of people that used each stop, meaning that the largest pie represents the most popular boat stop.

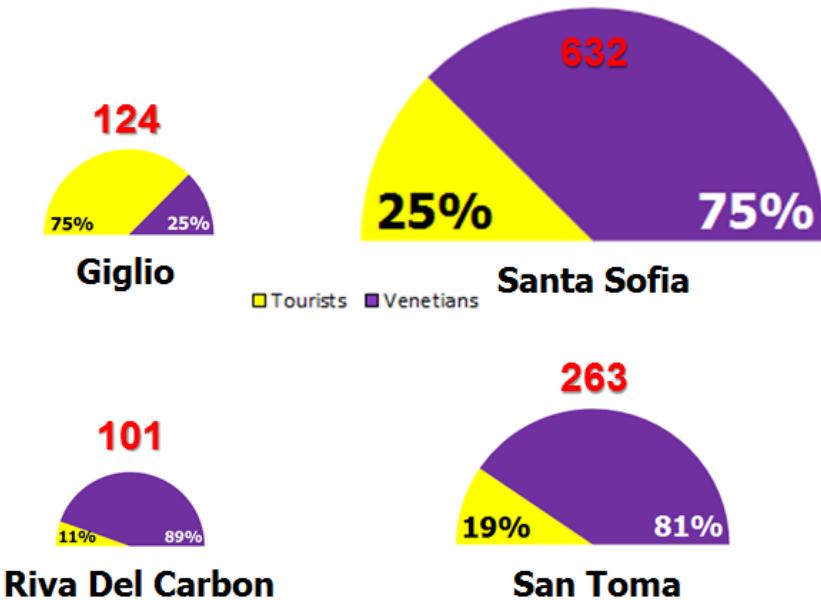


Figure 5-9: Proportional Pies for *Traghetti* Crossings

5.2.1 Decrease of *Traghetti* Ridership

A previous WPI group from last year also began to study the traditional *traghetti*, and the team was able to compare some of the data from the two years in order to determine a trend of *traghetti* use. Unfortunately, they did not collect data at all of the same crossings, and did not distinguish between Venetians and tourists. As a result, the totals from the previous counts were compared to the group's totals from this year at the same stops. This comparison is shown below in Figure 5-10.

Daily Total *Traghetti* Ridership

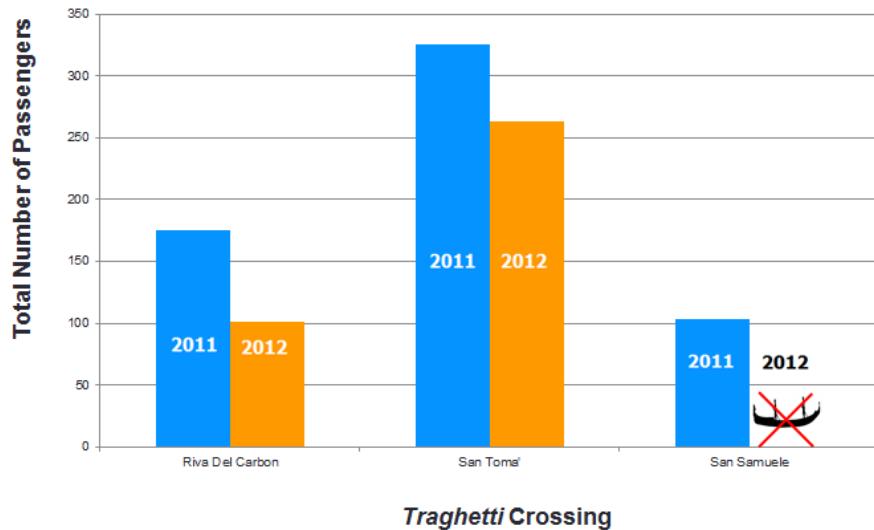


Figure 5-10: Comparing total passenger counts between 2011 and 2012

The total numbers of passengers represented in this graph are calculated between the hours of 9:00 AM and 12:30 PM, and all counts were taken on weekdays in early-to mid-November. The 2011 data for *Riva del Carbon* and *San Samuele* was collected over two days, and the 2011 data for *San Toma'* was collected over three days, so their total numbers of passengers are averages for two or three days.

Since all of the data was collected during the same time periods and represent totals for one day each, the overall trend appears that the use of *traghetti* is declining at all three stops. This decrease in use is thought to be linked to the recent increase in prices to use the *traghetti*. Last year, the price overall was 50 cents per crossing, however, this summer, the price changed to 50 cents for Venetians, and increased to €2 for tourists. This increase may have caused tourists to find other means of crossing the canal other than the use of the *traghetti*.

Another reason that the *traghetti* are losing their number of customers could also be due to their inconsistent hours of operation. Whenever there is a small problem at the stand, the *gondoliers* tend to close the stand for a few days in order to fix the problem. As a result, regular users of that *traghetti* crossing may think that the crossing is suspended indefinitely, and also choose other means of crossing the canal.

Closing of Traghetti Crossings

In the city of Venice, seven *traghetti* crossings span the Grand Canal. During the course of our project, the team only observed four of the seven crossings running, when all of the crossings should have been operational. The suspended crossings consisted of *San Marcuola*, *San Samuele*, and *Santa Lucia*. The group hypothesized that *Santa Lucia* was closed temporarily, due to construction taking place on the *Ferrovia* side of the Grand Canal where the crossing operates. Unfortunately, there was no obvious explanation for the *San Marcuola* and *San Samuele* crossings to be closed, other than the possible broken items at the *traghetti* stand.

6. Recommendations

While collecting data for this project, the group discovered and developed ideas for future projects that could be analyzed with the help of the WPI Venice Project Center. These suggestions could also be a beneficial addition to this project in the hopes of further understanding the impact of tourism on the public transportation system.

6.1 Adding to the ACTV Infrastructure

Over the course of the project, the group collected pictures of almost all of the ACTV and *Alilaguna* boat docks. However, due to time constraints, there are still some missing photos. The group would recommend that a future IQP group should continue taking pictures of the remaining boat stops. By completing this task, the Venipedia pages would be complete and would sufficiently inform the public further on their location.

Also, since the ACTV boat schedules are only valid for up to one year, the group would recommend that a future team update the Venipedia pages accordingly. By keeping the Venipedia pages up to date, they would be more useful to the public.

6.2 Expanding WPI Smartphone Application

The smartphone application that was further developed by the group is still in the testing stages of the prototype, and the team hopes that future groups will help to make it fully operational for the public to use to navigate around Venice. Since it currently contains all of the popular ACTV lines and all of the Alilaguna lines, it proves as a solid prototype that will be beneficial to its users.

The most important requirement needed for the advancement of this application is funding. With a sponsor and sufficient funds, this application can be further developed to include many more features that will be beneficial to its users. This app will cut down the confusion of navigating through the City dramatically, and will also serve as a tool to learn more about Venice using interactive technology. With the help of funding, newer versions of the app can be made feasible, which would encompass even more useful features than there are currently. This application also has the potential of creating revenue for the City, which could help maintain the application or even go into helping the City fund other public transportation projects in the future.

There are many plans for the next advances in the smartphone application, which include various features described by the design, such as turn-by-turn directions and alarms. In the final stage of the prototype, the team hopes that the application will be able to give a full set of directions to the user from their starting point to their final destination. In addition to directions, the group hopes that the various features from the application design will be included to help improve the application and aid in its success.

For the next version of the application, it would be convenient to link all of the ACTV feeds to the Venice Commerce website, which contains the information about high tides. This would be extremely useful during the flooding season in Venice, so the user would be aware of the flooding, and their routes, if affected by flooding, would automatically be altered due to the changed ACTV schedules. This information would eliminate much of the confusion that typically occurs on days when the City is experiencing high tides.

Also, further linking of the application to Venipedia would be useful for both sources. It would allow the app user to easily receive more information about Venice through the site, and as a result, it would make the Venipedia site more popular. Having both tools together will make traveling throughout Venice much more manageable, and will allow tourists to easily learn more about the City.

Another key component in the success of this application will be its promotion. Since both the *Alilaguna* and the ACTV lines are incorporated, both companies could promote this new application by advertising for it on their signs and websites. Users familiar with these companies would know about the application and be willing to tell others about its functionality, and more people would become more familiar with it. An easy way to promote the application would be to create a QR code for the application download site. A QR code is a small barcode that can be scanned using any smartphone, and once scanned, it can open a picture or any type of file that it was programmed for. For this code, the scan would bring the user to the application download page, so it is easy to access.



Figure 6-1: QR Codes with Alilaguna Smartphone Application

6.3 Furthering the Evaluation Public Transportation Counts

The group was successful in collecting data at popular boat stops, as well as *traghetti* lines, in order to further understand tourist effects in the city of Venice. For future projects that are involved with measuring tourism, more research must be done to encompass more aspects of the boat transportation system.

6.3.1 Expanding ACTV Counting

For this project, the boat stops that were examined were *Piazzale Roma*, *Rialto*, and *San Marco*. To further expand the analysis of the impact of tourism on the public transportation system, more boat stops should be investigated to see how tourists travel throughout the City, and to determine which boat stops should be further developed in order to handle the influx of people.

Similarly, the team only had enough resources to document the passengers using the ACTV Line 2, which is a major tourist line. More lines should be analyzed in order to fully understand the flow of tourists. Other popular lines such as Line 1 or the seasonal Line 3 are also heavily used by tourists who wish to travel around the City and to the nearby islands, so counting passengers using these lines as well would be beneficial in quantifying the tourist impact.



Figure 6-2: ACTV Line Logos

In addition to expanding the efforts to collect data at more boat stops as well as more boat lines, data should also be collected multiple times for each set of variables, in order to create a more reliable trend of data.

The team was able to gather information at all 3 boat stops for 3 days each. However, the amount of cruise ships for each one of those days was different, and thus it was impossible to create an average amount of tourists at each stop for each type of cruise ship day. Having that data would be useful in determining on a larger scale which stops and lines are being impacted the most. Also, having more data for each variable is beneficial in excluding outliers, as well as solidifying a conclusion based on the trends found in the results.

6.3.2 Monitoring Traghetti Use

The passenger data for *traghetti* that was collected for this project was a preliminary step for further investigation on their ridership, and how they are impacted by tourists. The baseline data will start a trend for future projects that wish to analyze the changes in the *traghetti* passengers over the years. By adding more variables into the data collection procedure, others will be able to determine which *traghetti* are more populated by tourists, and from there, create a solution to more easily accommodate them.

In addition to the ongoing ridership data that can be collected, the hours of operation for the *traghetti* should also be monitored due to the team's observations for a few of the crossings. Since the *traghetti* are a public service for the City, all of them must be fully operational during the day. Future projects can monitor the *traghetti* crossings and determine which ones run on a daily basis for consistent hours, and report that information to the Commune of Venice. Doing this would give the City updates on the different lines, and could further lead to a consistent schedule for all of the *traghetti* in order to ensure that this service is always running.

With and without cruise ships

The group collected data at each of the *traghetti* stops, all on days with no cruise ships, in order to have a set of consistent data that can be used later. To obtain more information about the *traghetti* and their use by tourists, counting at these stops on days when there are no cruise ships, as well as days with cruise ships would be useful with the large influx of tourism in the City. It would be expected that more tourists would use the *traghetti* simply because there would be more people total, but there could also be a correlation of increased ridership by Venetians on the *traghetti* as well, due to the overcrowding at the boat stops caused by cruise ship passengers.

6.3.3 Addition of Universal iMob Turnstiles

The public transportation network currently uses iMob, which is a boat pass scanner that is placed in front of the entrance ramps to each dock, and each rider is required to validate their boat pass before entering the dock. Each scan is registered and logged into a computer system which tracks the number of users, as well as the amount of trips that are still left on each card. If the ticket is validated, a green light will flash, and if it is not, a red light will flash.

Unfortunately, not every user validates their boat pass at the iMob scanners, and thus, people are bypassing the system and using the boat system illegally by not paying for a ticket. Entering the boat network without scanning the iMob pass also makes it impossible to track every passenger using the ACTV boats, so identifying which boats people are using is very difficult. Also, since there are not usually any ACTV employees checking boat passes, many passengers refuse to buy a pass, and use the transportation system free of charge.

To eliminate this problem, iMob turnstiles should be placed at every entrance and exit for each boat stop, in order to ensure that all of the riders are validating their ticket before using the transportation system, and that each rider is paying for a ticket. This type of turnstile would contain an iMob scanner, so when there is no boat pass present, the doors of the turnstile would stay closed, ensuring that no one could walk through to the boat dock without a pass. Once the pass was scanned, the doors would open, allowing the user to walk through. This current system is being utilized at the *San Marco - Giardinetti*, *Burano*, and *Lido* boat stops, but there are still areas where passengers may walk around the turnstiles without scanning their boat pass. Also, with exit turnstiles, the users will have to swipe their passes once they have disembarked the boat as well, which will be beneficial to the Venice Mobility Department. With this, the ACTV will be able to accurately determine which boat stops are the most popular by seeing how many people are disembarking at each stop, as well as the main entry boat stops for the City, which could further lead to their development.



Figure 6-3: iMob Turnstile at San Marco Giardinetti Boat Stop

This idea could potentially increase ticket sales at the ACTV dramatically, as well as help future projects more accurately count passengers entering the boat system. If the turnstiles had a counting system on each one, then future groups could get passenger counts more easily by frequently checking the counts, rather than manually counting people. Also, with partnership from the ACTV company, access to the computer data would allow future teams to determine which passenger was a tourist and which was a Venetian by the type of boat pass that they used, which could lead to a more automated way of collecting data.

6.3.4 Seasonal Differences

The data that was collected by the team was collected during the end of October and throughout November. Since the high tourist season usually goes from April through August, this data cannot thoroughly depict the higher numbers of tourists that are present during that time. Future researchers should attempt to collect similar data during the summer months in order to evaluate the higher tourism impact on the city of Venice.

Even though WPI students are only available in Venice for seven weeks during the early winter months, collecting data during this time will allow further analysis on the decline of tourism in the City, which can be measured over time.

6.4 Analyzing Tourist Impact with Additional Indicators

For this project, cruise ship passengers served as an indicator of tourism. In future studies, researchers or project teams can use passengers from other forms of entry to the City as tourist indicators. These other methods include passengers coming from the nearby airports, ferry boats, or the train station. After a recommendation from the Venice Mobility Department, the team collected data at the *Ferrovia* boat stop located in front of the *Santa Lucia* Train Station. After doing so, the team recommends that this idea be further studied in the future.

6.4.1 Analyzing Passenger Data from Santa Lucia Train Station

The team was able to gather some ridership information when a cruise ship was present at the *Ferrovia* boat stop, which is located directly in front of the *Santa Lucia* Train Station. Since many tourists also travel to the City of Venice via train, it would be beneficial to analyze the impact of train passengers in addition to cruise ship passengers. Future projects could count passengers embarking and disembarking at the *Ferrovia* boat stop to quantify the number of train passengers, as well as where they are traveling to inside the City. This group could also collaborate with another pedestrian mobility group, who would count pedestrians at the adjacent bridge to further identify the movement of traffic within that area.



Figure 6-4: *Santa Lucia* train terminal at *Ferrovia* boat stop

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8. Appendices

Appendix A: ACTV Background Information

A.1 Changes to Water Services during High Tide

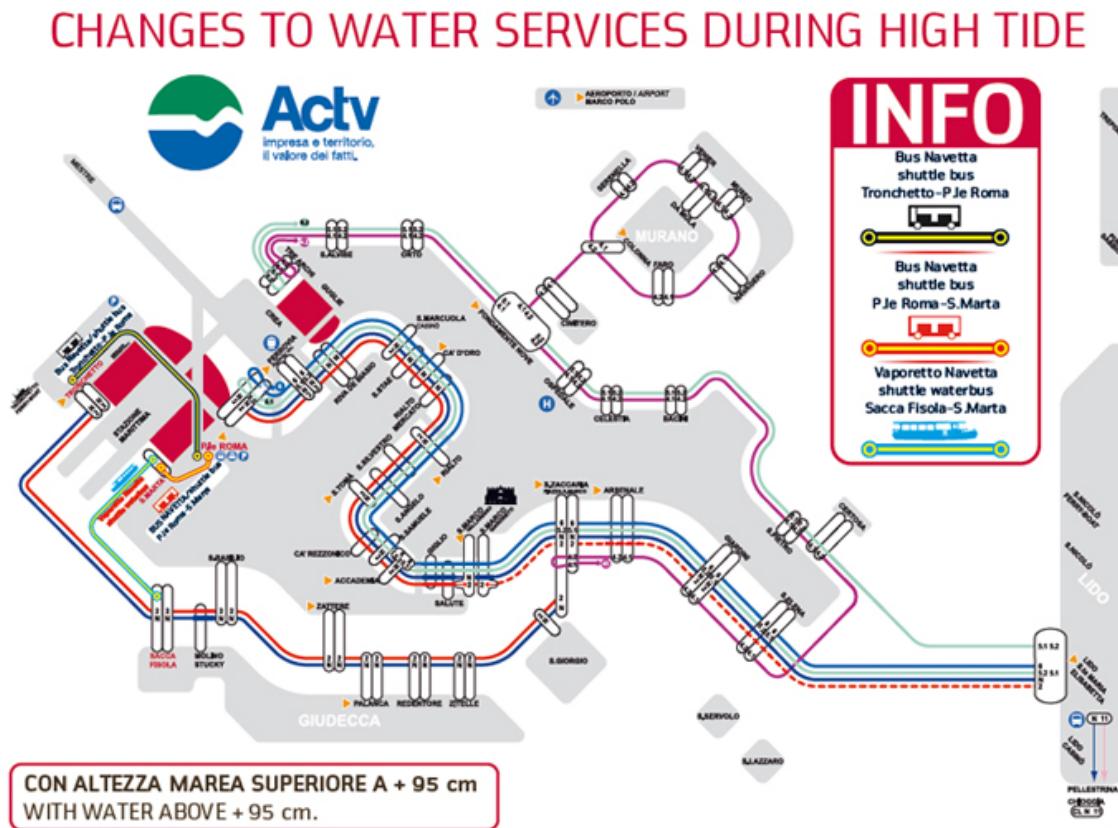


Figure 8-1: Changes to Water Services During High Tides

A.2 Line Changes in Special Conditions

ACTV Line Conditions	
High Tide	
Water Level	Line Status
Above 95 cm	<p>Lines 2, 4.1, 4.2, 5.1, 5.2, 6, N altered Line 3 suspended <i>Piazzale Roma-Tronchetto</i> and <i>Piazzale Roma-Santa Marta</i> bus lines added <i>Santa Marta-Sacca Fisola</i> water bus added</p>
Above 130 cm	<p>Lines 2, 5.1, 5.2, 6, N altered Lines 4.1 and 4.2 suspended in <i>Murano Museum-Murano Venier</i> section Line 3 suspended <i>Piazzale Roma-Tronchetto</i> and <i>Piazzale Roma-Santa Marta</i> bus lines added <i>Santa Marta-Sacca Fisola</i> water bus added</p>
Above 140 cm	Services or stops may be suspended
Foggy Conditions	
Visibility	Line Status
More than 150 meters	Normal services carry on
Between 70-150 meters	<p>Line 2 split into two routes Lines 3, 4.1, and 4.2 limited to partial routes Lines 5.1 and 5.2 altered Lines 6, 7, 8, 10, 18, and 21 suspended All other lines follow normal routes</p>
Less than 70 meters	<p>Line 2 split into two routes Lines 4.1, 4.2, 5.1, and 5.2 limited Line 13 altered Lines 6, 7, 8, 10, 18, and 21 suspended All other lines follow normal routes</p>
Less than 50 Meters	<p>Line 1 limited Lines 3, 6, 7, 8, 10, 18, and 21 suspended along with others previously listed Additional shuttle services provided</p>

A.3 Ticket Pricing

Ordinary Tickets		
Water Services Ticket	7,00 €	Good for travel on all services excluding Alilaguna, ACTV Lines 16, 19, 21, Casinò, and Vaporetto dell'Arte. Valid for 60 minutes after stamping. Does not include return trip. Includes transport of one luggage item (dimensions sum up to 150 cm).
On-board Waterbus Ticket	7,00 €	Same details as Water Services Ticket, but when boarding without a ticket, you must acquire one from the marinaio (attendant) at the platform before boarding.
Ferry, ordinary	4,00 €	Good for traveling Lido S.M.Elisabetta-S.Elena or Giardini; S.Marco S.Zaccaria-S.Servolo; S.Marco S.Zaccaria-Giorgio; Zattere-Palanca; Murano Colonna-Cimitero or Fondamente Nove.
Tourist Travel Cards		
12-hour	18,00 €	Good for unlimited travel on both water (excluding Alilaguna, ACTV Lines 16, 19, 21, Casinò, and Vaporetto dell'Arte) and land services on Lido and Mestre. Excludes routes to or from Venice Marco Polo Airport, unless extra charge is paid. Includes transport of one luggage item (dimensions sum up to 150 cm).
24-hour	20,00 €	
36-hour	25,00 €	
48-hour	30,00 €	
72-hour	35,00 €	
7-day	50,00 €	
3-day youth card	18,00 €	Same details as above Tourist Travel Cards. Can be bought between the ages of 14 and 29 by showing Rolling Venice Card (4,00 €).
To/From Venice Marco Polo Airport		
One Way	6,00 €	Good for travel to or from the airport by land on bus route 4 or 5 and aerobus route 15 or 45. Valid for 75 minutes.
Round Trip	11,00 €	Good for travel to or from the airport and return trip by land on bus route 4 or 5 and aerobus route 15 or 45. Valid for 75 minutes.
Aerobus + Nave	12,00 €	Good for travel on water services and bus route 5 to or from the airport. Valid for 90 minutes.
CartaVenezia Card Tickets		
-	-	Valid for 5 years. Holders can buy waterborne tickets at reduced prices.
Imob Card (valid as CartaVenezia)	10,00 € (+10 € within Veneto; +30 € outside Veneto)	Tickets can be bought for water and land routes, and for out-of-town travel cards. No additional charge to make valid as CartaVenezia for residents within the Venice city district.
Imob Card (not valid as CartaVenezia)	10,00 €	Excluding within Venice city district, in which Imob is valid as CartaVenezia. Tickets can be bought for land routes and out-of-town travel cards, but not for water routes.
10-Journey Discount Booklet	11,00 €	Reduced price for CartaVenezia holders. For use of water services excluding Alilaguna, ACTV Lines 16, 19, 21, and Casinò.

A.4 Boat Types

Boat name	Capacity	Operating Crew	Image
<i>Vaporetto</i>	220	Captain and sailor	
<i>Motoscafo</i>	160	Captain and sailor	
<i>Motonave</i>	1,000-1,200	Master, steersman, 1 st -class engineer, engine helper, two sailors	
<i>Nave Traghetto</i>	28-30 motor vehicles	Master, steersman, 1 st -class engineer, engine helper, two sailors	

Appendix B: Cruise Ship Calendar

Red represents High Cruise Ship Days, yellow represents Low Cruise Ship Days, and green represents No Cruise Ship Days. The blue are days on which we counted at traghetti crossings.

October						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
21 MSC Opera- d1700 MSC Musica- d1730 Costa Favolosa- d1800 Wind Surf- d1800	22 Seabourn Spirit- d1700 Costa Fascinosa- d1700	23 Celebrity Silhouette- d1700	24 Queen Elizabeth- d1700 Crystal Serenity- d1700	25 Norwegian Spirit- d0100	DAY 1 Albatros- d1800 Grandeur of The Seas- d1700 Celebrity Silhouette- d1700 Pacific Princess- a0600	26 Splendour of the Seas- 0645-1700 Pacific Princess- d2200 Seabourn Quest- 0700-2300 MSC Divina- 0930-1630
DAY 3 MSC Musica- 0900-1730 Costa Favolosa- a1000, d1800 Zenith- 0900-1700	28 Costa Fascinosa- a0900, d1700 Seven Seas Mariner- a0800	29 Seven Seas Mariner- d2100 Zenith- 0900-1700	30 Seabourn Spirit- a0800	31		27 7448
8582						
November						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 MSC Opera- a0900 Seabourn Spirit- d1700 Carnival Breeze- a1400	2 Carnival Breeze- d1900 Riviera- a0900	3 Splendour of the Seas- 0845-1700 MSC Divina- a0930, d1700 Azamara Journey- a0830 Riviera- d1600
4 MSC Musica- 0900-1730 Celebrity Reflection- a0645, d1700 Costa Favolosa- a1000, d1800 Azamara Journey- d2200	5 Costa Fascinosa- a0900, d1800	6 Santa Sofia & Giglio	7 Pacific Princess- a0600 Crown Princess- a1300	8 Crown Princess- d1300	9 Splendour of the Seas- 0645-1700 Artania- 1300-2300	10 8198
10517 3780	3780					
11 MSC Musica- 0900-1730 Costa Favolosa- a1000, d1800	12 Costa Fascinosa- a0900, d1800	13 Riva del Carbon & San Toma	14	15 Costa Favolosa- a0900	16 Splendour of the Seas- a0645, d1700 Costa Classica- a1500, d2200	17
3780	3780					
18 MSC Musica- a0900	19 Costa Fascinosa- a0900, d1800	20 Pacific Princess- a0400	21 Pacific Princess- d1700	22	23	24
3780	3780					
25	26	27	28	29	30	
December						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 Crown Princess- a1300
2 Crown Princess- d2300	3	4	5	6	7	8
9	10	11	12	13	14	15

Appendix C: Venipedia

C.1 List and Division of Venipedia pages

Marissa	Jess	Brian	Lindsay
BOAT STOPS			
RIVA DE BIASIO S. MARCUOLA S. STAE CÀ D'ORO RIALTO MERCATO FERROVIA S. SILVESTRO S. ANGELO S TOMÀ CA REZZONICO ACCADEMIA S. ELENA GIGLIO SALUTE LIDO LIDO- NICOLO LIDO CASINO GIUDECCA HILTON	RIALTO S. MARCO VALLERESSO S. MARCO GIARDINETTI S. MARCO- S. ZACCARIA- PIETA S. MARCO - S. ZACCARIA ARSENALE GIARDINI S. SAMUELE TRONCHETTO MERCATO TRONCHETTO ORTO MURANO MUSEO SACCA FISOLA S. BASILIO ZATTERE PALANCA REDENTORE ZITELLE S. GIORGIO S. PIETRO DI CASTELLO	CRUISE TERMINAL BURANO TORCELLO ALBERONI S. MARIA DEL MARE PELLESTRINA CAROMAN CHIOGGIA MAZZORBO TREPORTI PUNTA SABBIONI VIGNOLE S. ERASMO CAPANNONE S. ERASMO CHIESA S. ERASMO PUNTA VELA FUSINA S. SERVOLO S. LAZZARO PIAZZALE ROMA	BACINI CELESTIA OSPEDALE FONDAMENTE NOVE S. ALVISE TRE ARCHI GUGLIE S. MARTA SPIRITO SANTO MURANO FARO MURANO NAVAGERO MURANO DA MULA MURANO VENIER MURANO SERENELLA MURANO COLONNA CIMITERO CERTOSA CREA AIRPORT
ACTV LINES			
18 19 20 21 22 Notte Night Lagoon Notturno Murano	12 13 14 14L 15 16 17	1 2 3 4.1 4.2 5.1 5.2	6 7 8 9 10 11
ALILAGUNA LINES			
Rossa	Arancio	Giallo	Blu
TRAGHETTI LINES			
Calle Lanza (Giglio) San Marcuola	Santa Lucia	San Toma San Samuele	Riva del Carbon Santa Sofia
OVERVIEW PAGES			
Motoscafi	ACTV Company Alilaguna Company	Cruise Ships Vaporetto	ACTV Boat Lines Traghetti

C.2 Rialto Boat Stop page

VENIPEDIA

Page Discussion Read View source View history Go Search

Rialto Boat Stop

The Rialto boat stop is located along the middle part of the Grand Canal, right next to the iconic Rialto Bridge. There are two Helloworld ticket offices at this stop where passengers can purchase tickets to use the ACTV lines for boats and buses. The boat stop is made up of three different docks labeled A through C.

Contents [show]

Line 1

Line 1 is one of the most commonly used lines in the City that begins at Piazzale Roma, and terminates at Lido.

Boat Schedule Toward Lido (Dock A)

- Start Time: 5:20 AM
- Stop Time: 12:00 AM
- From 5:20 AM to 7:20 AM, every 20 minutes on the :00
- From 7:20 AM to 10:20 PM, every 10 minutes on the :00
- From 10:20 PM to 12:00 AM, every 20 minutes on the :00

Boat Schedule Toward Piazzale Roma (Dock A)

- Start Time: 4:55 AM
- Stop Time: 11:45 PM
- From 4:55 AM to 6:35 AM, every 20 minutes on the :05
- From 6:45 AM to 9:45 PM, every 10 minutes on the :05
- From 9:45 PM to 11:45 PM, every 20 minutes on the :05

Line 2

Line 2 is one of the tourist lines in the City that begins at San Marco Giardinetti, and terminates at San Zaccaria.

Boat Schedule Toward San Marco Giardinetti (Dock C)

- Start Time: 6:31 AM
- Stop Time: 11:51 PM
- Departs every 10 minutes on the :01

Boat Schedule Toward San Zaccaria (Dock B)

- Start Time: 6:32 AM
- Stop Time: 11:32 PM
- From 6:32 AM to 8:12 PM, every 10 minutes on the :02
- From 8:12 PM to 11:32 PM, every 20 minutes on the :02

Line N

Line N is one of the night lines in the City that begins at San Marco Zaccaria, and terminates at Lido.

Boat Schedule Toward Lido (Dock C)

- Start Time: 12:24 AM
- Stop Time: 5:04 AM
- Departs every 20 minutes, alternating on the :04 then :07

Boat Schedule Toward San Zaccaria (Dock B)

- Start Time: 11:55 PM
- Stop Time: 4:33 AM
- From 11:55 PM to 12:55 AM, departs every 20 minutes on the :05
- From 12:55 AM to 4:33 AM, departs every 20 minutes, alternating on the :03 then :05

Arancio

The Alilaguna Line Arancio begins at the Marco Polo International Airport, and terminates at San Marco.

Boat Schedule Towards San Marco (Dock C)

- Start Time: 8:57 AM
- Stop Time: 12:47 AM
- From 8:57 AM to 9:57 AM, every 60 minutes on the :07
- From 9:57 AM to 7:27 PM, every 30 minutes on the :07
- From 7:27 PM to 12:47 AM, every 60 minutes on the :07

Boat Schedule Toward Marco Polo Airport (Dock B)

- Start Time: 7:03 AM
- Stop Time: 10:33 PM
- From 7:03 AM to 8:33 AM, every 60 minutes on the :03
- From 8:33 AM to 5:33 PM, every 30 minutes on the :03
- From 5:33 AM to 10:33 AM, every 60 minutes on the :03

Rialto Boat Stop

Map Satellite

Google Map Data - Terms of Use

General Information

ACTV & Alilaguna Lines	1, 2, and N
Number of Docks	3

Docks

Dock A

Latitude 45.437024
Longitude 12.334769
ACTV & Alilaguna Lines 1

Dock B

Latitude 45.437376
Longitude 12.335415
ACTV & Alilaguna Lines 2, N, and Arancio

Dock C

Latitude 45.437544
Longitude 12.335584
ACTV & Alilaguna Lines 2, N, and Arancio

C.3 ACTV Line 12 page

VENIPEDIA

Page Discussion Read View source View history Go Search

Line 12

This is information for Line 12 of the [Actv](#) public boat transportation company.

Contents [show]

Line 12 Stops

There are 7 stops in Line 12:

1. Fondamente Nuove
2. Murano Faro
3. Mazzorbo
4. Torcello
5. Burano
6. Treporti
7. Punta Sabbioni

Line 12 Hours of Operation

Line 12 operates from 4:20 AM until 12:53 AM. Click [here](#) for an updated schedule.

All Actv Lines

The map displays the ACTV waterborne routes in Venice. The route for Line 12 is highlighted in blue. The map includes labels for various islands and areas such as Giudecca, Burano, Torcello, and Murano. A legend at the bottom left explains symbols for seasonal routes, ticket points, and stops. A red banner at the bottom right promotes HelloVenezia ticket points for events.

LINEE DI NAVIGAZIONE
WATERBORNE ROUTES

ACTV Network

Remember to read the timetables shown

— Seasonal route
— Ticket points — HelloVenezia
— The waterbus stops here
— The waterbus does not stop here

BUY YOUR TICKETS FOR EVENTS IN VENICE AT THE HELLOVENEZIA TICKET POINTS

Information / Information
www.hellovenezia.com // www.actv.it
call center (+39) 041 24.24

HELLOVENEZIA
ALTE LA VITA, CONDIVIDENDO

See Also

- [ACTV](#)
- [ACTV Boat Stops](#)
- [ACTV Boat Lines](#)

C.4 Alilaguna Line Arancio page

VENIPEDIA

Page Discussion Read View source View history Go Search

Arancio

This is information for Line Arancio of the [Alilaguna](#) public boat transportation company.

Contents [show]

Arancio Stops

There are 9 stops in Line Arancio:

1. Airport
2. Fondamente Nuove
3. Orto
4. Guglie
5. San Stae
6. Rialto
7. Sant'Angelo
8. Ca' Rezzonico
9. San Marco Giardinetti

Line Arancio Hours of Operation

Line Arancio operates from 6:53 AM to 1:04 AM. Click [here](#) for an updated schedule.

All Actv Lines

See Also

- [Alilaguna](#)
- [ACTV](#)
- [ACTV Boat Stops](#)
- [ACTV Boat Lines](#)

External Links

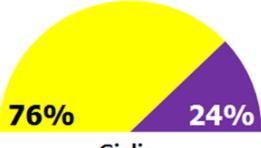
C.5 Traghetto Calle Lanza (Traghetto Giglio) page

VENIPEDIA

Page Discussion Read View source View history Go Search

Traghetto Calle Lanza

Traghetto Calle Lanza is also known as Traghetto Santa Maria del Giglio, and is located near the [Giglio Boat Stop](#).



Giglio
Tourists Venetians

Giglio	Embarking	Disembarking
	T V	T V
9:27:00	0 4	0 0
9:38:00	2 1	0 1
9:45:00	0 0	0 1
9:50:00	13 0	0 0
9:56:00	13 0	0 0
10:08:00	8 0	0 0
10:15:00	4 1	5 0
10:40:00	0 0	0 1
10:48:00	2 0	0 0
10:57:00	9 3	0 0
11:01:00	2 2	0 0
11:08:00	0 0	0 1
11:21:00	2 2	0 0
11:28:00	7 2	8 0
11:37:00	8 1	0 1
11:43:00	0 0	0 2
11:51:00	2 1	0 0
11:55:00	0 0	0 1
11:58:00	4 0	0 0
12:04:00	0 1	0 0
12:19:00	0 3	2 0
12:27:00	0 2	2 0

• Data collected on Wednesday, November 7, 2012, from 9AM-12:30PM (no cruise ships).

See Also

- [Traghetti](#)

Traghetto Calle Lanza



Direction: Campo del Traghetto - Calle Lanza
Operation Hours: daily 9:00 - 18:00

C.6 ACTV Company page

VENIPEDIA

Page Discussion Read Edit View history Go Search

ACTV

The Azienda del Consorzio Trasporti Veneziano (A.C.T.V.) is a joint-stock public transportation company in Venice, Italy. This company focuses on providing efficient boat transportation throughout the City. Their transport services include the management, monitoring, and planning of all local public transport needs for both road and water crafts. Additional services complement these activities, such as managing new mass rapid transport systems, administrating complementary transport systems, managing parking and waiting areas, refreshment points in passenger stations, and the construction and maintenance of company-owned or leased vehicles. The ACTV is committed not only to managing local public transport services, but also to innovating and diversifying them in order to respond to future mobility needs in the Venice area.

Contents [show]

History [edit]

The first public transportation system in Venice with mechanically-propelled ships began in 1881, followed by the debut of "Regina Margherita," the first waterbus, on Venice's Grand Canal. In 1965, after the setting up of the "Consorzio Trasporti Veneziano" (Venice Transport Consortium), with the subsequent publicising of the company "Società SVET", the Azienda del Consorzio Trasporti Veneziano – the Venice Public Transport Company—was founded on the first of October in 1978. It was formed as a combination of Azienda Comunale di Navigazione Interna Lagunare (ACNIL), Società SVET, Società Veneta Lagunare (SVL), and other smaller water transportation companies later on. As of 2010, the ACTV owns about 600 land buses and 160 water vessels, which combined carry approximately 194 million passengers. The companies [ACNIL](#), [SVET](#), [SVA](#), [S.V.L.](#) and smaller companies converged into what has evolved into the modern day functions of the A.C.T.V.^[1]

ACTV Operations [edit]

The ACTV group, a parent company, provides local public transport services in and around Venice, while subsidiary and associated companies provide secondary services, which complement those of ACTV.

Vela S.p.A. [edit]

Vela is a spin-off of ACTV established in 1998. Its core business is to commercialize and promote the public transport services of ACTV in and around Venice. They organize and administer the sale of travel tickets and manage relations with the widespread sales network (direct and indirect). The company's role in the introduction of a new automatic ticketing system proved to be a significant improvement to transportation in Venice.^[2]

Ailaguna [edit]

Ailaguna provides passenger transport services in the Venice lagoon area, and also runs the contracted scheduled services between Marco Polo airport and the Venice city Centre.

Consorzio Venice Maritime School [edit]

This institution was founded in 2004 as a Venice-based training institute to teach the technical skills of navigation and safety. In 2008, the Consortium provided training for ACTV, for captains and helmsmen in particular. For training of merchant marine officers, the Consortium has one of the most advanced naval simulators in Europe. The passengers of boats passing through the Venetian lagoon are in well-trained hands.

Water Transport: Different Lines [edit]

For boat transportation throughout Venice ACTV provides approximately 30 routes in the Venice navigation network.

Lines 1 & 2 [edit]

Line 1 and Line 2 cross the city connecting [Tronchetto](#), [Piazzale Roma](#), the railway station and [Lido](#) using the two largest canals – the world famous [Grand Canal](#) and the [Giudecca Canal](#), which is wide enough and deep enough to allow passenger ships entry to Venice.

Lines 4, 1, 4, 2, 5, 1, 5, 2, & 6 [edit]

Line 4, Line 1, Line 4, Line 2, Line 5, Line 1, Line 5, Line 2, and Line 6 are all lines that connect the city of Venice to the [Giudecca](#), [Lido](#) and [Murano](#) islands. They also stop in the central city, [Piazza San Marco](#) (St Mark's Square) and at Venice's hospital.

Lines 3, 4, 5, & 20 [edit]

Line 3, Line 4 and Line 5 are all seasonal lines in that they are mostly for tourists during high season, spring and summer or special occasions such as [Carnival](#). They act as "helper" lines to Lines 1 and 2 to cope with the large number of visitors to the City during these periods and follow the [Grand Canal](#), [Giudecca Canal](#) routes. Line 5 connects Murano island with Piazza San Marco (St Mark's Square) on an external route. Line 20 connects Lido Casino with [San Lazzaro](#).

Lines N, T, 11, 12, 17, 18, & 20 [edit]

Lines N, T, 11, 13, 17, 18 and 20 connect the main islands in the northern part of the lagoon ([Mazzorbo](#), [Burano](#), [Torcello](#), [Sant'Erasmo](#)) and the southern islands. They also connect Venice to the mainland ports of [Punta Sabbioni](#), [Treporti](#) and [Chioggia](#). The car ferry (Line 17) connects [Lido](#) with the mainland at [Tronchetto](#) and Line 11 connects [Lido](#) with a neighboring island, [Pellestrina](#).

Line Note [edit]

Line N runs a connection to the entire city on a late-night basis. They are identified by the 'N' and are in service from midnight until 5am. Arrival times are designed to connect with mainland bus departures to Mestre and on [Lido](#) island.

See Also [edit]

- [ACTV Boat Lines](#)
- [ACTV Boat Stops](#)
- [ACTV Passenger Traffic](#)
- [Traffic](#)

External Links [edit]

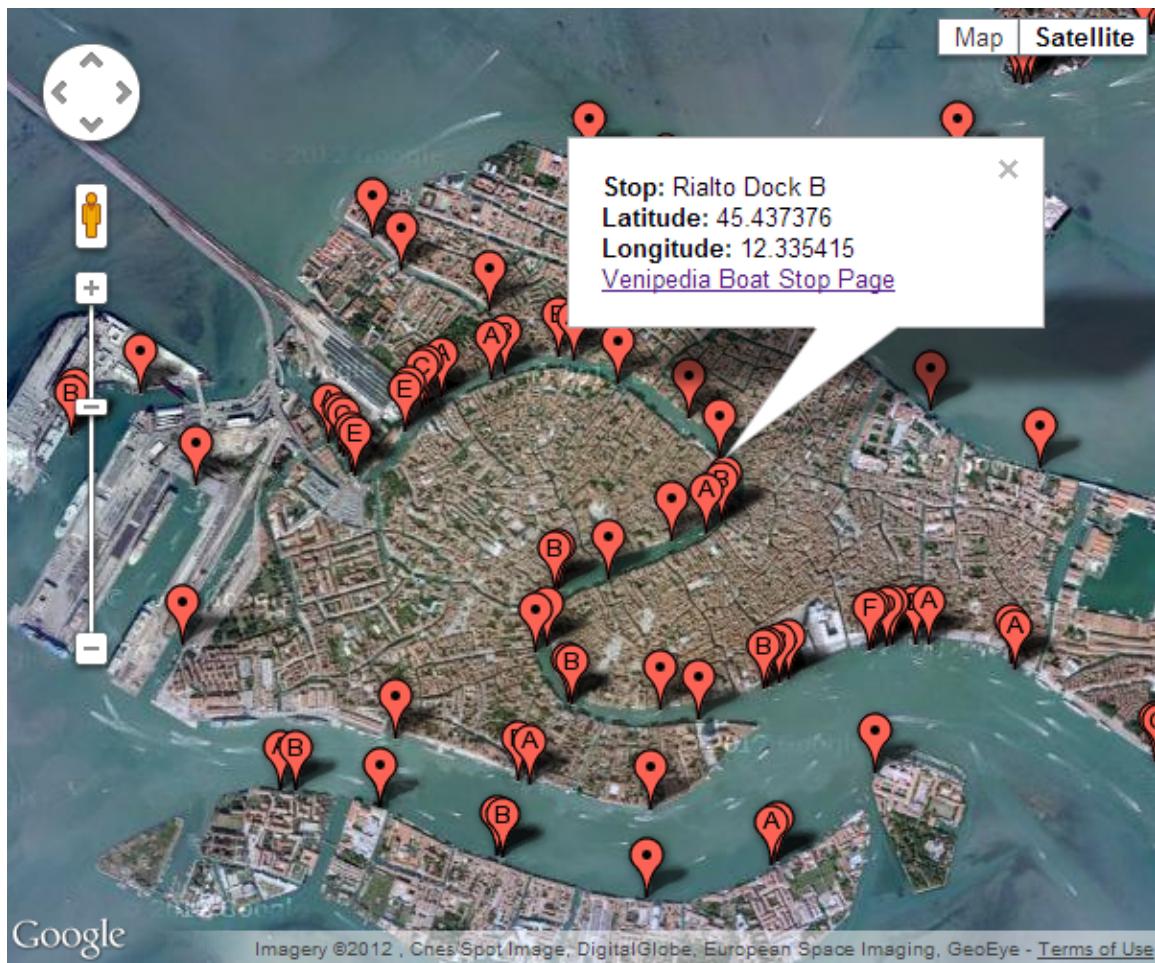
1. ↑ [ACTV History Page](#)
2. ↑ [ACTV Home Page](#)

ACTV

 **ACTV**
imprese a servizio, il valore dei fatti.

Public Transportation	
Location	Coordinates: 45.43885, 12.304752
Address	Isola Nuova del Tronchetto, 32 Piazzale Tronchetto, 30125 Venezia
Telephone Number	+39 041-272-2111
Fax	+39 041-520-7135
Founded	Founded: 1978
Staff	
Chairman/CEO	Marcello Panettori
Managing Director	Maurizio Castagna

C.7 Interactive Map of ACTV Boat Stops



Appendix D: ACTV Ridership Data

D.1 Piazzale Roma High Cruise Ship Day (10/27/12)

For this day, flooding occurred in the morning, which suspended half of the line for the morning. In the afternoon, the ACTV officials asked us to leave due to lack of authorization.

Line 2 Giardinetti	Embarking		Disembarking		Line 2 Zaccaria	Embarking		Disembarking	
Time	T	V	T	V	Time	T	V	T	V
9:00 AM					9:00 AM				
9:10 AM					9:10 AM				
9:20 AM	65	15			9:20 AM			44	4
9:30 AM	125	40			9:30 AM			34	7
9:40 AM	109	32			9:40 AM			89	7
9:50 AM	128	23			9:50 AM			79	8
10:00 AM	117	29			10:00 AM			40	2
10:10 AM	125	40			10:10 AM			55	4
10:20 AM	138	23			10:20 AM			38	0
10:30 AM	109	28			10:30 AM			104	4
10:40 AM	123	17			10:40 AM			66	7
10:50 AM	134	16			10:50 AM			94	7
3:00 PM	23	7	13	4	3:00 PM	29	5	61	4
3:10 PM	59	20	25	4	3:10 PM	13	0	67	4
3:20 PM	18	9	20	5	3:20 PM	59	6	79	13
3:30 PM	56	17	33	4	3:30 PM	27	3	62	11
3:40 PM	27	13	21	6	3:40 PM	15	3	38	8
3:50 PM	61	19	19	6	3:50 PM	24	5	86	10
4:00 PM	29	4	8	2	4:00 PM	12	3	50	5
4:10 PM			21	3	4:10 PM			73	7
4:20 PM					4:20 PM				
4:30 PM					4:30 PM				
4:40 PM					4:40 PM				
4:50 PM					4:50 PM				

D.2 Piazzale Roma Low Cruise Ship Day (11/05/12)

Flooding occurred on this day as well, causing the change in Line 2.

Line 2 Giardinetti		Embarking		Disembarking				Line 2 Zaccaria		Embarking		Disembarking	
Time		T	V	T	V			Time		T	V	T	V
9:00 AM	82	50	13	6				9:00 AM	12	3	10	24	
9:10 AM	97	78	7	9				9:10 AM	13	4	10	22	
9:20 AM	32	45	0	10				9:20 AM	13	7	13	24	
9:30 AM	63	66	7	18				9:30 AM	6	5	7	13	
9:40 AM	53	61	4	11				9:40 AM	20	7	16	33	
9:50 AM	38	80	6	9				9:50 AM	9	4	7	16	
10:00 AM	37	33	8	8				10:00 AM	19	2	15	23	
10:10 AM	44	65	14	5				10:10 AM	4	1	20	28	
10:20 AM	39	75						10:20 AM			15	25	
10:30 AM	62	41						10:30 AM			12	30	
10:40 AM	63	32						10:40 AM			14	21	
10:50 AM	56	21						10:50 AM			9	32	
3:00 PM	57	30						3:00 PM			107	19	
3:10 PM	43	42						3:10 PM			70	16	
3:20 PM	45	44						3:20 PM			168	15	
3:30 PM	47	34						3:30 PM			81	12	
3:40 PM	42	27						3:40 PM			122	15	
3:50 PM	35	24						3:50 PM			91	12	
4:00 PM	35	30	20	6				4:00 PM	16	4	105	12	
4:10 PM	28	18	24	8				4:10 PM	7	2	95	7	
4:20 PM	44	26	12	5				4:20 PM	16	3	98	9	
4:30 PM	11	17	21	10				4:30 PM	4	1	72	5	
4:40 PM	23	32	22	10				4:40 PM	12	6	105	11	
4:50 PM	7	19	20	7				4:50 PM	5	3	93	9	

D.3 Piazzale Roma No Cruise Ship Day (11/06/12)

Line 2 Giardinetti	Embarking		Disembarking		Line 2 Zaccaria	Embarking		Disembarking	
Time	T	V	T	V	Time	T	V	T	V
9:00 AM	109	78	7	4	9:00 AM	8	8	22	17
9:10 AM	108	68	14	4	9:10 AM	3	10	20	26
9:20 AM	24	13	9	5	9:20 AM	5	10	23	20
9:30 AM	82	53	10	10	9:30 AM	11	27	30	18
9:40 AM	78	105	10	8	9:40 AM	11	13	50	42
9:50 AM	17	39	6	7	9:50 AM	4	8	14	17
10:00 AM	36	71	10	8	10:00 AM	4	9	12	12
10:10 AM	30	42	6	9	10:10 AM	7	9	20	13
10:20 AM	49	94	7	7	10:20 AM	10	21	23	23
10:30 AM	39	84	17	9	10:30 AM	3	4	18	14
10:40 AM	18	31	2	5	10:40 AM	5	10	32	24
10:50 AM	40	61	3	4	10:50 AM	6	8	27	21
3:00 PM	31	28	9	24	3:00 PM	8	8	43	34
3:10 PM	28	40	7	14	3:10 PM	7	4	50	28
3:20 PM	36	30	10	8	3:20 PM	6	12	60	37
3:30 PM	17	27	7	16	3:30 PM	2	5	43	30
3:40 PM	14	33	7	11	3:40 PM	10	20	65	40
3:50 PM	19	32	6	12	3:50 PM	2	6	27	22
4:00 PM	19	18	7	15	4:00 PM	6	17	46	40
4:10 PM	29	46	9	23	4:10 PM	2	9	34	29
4:20 PM	23	38	8	12	4:20 PM	10	10	53	33
4:30 PM	43	47	7	10	4:30 PM	5	10	36	33
4:40 PM	22	29	8	21	4:40 PM	1	6	53	32
4:50 PM	11	42	4	11	4:50 PM	2	7	43	38

D.4 Rialto High Cruise Ship Day (11/03/12)

Due to the high amount of passengers at the boat stops, additional boats were sent to *Rialto* when needed.

Line 2 Giardinetti	Embarking		Disembarking		Line 2 Zaccaria	Embarking		Disembarking	
	T	V	T	V		T	V	T	V
Time					Time				
9:00 AM	7	2	73	36	9:00 AM	43	15	10	4
9:10 AM	3	1	63	54	9:10 AM	33	8	9	2
9:20 AM	14	8	66	30	9:20 AM	63	8	12	6
9:30 AM	8	3	97	47	9:30 AM	50	17	8	3
9:40 AM	46	3	28	24	9:40 AM	42	7	18	6
9:45 AM	-	-	-	-	9:45 AM	36	4	-	-
9:50 AM	19	7	106	33	9:50 AM	32	4	15	7
10:00 AM	24	8	89	26	10:00 AM	46	7	5	3
10:05 AM	-	-	-	-	10:05 AM	25	3	-	-
10:10 AM	7	11	14	11	10:10 AM	57	13	13	6
10:20 AM	74	12	78	22	10:20 AM	37	11	0	0
10:25 AM	-	-	-	-	10:25 AM	23	1	-	-
10:30 AM	4	0	63	16	10:30 AM	45	10	22	7
10:40 AM	18	6	52	12	10:40 AM	57	13	18	7
10:50 AM	28	3	58	16	10:50 AM	41	11	14	3
3:00 PM	23	5	43	12	3:00 PM	34	11	19	0
3:10 PM	15	3	63	7	3:10 PM	73	14	20	2
3:20 PM	22	10	24	6	3:20 PM	26	14	5	1
3:30 PM	29	6	33	15	3:30 PM	67	24	8	2
3:40 PM	19	3	18	5	3:40 PM	108	12	34	2
3:50 PM	39	19	53	21	3:50 PM	116	23	13	3
4:00 PM	30	2	17	13	4:00 PM	139	36	5	1
4:10 PM	20	20	34	15	4:10 PM	76	25	44	7
4:20 PM	20	11	11	4	4:20 PM	174	34	17	3
4:30 PM	12	10	47	25	4:30 PM	107	28	40	4
4:40 PM	18	7	24	4	4:40 PM	51	10	7	4
4:50 PM	6	5	31	8	4:50 PM	67	12	25	4

D.5 Rialto Low Cruise Ship Day (11/12/12)

Line 2 Giardinetti		Embarking		Disembarking			Line 2 Zaccaria		Embarking		Disembarking	
Time	T	V	T	V		Time	T	V	T	V		
9:00 AM	2	3	38	36		9:00 AM	13	34	-	-		
9:10 AM	0	1	81	71		9:10 AM	25	27	-	-		
9:20 AM	1	2	74	58		9:20 AM	19	18	-	-		
9:30 AM	6	6	74	65		9:30 AM	24	29	5	14		
9:40 AM	0	3	56	46		9:40 AM	17	24	-	-		
9:50 AM	3	0	84	91		9:50 AM	9	14	13	5		
10:00 AM	14	9	57	56		10:00 AM	22	21	-	-		
10:10 AM	13	6	82	50		10:10 AM	6	58	5	12		
10:20 AM	18	9	54	33		10:20 AM	16	26	-	-		
10:30 AM	8	1	72	43		10:30 AM	45	55	7	10		
10:40 AM	5	8	58	37		10:40 AM	11	22	-	-		
10:50 AM	4	0	76	33		10:50 AM	38	35	11	16		
3:00 PM	19	8	9	24		3:00 PM	57	54	0	0		
3:10 PM	5	3	48	31		3:10 PM	79	82	5	14		
3:20 PM	13	16	41	25		3:20 PM	31	54	0	0		
3:30 PM	8	4	37	29		3:30 PM	72	98	5	13		
3:40 PM	10	6	32	26		3:40 PM	39	46	0	0		
3:50 PM	8	4	31	19		3:50 PM	48	71	3	3		
4:00 PM	13	6	29	27		4:00 PM	33	61	0	0		
4:10 PM	8	4	32	23		4:10 PM	82	96	8	11		
4:20 PM	14	5	18	18		4:20 PM	35	39	0	0		
4:30 PM	6	2	26	31		4:30 PM	75	85	4	7		
4:40 PM	22	8	43	44		4:40 PM	28	73	0	0		
4:50 PM	4	3	1	10		4:50 PM	66	92	4	8		

D.6 Rialto No Cruise Ship Day (11/13/12)

Line 2 Giardinetti		Embarking		Disembarking		Line 2 Zaccaria		Embarking		Disembarking		
Time		T	V	T	V	Time		T	V	T	V	
9:00 AM		7	14	18	91			9:00 AM	15	25	0	0
9:10 AM		2	3	20	113			9:10 AM	15	34	0	0
9:20 AM		7	7	17	139			9:20 AM	23	23	0	0
9:30 AM		3	3	21	139			9:30 AM	9	31	5	12
9:40 AM		4	7	19	145			9:40 AM	12	24	0	0
9:50 AM		2	4	28	134			9:50 AM	12	27	3	11
10:00 AM		5	6	21	105			10:00 AM	10	26	0	0
10:10 AM		1	4	22	109			10:10 AM	28	52	3	12
10:20 AM		5	3	22	94			10:20 AM	8	33	0	0
10:30 AM		3	2	16	73			10:30 AM	21	56	5	10
10:40 AM		17	11	12	92			10:40 AM	10	29	0	0
10:50 AM		2	3	13	48			10:50 AM	20	35	4	8
3:00 PM		11	3	24	82			3:00 PM	27	44	0	0
3:10 PM		2	0	12	42			3:10 PM	44	69	6	13
3:20 PM		10	5	13	48			3:20 PM	23	70	0	0
3:30 PM		4	3	10	44			3:30 PM	62	68	2	3
3:40 PM		8	1	13	55			3:40 PM	26	45	0	0
3:50 PM		11	3	17	55			3:50 PM	36	59	4	8
4:00 PM		12	3	12	48			4:00 PM	15	45	0	0
4:10 PM		4	1	16	46			4:10 PM	62	84	5	10
4:20 PM		21	5	18	33			4:20 PM	29	49	0	0
4:30 PM		7	3	13	51			4:30 PM	73	81	0	10
4:40 PM		19	8	10	60			4:40 PM	51	54	0	0
4:50 PM		7	2	14	52			4:50 PM	71	76	9	19

D.7 San Marco High Cruise Ship Day (11/04/12)

Line 2 Giardinetti	Embarking		Disembarking			Line 2 Zaccaria	Embarking		Disembarking	
Time	T	V	T	V		Time	T	V	T	V
9:00 AM	23	3	19	4		9:00 AM	21	9	4	6
9:10 AM	33	4	20	7		9:10 AM	4	4	5	10
9:20 AM	25	2	18	3		9:20 AM	2	3	4	15
9:30 AM	31	1	38	7		9:30 AM	27	8	8	13
9:40 AM	11	2	46	8		9:40 AM	59	23	7	14
9:50 AM	16	1	52	5		9:50 AM	31	9	40	2
10:00 AM	16	2	80	7		10:00 AM	48	6	22	17
10:10 AM	15	2	51	5		10:10 AM	39	12	27	11
10:20 AM	17	1	59	6		10:20 AM	34	8	69	12
10:30 AM	24	0	78	5		10:30 AM	44	9	35	12
10:40 AM	23	5	63	3		10:40 AM	44	14	30	11
10:50 AM	23	4	38	6		10:50 AM	42	14	49	12
3:00 PM	21	5	50	8		3:00 PM	54	27	33	15
3:10 PM	19	4	26	7		3:10 PM	44	10	32	6
3:20 PM	24	9	36	9		3:20 PM	33	8	28	6
3:30 PM	31	4	32	6		3:30 PM	24	5	21	8
3:40 PM	43	3	9	3		3:40 PM	30	8	34	3
3:50 PM	31	5	27	7		3:50 PM	36	7	22	7
4:00 PM	49	6	40	10		4:00 PM	32	9	31	11
4:10 PM	46	5	17	8		4:10 PM	38	12	18	4
4:20 PM	76	13	31	2		4:20 PM	38	9	26	6
4:30 PM	34	2	24	7		4:30 PM	44	9	37	5
4:40 PM	30	5	28	7		4:40 PM	33	6	40	7
4:50 PM	40	11	51	8		4:50 PM	27	6	50	11

D.8 San Marco Low Cruise Ship Day (11/19/12)

Due to the closing of *San Marco Vallaresso*, Line 2 at *Giardinetti* only came at 20-minute intervals.

Line 2 Giardinetti		Embarking		Disembarking				Line 2 Zaccaria		Embarking		Disembarking	
Time		T	V	T	V			Time	T	V	T	V	
9:00 AM	-	-	-	-	-			9:00 AM	8	15	13	29	
9:10 AM	13	4	16	7				9:10 AM	10	13	18	33	
9:20 AM	-	-	-	-				9:20 AM	9	13	4	15	
9:30 AM	4	3	15	5				9:30 AM	22	16	11	32	
9:40 AM	-	-	-	-				9:40 AM	6	55	10	20	
9:50 AM	13	4	22	6				9:50 AM	8	12	34	26	
10:00 AM	-	-	-	-				10:00 AM	11	14	15	17	
10:10 AM	10	3	27	8				10:10 AM	7	10	14	21	
10:20 AM	-	-	-	-				10:20 AM	20	35	13	7	
10:30 AM	15	4	30	10				10:30 AM	13	14	33	25	
10:40 AM	-	-	-	-				10:40 AM	12	17	44	16	
10:50 AM	7	3	17	9				10:50 AM	9	15	13	16	
3:00 PM	-	-	-	-				3:00 PM	21	18	15	13	
3:10 PM	3	1	15	6				3:10 PM	17	15	15	25	
3:20 PM	-	-	-	-				3:20 PM	15	13	21	17	
3:30 PM	12	4	14	3				3:30 PM	21	11	18	17	
3:40 PM	-	-	-	-				3:40 PM	13	8	16	15	
3:50 PM	10	7	19	6				3:50 PM	19	10	19	26	
4:00 PM	-	-	-	-				4:00 PM	29	13	14	18	
4:10 PM	23	13	12	8				4:10 PM	27	41	33	14	
4:20 PM	-	-	-	-				4:20 PM	22	16	20	14	
4:30 PM	45	7	19	8				4:30 PM	12	15	37	19	
4:40 PM	-	-	-	-				4:40 PM	21	16	22	24	
4:50 PM	23	13	31	10				4:50 PM	15	8	13	23	

D.9 San Marco No Cruise Ship Day (11/27/12)

Due to the closing of *San Marco Vallareso*, Line 2 at *Giardinetti* only came at 20-minute intervals.

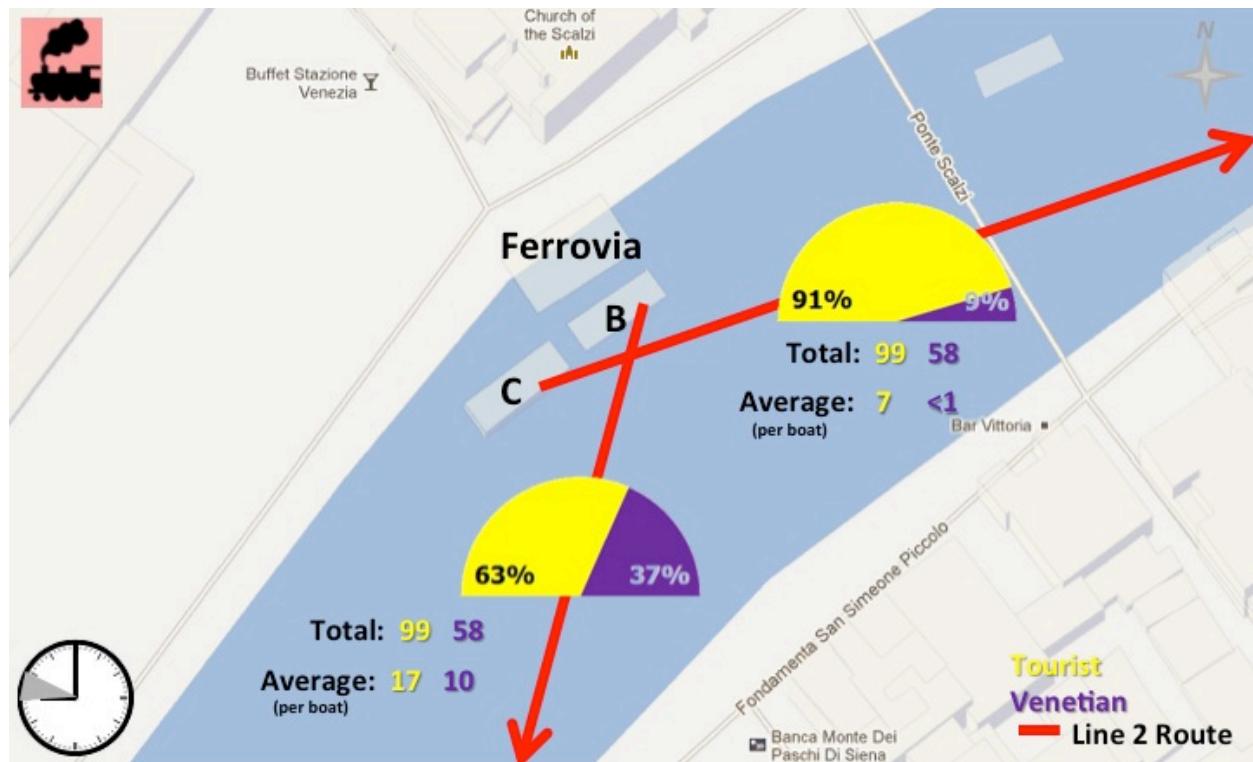
Line 2 Giardinetti		Embarking		Disembarking		Line 2 Zaccaria		Embarking		Disembarking	
Time	T	V	T	V	Time	T	V	T	V	T	V
9:00 AM	-	-	-	-	9:00 AM	6	12	2	19		
9:10 AM	2	0	6	7	9:10 AM	10	13	2	31		
9:20 AM	-	-	-	-	9:20 AM	5	12	5	21		
9:30 AM	3	1	10	3	9:30 AM	10	14	4	21		
9:40 AM	-	-	-	-	9:40 AM	10	15	3	16		
9:50 AM	1	5	15	7	9:50 AM	4	6	19	27		
10:00 AM	-	-	-	-	10:00 AM	11	15	2	9		
10:10 AM	3	5	5	10	10:10 AM	4	15	9	30		
10:20 AM	-	-	-	-	10:20 AM	11	19	3	16		
10:30 AM	13	6	22	13	10:30 AM	14	28	12	27		
10:40 AM	-	-	-	-	10:40 AM	7	14	0	6		
10:50 AM	5	3	11	7	10:50 AM	12	19	7	14		
3:00 PM	-	-	-	-	3:00 PM	7	7	12	18		
3:10 PM	0	0	11	5	3:10 PM	6	6	6	13		
3:20 PM	-	-	-	-	3:20 PM	9	9	15	16		
3:30 PM	1	3	6	8	3:30 PM	10	10	9	16		
3:40 PM	-	-	-	-	3:40 PM	12	12	7	12		
3:50 PM	6	9	16	7	3:50 PM	9	9	7	19		
4:00 PM	-	-	-	-	4:00 PM	10	10	12	23		
4:10 PM	9	13	6	5	4:10 PM	6	6	7	10		
4:20 PM	-	-	-	-	4:20 PM	11	11	11	24		
4:30 PM	11	7	15	13	4:30 PM	8	8	4	26		
4:40 PM	-	-	-	-	4:40 PM	6	6	14	22		
4:50 PM	17	13	14	12	4:50 PM	7	7	13	15		

Appendix E: Ferrovia Ridership Data

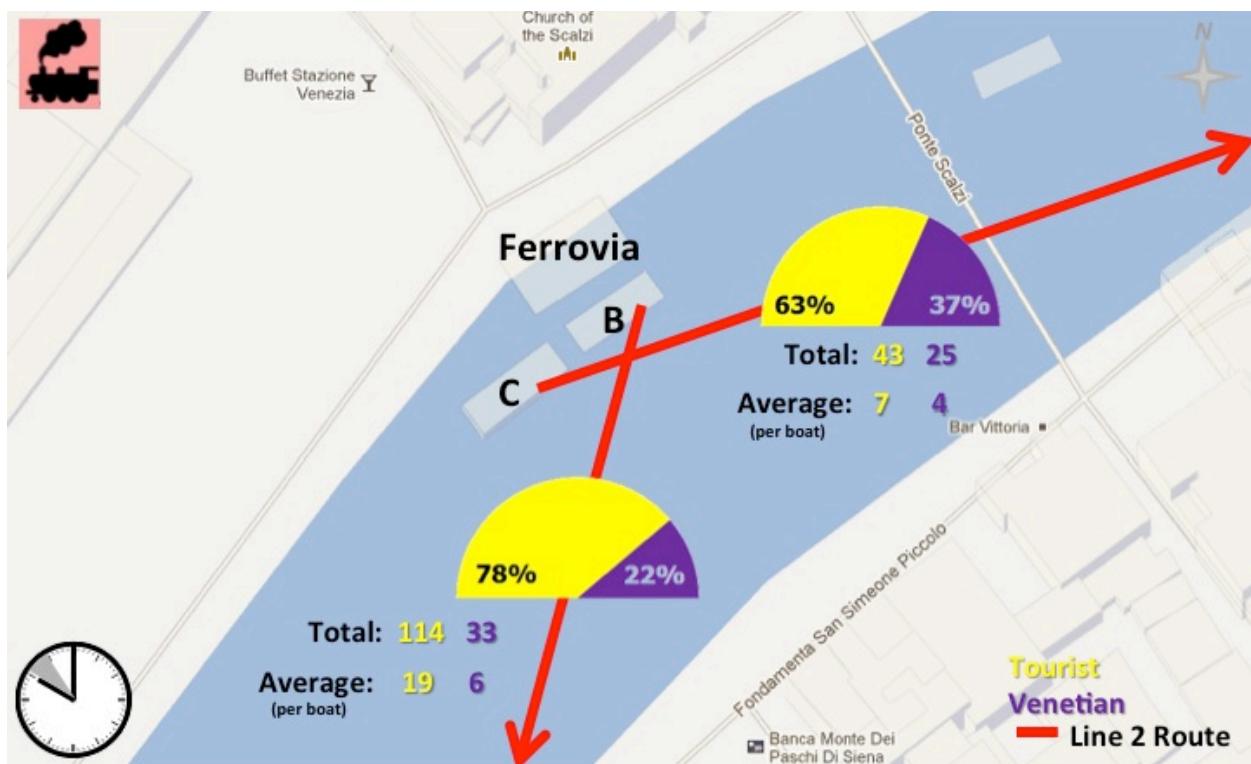
E.1 Ferrovia Low Cruise Ship Day (12/01/12)

Line 2 - Giardinetti		Embarking		Line 2 - S. Zaccaria		Embarking	
Time	T	V		Time	T	V	
9:00:00	16	17		9:00:00	6	1	
9:10:00	18	11		9:10:00	7	2	
9:20:00	17	11		9:20:00	9	1	
9:30:00	7	7		9:30:00	4	0	
9:40:00	13	2		9:40:00	8	0	
9:50:00	28	10		9:50:00	5	0	
10:00:00	19	6		10:00:00	3	1	
10:10:00	27	8		10:10:00	3	2	
10:20:00	17	4		10:20:00	5	0	
10:30:00	22	8		10:30:00	5	4	
10:40:00	12	3		10:40:00	9	6	
10:50:00	17	4		10:50:00	18	12	
11:00:00	13	4		11:00:00	18	2	
11:10:00	19	8		11:10:00	10	3	
11:20:00	18	6		11:20:00	12	0	
11:30:00	9	4		11:30:00	11	2	
11:40:00	10	4		11:40:00	10	1	
11:50:00	18	10		11:50:00	11	2	

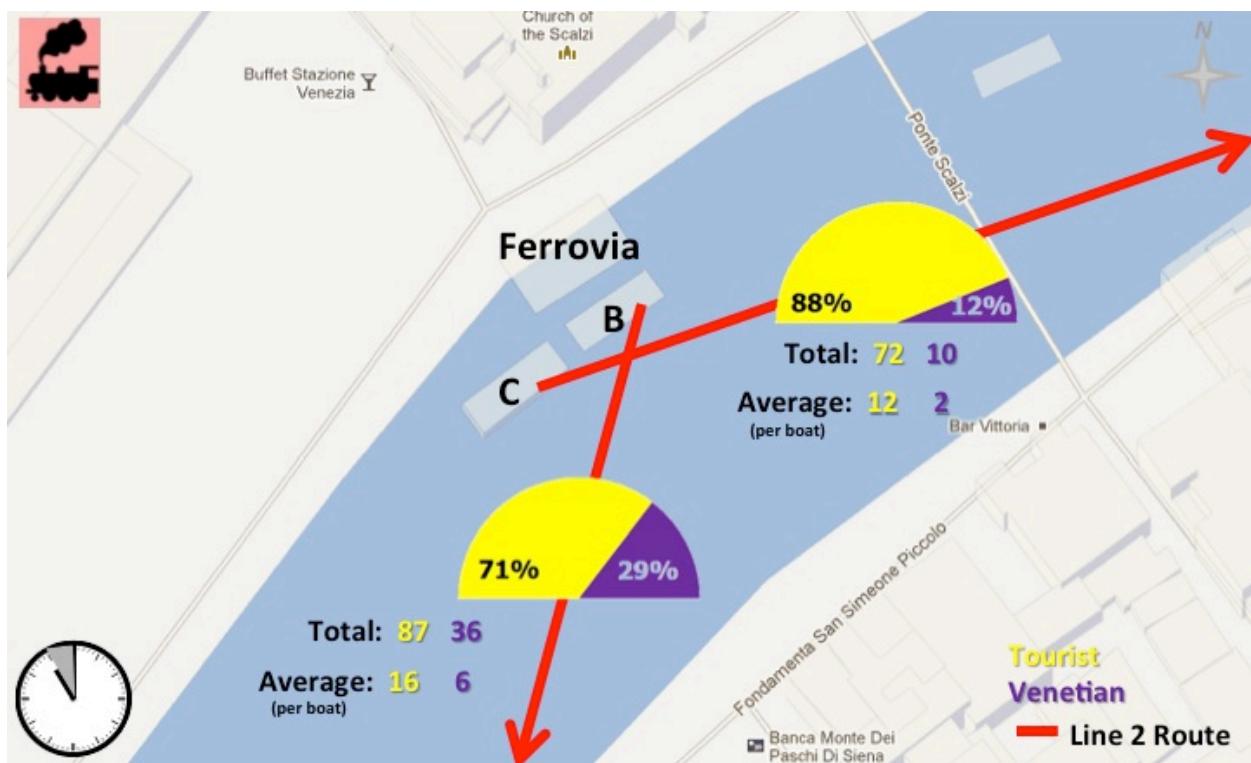
E.2 Ferrovia Ridership- 9 AM



E.3 Ferrovia Ridership- 10 AM



E.4 Ferrovia Ridership- 11 AM



Appendix F: *Traghetti* Ridership Data

F.1 *Traghetto Giglio* (11/07/12)

Giglio	Embarking		Disembarking	
	T	V	T	V
9:27:00	0	4	0	0
9:38:00	2	1	0	1
9:45:00	0	0	0	1
9:50:00	13	0	0	0
9:56:00	13	0	0	0
10:08:00	8	0	0	0
10:15:00	4	1	5	0
10:40:00	0	0	0	1
10:48:00	2	0	0	0
10:57:00	9	3	0	0
11:01:00	2	2	0	0
11:08:00	0	0	0	1
11:21:00	2	2	0	0
11:28:00	7	2	8	0
11:37:00	8	1	0	1
11:43:00	0	0	0	2
11:51:00	2	1	0	0
11:55:00	0	0	0	1
11:58:00	4	0	0	0
12:04:00	0	1	0	0
12:19:00	0	3	2	0
12:27:00	0	2	2	0
12:34:00	6	0	0	0
12:40:00	0	0	0	1
12:49:00	0	2	0	0
12:58:00	0	0	7	0

F.2 Traghetto Riva del Carbon (11/14/12)

Riva del Carbon	Embarking		Disembarking	
	T	V	T	V
9:05:00	0	3	0	1
9:09:00	0	0	0	3
9:19:00	0	2	0	2
9:27:00	0	0	0	6
9:35:00	0	2	0	4
9:44:00	0	2	0	1
9:51:00	2	1	0	1
10:03:00	0	0	0	1
10:11:00	5	1	0	3
10:20:00	0	1	0	7
10:29:00	0	3	0	2
10:37:00	0	1	0	3
10:42:00	0	0	0	1
10:50:00	0	3	0	6
10:56:00	0	1	0	3
11:03:00	0	0	0	2
11:11:00	0	4	0	6
11:21:00	0	1	0	0
11:29:00	0	2	0	0
11:39:00	0	3	0	0
11:50:00	0	1	0	1
12:01:00	0	0	1	3
12:10:00	0	0	0	2
12:19:00	2	0	1	1

F.3 Traghetto San Toma' (11/14/12)

San Toma	Embarking		Disembarking	
	T	V	T	V
9:22:00	0	13	0	3
9:30:00	4	9	0	4
9:37:00	0	5	0	0
9:42:00	0	10	0	2
9:48:00	0	10	0	2
9:57:00	0	4	0	0
10:03:00	0	9	0	2
10:12:00	0	8	0	2
10:19:00	0	5	0	2
10:26:00	0	13	0	1
10:33:00	5	5	1	1
10:42:00	0	1	0	0
10:47:00	0	2	0	3
10:51:00	1	9	0	2
11:01:00	0	4	0	0
11:09:00	6	7	4	0
11:16:00	1	14	1	2
11:23:00	2	4	0	2
11:30:00	0	0	3	3
11:35:00	1	2	0	0
11:43:00	2	4	0	6
11:50:00	2	2	0	2
11:55:00	6	5	0	2
12:04:00	0	4	2	3
12:11:00	0	8	4	6
12:17:00	3	1	0	1
12:25:00	2	3	0	1
12:31:00	0	2	0	2
12:40:00	0	1	0	5
12:46:00	0	1	0	7
12:53:00	0	2	1	6

F.4 Traghetto Santa Sofia (11/07/12)

Santa Sofia	Embarking		Disembarking	
	T	V	T	V
9:01:00	0	5	2	3
9:05:00	3	6	0	2
9:10:00	0	7	4	2
9:14:00	0	5	2	2
9:21:00	2	9	2	7
9:25:00	2	4	0	6
9:32:00	0	5	0	3
9:37:00	2	4	0	2
9:43:00	2	3	0	6
9:47:00	0	10	4	3
9:54:00	2	6	3	9
9:59:00	3	8	2	5
10:05:00	4	3	2	5
10:11:00	5	9	3	12
10:17:00	2	9	0	12
10:23:00	2	10	0	7
10:30:00	2	11	2	3
10:37:00	2	11	0	7
10:43:00	0	7	3	6
10:49:00	2	8	3	7
10:55:00	3	5	2	6
11:00:00	5	0	4	7
11:07:00	5	8	6	6
11:12:00	3	10	3	6
11:20:00	0	11	2	12
11:25:00	0	9	3	9
11:30:00	2	7	3	2
11:36:00	4	8	3	3
11:40:00	0	7	3	8
11:47:00	4	7	2	6
11:51:00	6	4	2	4
11:59:00	6	3	0	4
12:04:00	6	4	4	9
12:10:00	0	8	3	7
12:17:00	4	6	2	9
12:22:00	0	8	0	7
12:29:00	0	5	4	7
12:35:00	2	6	2	9
12:42:00	2	6	0	9
12:47:00	4	6	0	1
12:53:00	0	4	0	3
12:59:00	0	2	0	1