# Vacation Rentals and Residential Housing in Venice

**AN INTERACTIVE QUALIFYING PROJECT REPORT**
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# Abstract

This team explored the critical issues related to the Venetian housing market including availability of housing assistance and the properties owned and managed in Venice by various agencies.  We also studied the nature and extent of tourist vacation rentals in Venice. We created computer scripts to monitor the vacation rental listings so that long term trends could be studied to determine the impact of the industry on housing in Venice.  After analyzing the data and research, the team offered possible solutions for regulation of the tourist vacation rental industry and potential initiatives to assist the city in providing affordable housing for its residents.

Please visit our project websites at: sites.google.com/site/ve.16-house/ and www.venipedia.org

# Acknowledgements

# Authorship

This project report, titled Vacation Rentals and Residential Housing, was created with equal, cohesive efforts by Hayley Boigenzahn, Steven Loftin, Dylan Roncati, and Andrey Yuzvik.

Hayley Boigenzahn worked on the creation of map visuals based on InsideAirbnb data and on the presentation associated with this report.
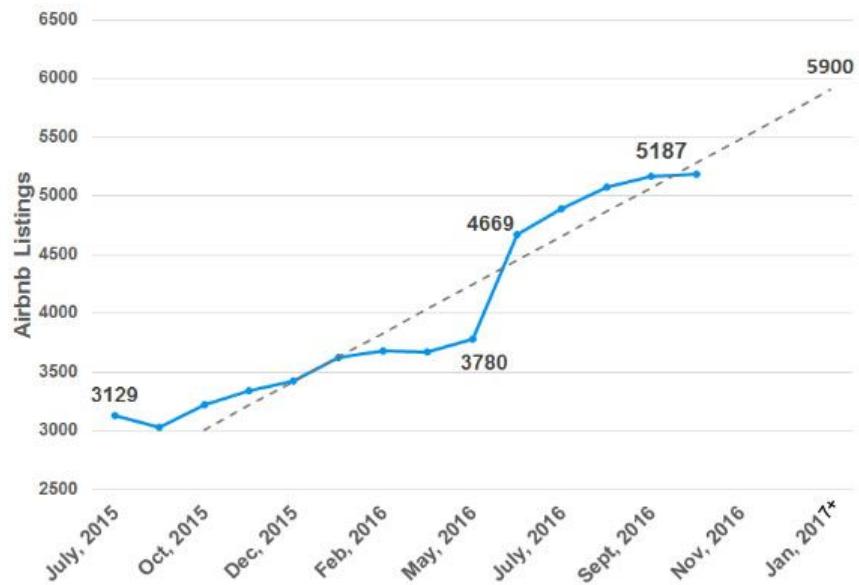
Dylan Roncati conducted the in depth research on tourist vacation rentals, tourist vacation rental regulations, research in Italian on the Housing Agencies and Housing Initiatives and Policies for Venetians. He prepared the Venipedia pages on Housing Agencies and Their Patrimony. He also conceived and drafted the Recommendations to the city.

Andrey Yuzvik and Steven Loftin are the primary developers of the Venice Dashboard widgets and authors of all sections related to the widget and Airbnb scraping code.

Each student deserves to earn equal credit for the authorship of this report.

# Executive Summary

While the tourism industry brings significant revenue to Venice, it may have negative effects on the ability of Venetians to live affordably in their city. There are currently 5,200 Airbnb listings for Venice, which has grown 35% in the past year (see figure below, InsideAirbnb). Properties may now be marketed to tourists rather than locals at a nightly rate that is much higher than what a Venetian can afford.



Airbnb listings according (InsideAirbnb July 2015-Oct 2016) and projected values

The goal of this project was to quantify and analyze the impact made on Venice's housing market by tourist vacation rentals and to recommend possible solutions to the lack of affordable housing for Venetians. Our objectives for this project are as follows:

1. To investigate Venice's online vacation rental market
2. To determine patterns of ownership for housing in Venice
3. To investigate existing housing assistance programs in Venice
4. To analyze the applicability of tourist rental regulation policies to Venice's situation

As part of our study, the group researched, analyzed and visualized the Airbnb tourist vacation rental market, various Venetian housing agencies and initiatives, and regulatory practices for tourist rentals in major cities around the world. The team created new Venipedia pages, which contain information about all aspects of the tourist rental market and public and charitable housing agencies in Venice that respond to the demand for low income and affordable housing. These pages are open to the public, which can help to educate English-speaking users on information about Venice's housing system, along with the data collected during this project.
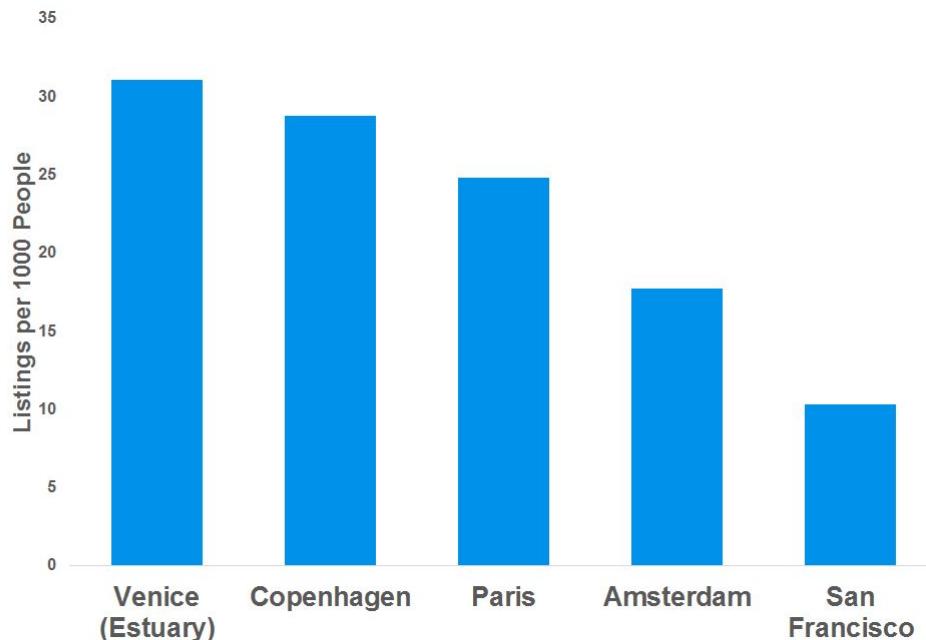
To determine the effect of tourist vacation rentals on the availability of housing and consequent depopulation of Venice, data was collected on the rental market using Airbnb as the source. This data was both gathered by the team and made available to us by Inside Airbnb and Airdna, two organizations that collect and analyze data on vacation rentals listed on Airbnb.

There are currently approximately 38,000 residences in the historical center of Venice. Of the total residential housing supply, 5,800 are owned and managed by ATER, IRE, and Istituzione di Venezia, public housing agencies who work with the city to provide housing to individuals who have low to moderate income. The bulk of the properties, approximately 5200 of

them, are owned and managed by ATER.  We recognized a trend in ATER's properties as being located around school campuses.

We estimated the demand for housing to be  about 26,500 residences, a mix of 55,000 residents and 6,000 students living in an average size dwelling of 2.3 people. This estimate is supported by municipal tax data that included 25,000 occupied properties. Since 26,000 occupied dwellings is only 68% of the 38,000 dwellings we identified, it is necessary to look for other sources of market demand. One such source of demand is the vacation rental market, as the composition of the listings suggests fairly extensive commercial use, which can cause the number of listings to grow quickly if speculation continues to be profitable. The approximately 4,000 tourist vacation rentals currently in Venice represent about 10% of the total available housing in Venice.  The overwhelming majority, 77%,  are located in the historic city center.

In addition, Venice has the highest number of listings relative to its population out of the other major cities like Copenhagen……….., Paris, Amsterdam and San Francisco. This high density is unusual and significant to a city like Venice with residential housing issues.
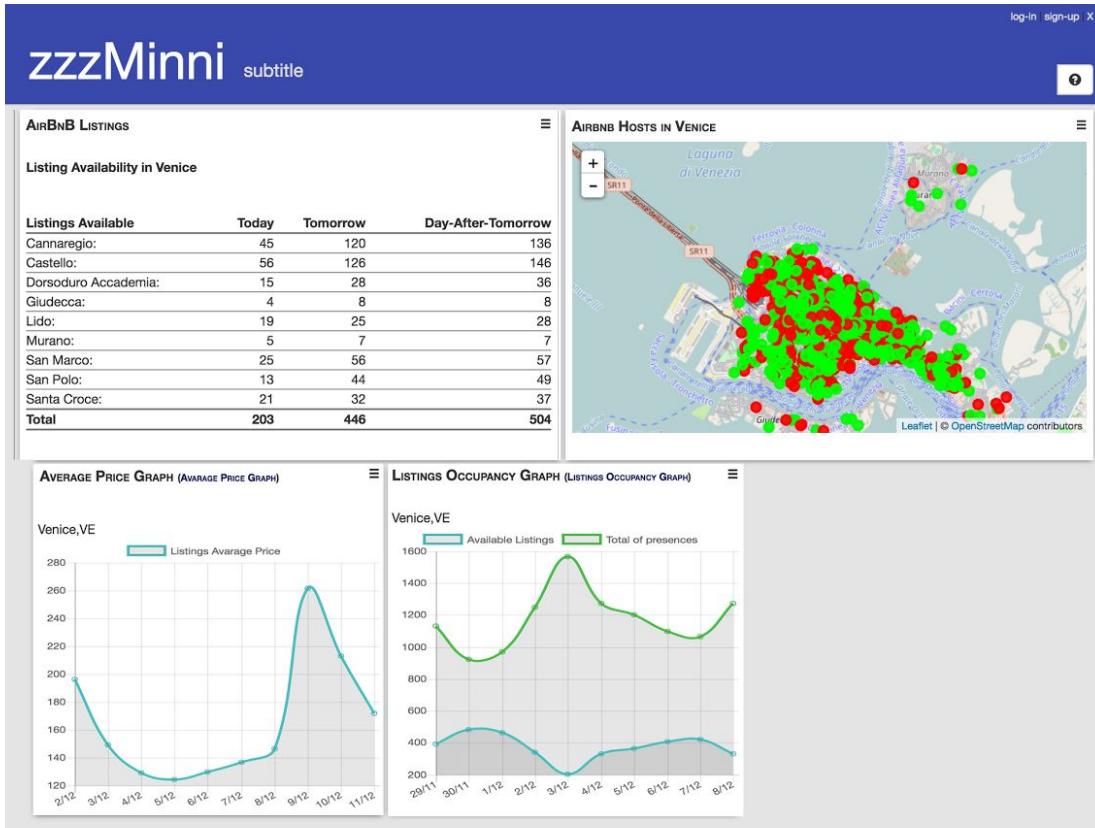
Density of listings by city. Data from Murray Cox InsideAirbnb

A major concern with respect to Airbnb rentals is that worldwide, the majority of them are full home rentals. Unlike private room rentals, when an owner rents out extra space in their primary residence, full home rentals are likely to have a direct impact on the residential housing market. We determined that in Venice, 79% of Airbnb tourist vacation rentals are full homes.

In historic Venice, there are approximately 3,200 full home rentals. Private home rentals total 20% while shared rooms only account for 1% of the total vacation rentals. After studying this data and our calculations of total housing supply, we concluded that full home listings on Airbnb represent one out of every ten homes in Venice.

We studied data regarding the availability of the tourist vacation rental listings. We determined that over 1,500 listings were available for periods greater than 90 days, or approximately 28% of all Airbnb rentals. Many people in Venice also own more than one property listed on Airbnb, with 25% of the hosts owning over 60% of the properties.

Airbnb Online Widgets Created by the Team (Screenshot from Venice Dashboard)

To avoid relying on static data that must be purchased or requested from organizations such as InsideAirbnb and Airdna, our group has created multiple online widgets that collect and display data from Airbnb website such as listings' availability, approximate location, cost trends, name, type and occupation across the nine districts of Venice. These widgets allow users to visualize the data that our scripts gather from Airbnb, displaying it an easy-to-read manner. Our team hopes that these widgets will prove to be useful tools for anyone working on monitoring or regulating the vacation rental market in Venice.

After extensive research and data analysis of the Venetian housing market, the team investigated ideas to make housing affordable and available for citizens. We determined that Venice could leverage tourist vacation rentals in the city to create affordable options for citizens.

Taxes on registered rentals and fines on the owners of unregistered rentals could be used to advance housing assistance and initiatives.

The team explored possible policies to regulate vacation rentals that would benefit the city. Since Airbnb does not require their users provide proof of registration with the city, it is difficult to monitor hosts who fail to register. Unregistered rentals result in a loss of tax revenue over time, as visitors staying in them do not pay the city's tourist tax. We determined possible solutions to locate illegal tourist rentals using neighbor reporting in conjunction with the city task force, Domus Network, already in place to locate offenders.

Our contribution to the study of the impact of tourist vacation rentals on the Venetian housing market and population will be useful in monitoring this problem on a continuing basis. The solutions and recommendations that we propose will hopefully assist in establishing sufficient regulation of tourist rentals in Venice and make affordable housing for Venetians, particularly the young.

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# 1. Introduction

Venice is a unique city that is increasingly popular with tourists from around the world. However, since 1951, the local population of Venice has rapidly declined. Contributing to the trend of Venetians leaving the city are tourist vacation rentals, marketed online with sites such as Airbnb and HomeAway. The vacation rental market is inflating local housing prices and making it difficult for Venetians to find affordable housing (Osservatorio, 2014). Revenue generated from vacation rentals exceeds what can be earned by renting to a local resident, aggravating housing shortages and increasing rent (Kendall, 2016).

Cities are struggling to balance both the rights of property owners to rent their property and the needs of locals to have affordable housing. In major cities such as New York, Barcelona, San Francisco and Paris, municipal governments are attempting to regulate and control the industry (San Francisco Budget, 2015; Berton, 2015; Stulberg, 2015; Ting, 2016). Most cities have restrictions in place to limit short-term rentals by geographic area, proximity and number of days they can be rented which are regularly violated by vacation rental owners (Gottlieb, 2013). Housing initiatives to regulate the industry and make housing affordable are beginning to address the needs of residents and curtail depopulation.

Like many other cities around the world, Venice's residential housing market and neighborhoods are altered by buildings converted into tourist rentals, allowing overnight visitors to occupy historically residential areas. Many Venetians, especially the young, are simply unable to purchase a home due to high prices (Squires, 2016). With many locals leaving the city,

Venetians are concerned that, without intervention, their city will become nothing more than a museum (Ross, 2015, Squires, 2016).

In response, the city of Venice has attempted to regulate vacation rentals, but like other cities, it experiences difficulty enforcing such regulations (Dougherty, 2015; Minor, 2015). The online vacation rental industry has grown so quickly worldwide in the past 8 years that in many places the legal framework for their specific regulation is incomplete or nonexistent (Global, 2015). Since rental sites are not required to report their data to cities, and usually do not volunteer it for business and privacy reasons, there is a lack of information regarding the location and ownership of vacation rentals (Martini, 2016). As a result, it is difficult to keep the system regulated, enabling illegal rental properties and causing Venice to miss out on tax revenue (The Guardian, 2009; Ross, 2015; Connor, 2015).

A variety of solutions have been attempted to regulate the vacation rental market, including requiring different types of licenses, instituting a lodging tax for owners, setting safety standards such as handicap access and a sprinkler system, and limiting the number of days per year that a property can be rented (Fishman, S., 2016). Hefty fines are levied against violators. For enforcement, some cities like Barcelona have assigned a task force while other cities ask citizens to report neighbors who run illegal vacation rentals. Through these types of regulation and restriction, cities hope to limit the number of properties on the short-term vacation market and return them to the community (Dougherty, 2015; Gregor, 2011; Minor, 2016).

Since there is currently no centralized information resource that cities, including Venice, can use to locate vacation rentals and enforce regulations, owners frequently do not register property, and thus do not pay taxes on the income or follow regulations (Virtanen, 2016). Sites

such as Airbnb and VRBO do not publish the addresses of their clients due to privacy concerns, yet it is an important factor in assisting cities in enforcing regulations on property owners (Matier, 2015; Said, 2016). When cities approach companies like Airbnb with requests for assistance in regulating vacation rentals, the listing websites frequently refuse to comply (Said, 2016; Fishman, S,. 2016).

Venice currently lacks the data necessary for successful enforcement of regulations on tourist rentals as there is no information resource to locate the properties and the owners, putting the city at a disadvantage in terms of enforcement (Monroe, R., 2014). Attempts to regulate the vacation rental market have sparked policy debates between those who support vacation rentals and those who are troubled by the effects on their city and neighborhoods.

This project fills the gap of previous research by laying the framework to show, using quantitative data, the effect of the vacation rental market on local housing in Venice. We also used analysis of data from the past and researched current regulation policies to make recommendations to the city about regulating the tourist vacation rentals in Venice. Finally, the data gathered through the course of the project was used to update the Venice Project Center's housing datasets and their related Venipedia pages.

# 2. Background

The house sharing economy has introduced new challenges to Venice's already strained housing market. In the years since the creation of online vacation rental listings, overnight tourists have been cited as one of the major causes of a lack of affordable housing for Venetians (Nadeau, 2009). Preserving housing for locals is an increasing challenge for the city. Young Venetians are particularly impacted, and many leave the islands due to the inability to find affordable housing. The result is a in the disruption of local culture as the number of permanent residents continues to drop and the city continues to orient itself towards tourist services (Greenfield, 2016).

Venice already had problems with excessive tourism and a steadily declining permanent population long before the rise of the vacation rental market. Prior to the vacation rental market, locals left the city for a variety of reasons including unemployment, high cost of living, unhealthy conditions of housing and excessive numbers of tourists (Nadeau, 2009; Pedenzini, 2009). With tourism on the rise and Venetians leaving to search for work, other industries and businesses failed to thrive (Ford, 2014). At the same time, homes once occupied by Venetians were sold for use as vacation homes, often left empty for a large portion of the year (BBC, 2006; Zwingle, 1995). Homes left empty by former residents were turned into bed and breakfasts or tourist rentals, which increased the profitability of Venice's real estate (Pedenzini, 2009). Many properties in Venice are now owned specifically for the purpose of renting them as vacation homes, which aggravates the housing problem by creating more options for tourists and fewer

affordable options for Venetians. While regulations of vacation rentals are in place, they are frequently and easily ignored (Monroe, R., 2014).

Venice is attempting to retain its local population by alleviating housing problems and establishing initiatives that would encourage the growth of the local population. The creation of policies to disincentivize owners from renting to tourists, and adapting use of city owned property as affordable rentals, and programs to assist young people to purchase property may help restore Venetian neighborhoods.

## 2.1 Venice's Residential Real Estate Market

The availability of affordable housing for both purchase and rent in Venice is affected by several factors. Venice is unique in that it has many limitations on its ability to expand housing options due to its geographical location. Some properties in Venice require expensive maintenance or renovation due to their age and historical significance, while others are used as vacation homes and never occupied by long term residents. Housing that is removed from the supply, whether due to aging damage or the commodification of residences into short-term rentals cannot easily be replaced by completely new buildings because there is limited space on the islands. The historical nature of the city limits the possibilities for redeveloping existing land, and older properties are more likely to require maintenance and additional investment by the owners. The increasing threat of flooding due to rising tides further limits potentially available space, particularly on the ground floor.
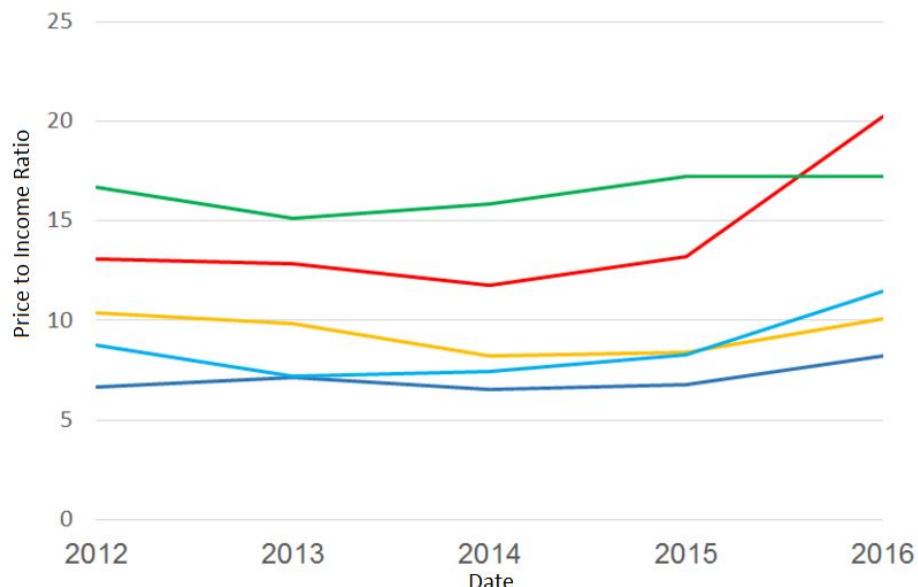
According to a census in 2001, Venice had 35,657 homes in 8,684 buildings. At that time, 82.7% were occupied by residents, 2.5% by non-residents and the remaining 5,295 homes, 14.8%, were vacant many due to inhabitable condition (Pedenzini, 2009). By 2007, one quarter of Venice's homes were not occupied by residents (Osservatorio, 2009).

### 2.1.1 Current Housing Availability and Cost for Purchase

Overall, the cost of housing in Italy has been gradually falling for the past seven years, a trend instigated by the global financial crisis in 2008 and the Euro crisis shortly thereafter (Guide, 2016). While the value of housing has dropped throughout the world, the price has

decreased more slowly in Venice. Some of the most expensive properties in Italy are found in Venice, where the average home purchase price is approximately 4,600 euros per square meter - significantly higher than both the average price of a pre-owned home in Italy at 2,060 euros per square meter, and the price of the next most expensive city, Milan, at 3,640 euro per square meter (OECD, 2016, Guide, 2016).

There are other cities across the world in which the cost of housing is higher than it is in Venice, but Venice is unusual in that it has a high price to income ratio, as shown in Figure 1. In addition, the overall cost of living in Venice is high, requiring the average resident to spend about 41% of their income on daily needs. This is most likely due to low growth in the rate of income in Venice combined with inflated tourist pricing and the fact that most goods are more expensive as they must be brought to the island and distributed by boat (Osservatorio, 2012; Cost of Living, 2016; Ross, 2015).



**Figure 1**: Median apartment purchase price to median income in selected cities between 2012 and 2016.  (Numeo, 2016)

As of 2012, house sales in Venice were in decline by more than 16% according to the Osservatorio 14th Annual Report.  Compounding the difficulties of this housing price to income ratio is the difficulty young Venetian families may have to secure mortgages.  Banks are highly selective when it comes to giving mortgages, which may make it difficult for young Venetians to obtain loans (Osservatorio, 2012). Venetians cannot afford to purchase homes or have difficulty obtaining financing and house sales are in decline (Osservatorio, 2012).

## 2.1.2 Current Housing Availability for Rent

There are currently over 100 apartments available for rent in historical Venice listed on Immobiliare.it, the largest network of property listing websites in Italy. The rent prices in Venice are considerably higher than most other cities in Italy with the exception of Milan and Rome. The average price for an apartment in Venice is 671 euro per month (Osservatorio, 2012).  A one bedroom apartment averages 557 euros per month, with two and three bedroom apartments averaging 613 and 729 euros per month respectively (Osservatorio, 2012).

The rental property costs that limit the options of Venetians are the result of a combination of factors, including the limited ability of Venice to considerably expand its housing market, the age and maintenance requirements of many of the homes, and the tourist vacation rental market. Tourist vacation rentals have changed the nature of the hospitality industry worldwide as entire homes have become readily available for booking online. Since the creation of online vacation sites such as Airbnb in 2008, the rental industry has become immensely popular in Venice (Cox, 2016). Some properties in Venice have been acquired by landlords to be

used as tourist vacation rentals, because it is often more profitable than renting to a full time tenant with a long term lease.

## 2.1.3 Renting Laws In Italy
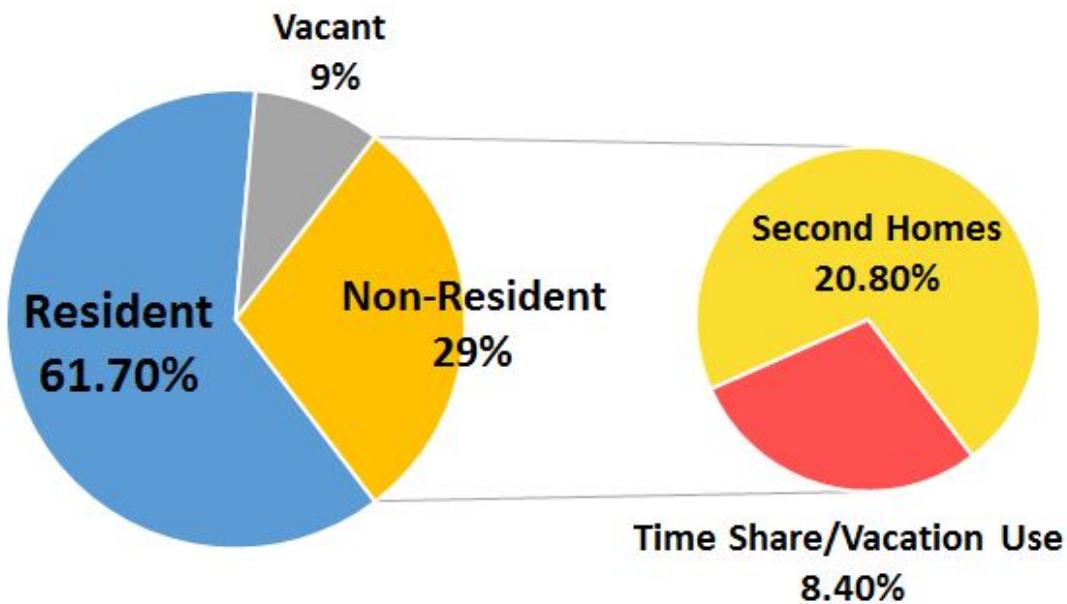
Modern changes that have attempted to improve Italy's general rental market appear to actually have helped create a situation where the tourist rental market can flourish. Italy's current tenancy laws have been developed over time as a compromise between the conflicting interests of tenants and landlords (Breccia, Bargelli). In 1978, the Equo Canone (Fair Rent Act) was passed. This statute strongly favoured the protection of tenants' rights and established that rental contracts must last for a minimum of four years, renewable by the tenant for another four years. Rents were determined by government specified formulas, not through an agreement of the two parties. For landlords, this meant that renting to local residents committed their property for an extended period of time, up to eight years, and that they were unable to set rent prices based on demand. Issues arose with the Equo Canone laws when rental rates failed to increase as quickly as the value of the property itself, causing landlords to sell their property because it was more financially favorable (Breccia, Bargelli). As some landlords stopped renting and began selling, many properties changed from rental to owner-occupied and the demand for rentable property consequently increased (Brecchia, Bargelli). To remedy this situation, the 1998 Rent Act was designed to increase the desirability for landlords to rent by decreasing restrictions dictating how they could rent their property. It allowed landlords to negotiate rent, resulting in some regrowth of the rental general market, but it did not relieve landlords of long term leases (Brecchia, Bargelli).

## 2.2 Tourist Vacation Rentals In Venice

One aspect of the demand for housing in Venice comes from tourists. Around 9.8 million tourists spent the night in Venice over the course of 2014 in some form of housing (Ross, W., 2015). With thousands of tourist vacation rental listings available for booking, it is important to consider the history and evolution of the industry as well as current issues that may impact the housing market of Venice.

### 2.2.1 Tourist Rentals Before the Rise of the House Sharing Economy

The existence of tourist rental apartments in Venice predates the boom of the online market. However, prior to the emergence of Airbnb in 2008, the portion of Venetian housing that was used for vacation rentals was relatively small (Good, 2005). As shown in Figure 2, a study conducted by the city in 1999 using utility contracts to determine occupancy and found that 29% of the housing market was used as non-resident housing, but only 8.4% of that segment of the market was for nearly continuous tourist use.
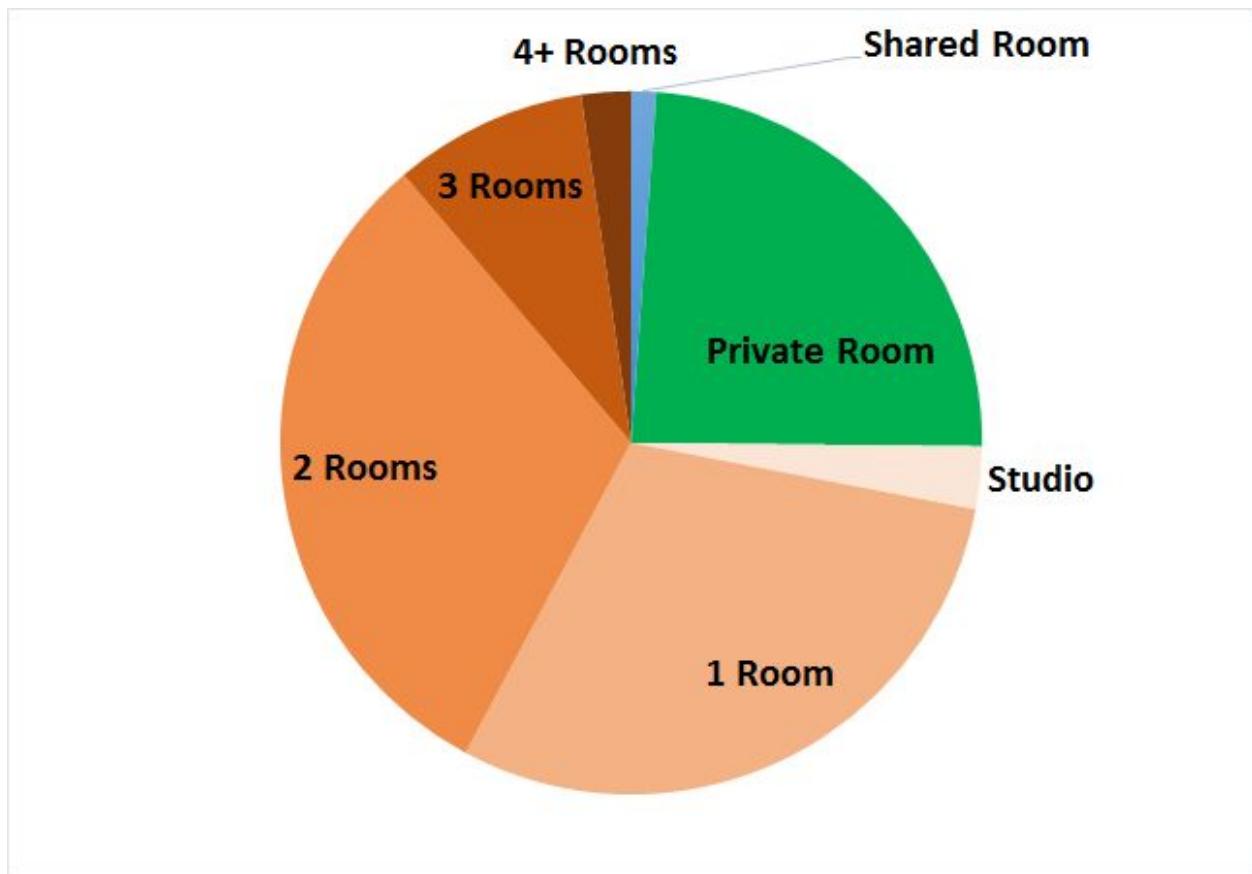
**Figure 2:** Occupancy of the Venetian Houses in 1999 based on utility use patterns. Adapted from Good, 2005, with original data from *Osservatorio: Quarto Rapporto*(Venice: Comune di Venezia, June 1999). Home usage was determined using data from utility contracts

## 2.2.2  Tourist Rentals After the Rise of the Sharing Economy

Since the rise of the sharing economy, short-term vacation rentals have become a multi-billion dollar industry that includes companies such as Airbnb, HomeAway and FlipKey along with an ever-growing network of users (Skift, 2016, Dougherty, 2015). The biggest company in this market, Airbnb, has grown exponentially over the past several years from what began as three air mattresses on the floor of a San Francisco apartment (Guttentag, 2015). Listings on Airbnb alone have increased 948% in the past two years (Gasperina, 2015).  As the popularity of online listings has grown, the type of properties listed turned from single rooms to full homes, which were consequently unavailable for renting to local Venetians (Guttentag, 2013).
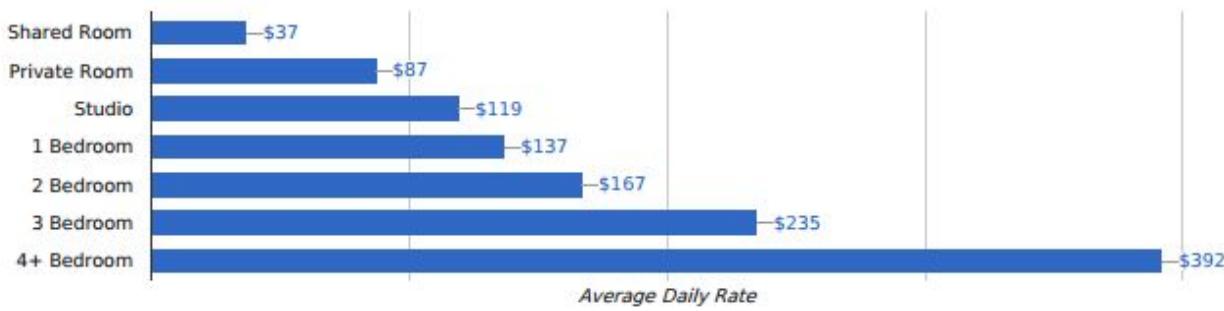
As of October 2016, estimates for the number of Airbnb listings in Venice range between about 5,000 and 7,700 (Cox, 2016, Airdna, 2016). This number fluctuates frequently as new listings are added and others are removed or temporarily suspended by their owner. It does not include other properties that may be listed on other rental sites, such as HomeAway, 9flats, and FlipKey, since these sites do not have as much of a presence as AirBnb. Of the total listings, over 2,417 are one and two bedroom properties, with slightly more two bedroom apartments dedicated to tourist vacation rentals. Less popular are shared rooms, studios and larger properties with more than 2 bedrooms.



**Figure 3:** Active Airbnb listings by room type (Airdna, October 2016) Full home rentals are represented by shades of orange, and account for 72% of listings.

As shown in Figure 3 above, the overwhelming majority of properties, approximately 72% of all rental listings are for an entire home or apartment. Only 2% of the total listings are for shared rooms in a private residence while nearly all of the remaining 27% are listings for private rooms.

While information about owner addresses and resident names is not published by Airbnb as per their privacy policies, reviews left for each property may be used to estimate how many days per year the properties are occupied. InsideAirbnb cross references this data, and estimated that only 30.4% of the listed properties are occupied at any given time on average (Cox, 2016).



**Figure 4:** Average Daily Rates of Airbnbs in Venice October 2016 from Airdna

We studied the data we received from Airdna with information regarding the average daily rates for properties by type (Figure 4). The four bedroom apartments were by far the most expensive with a much less significant variation in price between one and two bedrooms. Average prices for the most popular type of apartments on Airbnb, the one and two bedroom average from $137 to $167 per night respectively.

## 2.2.3 Impact of Vacation Rentals on Neighborhoods and Cities

Vacation rentals affect the availability and price of housing for residents. In New York City, a report commissioned by Housing Conservation Coordinators determined that average rent increases in the past five years have doubled and over 8,000 properties have been removed from the affordable housing stock, reducing availability by 10% (Ting, 2016).

Residential communities can be disrupted when too many properties are used for tourists and visitors. Every city has zoning laws which are designed to separate residential areas from business zones, helping citizens remain undisturbed by commerce, including tourists and guests to the city. However, the tourist vacation rentals are turning homes in residential areas into motels, which is normally only found in areas with zoning that permit transient population (Nichols, 2015). For example, in Seattle entire residential buildings have been converted to vacation rental housing, displacing residents and changing the entire environment of neighborhoods (Nichols, 2015). Some vacation rentals are even marketed as party houses on Airbnb (Nichols, 2015) which may disturb the peace of quiet residential communities.

In addition, cities are missing out on tax revenue as some owners do not register their properties or declare the income generated from renting. In some cases, tourist vacation rentals lead to a reduction in the inventory and an inflation in price affordable housing as investors buy up property to convert to tourist rentals. For example, in 2014, the total housing costs for renters in Los Angeles rose by $464 million dollars due to loss of such properties from the housing market (Hiltzik, 2015).

In Italy, unregistered properties pose a problem to cities in terms of lost tax revenues. In

2014, there were over 73 million bookings of tourist vacation rentals, none of which were registered (Martini, 2016). These bookings represent total revenue of more than 2.4 billion Euros and tax evasion of over 110 million Euros (Martini, 2016). An additional 57 million Euros of mandatory tourist taxes also went unpaid (Martini, 2016).

## 2.3 Regulation of the Vacation Rental Market

The vacation rental market has grown extremely quickly since the expansion of online distribution, and is expected to to continue to expand (Global, 2016). However, because the growth has happened recently, the legal framework and regulations that usually exist for multibillion dollar industries does not exist yet in many cities (Global, 2016). Local governments all over the world have begun implementing appropriate legislation, but striking the right balance between promoting investment and protecting residential housing is difficult, and different for each city depending on their size and economic situation. Legal battles are already underway and the strategies for regulation will likely continue to change for many years.

Regulation practices vary from aiming to limit only the commercial use of the online rental market to attempting to restrict the number of listings altogether. It is also common for cities to tax vacation rentals so that the city can profit from the growing industry (Coldwell, 2014). However, there is significant resistance in many cities from companies, hosts, and others who see the market as an investment opportunity and would prefer not to see it limited. Even once the regulation is passed, requiring vacation rental owners to register with the city is usually only moderately effective, as it is difficult to find unregistered properties to enforce city regulations.

## 2.3.1 Practices for Regulating Vacation Rental Markets

Popular methods for regulating the vacation rental market include requiring short term landlords to purchase a license, lodging taxes, requiring safety standards such as handicap accessibility and fire protection systems, and limiting the number of days that a property can be rented out per year (Ting, October 2016).

While cities like New York, Barcelona, and Paris seek to strictly regulate tourist vacation rentals, other cities are interested in promoting the industry that contributes greatly to their economics. New Orleans is one such city, where tourism makes up a large portion of the city's income (Litten, 2016). New Orleans has instituted a 90 day limit per year on tourist vacation rentals in the hopes of still promoting the home sharing economy (Litten, 2016). New York recently signed a law imposing a fine up to $7,500 on hosts advertise vacation rental properties online for a period of less than 30 days in violation of city law (Ting, October 2016).

Perhaps the most successful practices for regulation exist in Europe. In Paris, a team of investigators scours the city looking for unregistered tourist vacation rentals. Once found and determined to be in violation, fines of $25,000 are imposed upon the owners unregistered properties (Fouquet, 2014). In Barcelona, a database of properly registered vacation rental properties has been made available online. Anyone can check the database to determine where suspected illegal properties are registered. If not, they can be anonymously reported. Through these types of regulation and restriction, cities hope to better manage the the short-term vacation market.

Venice recently enacted policies regarding tourist vacation rentals to encourage them for

purposes of promoting tourism. (Legge, 2013). These policies facilitated the operation of private management companies for short term rentals to make it easier for property owners to have multiple tourist rentals. While such management companies were were previously considered business entities, requiring compliance with regulations, Venice has now made it legal for individuals to operate up to three properties without a business license (Gasperina, 2015). These regulations facilitated the process, resulting in even more owners turning their properties into tourist rentals.

However, Venice also imposes restrictions on tourist vacation rental properties, most designed to ensure the eventual payment of taxes on generated revenue. All properties must be registered with the regional registry office and receive accreditation (Locazione, 2016). Each property is entered into a regional tourist database called MTWEB (Locazione 2016). From there, owners record guests upon arrival and departure, and register guest information with the Venetian police. Finally, taxes must be paid on the income (Locazione, 2016). The fine for operating an unregistered vacation rental in Venice is 5,000 euros.

Venice also launched an investigation in May 2016 searching for undeclared tourist vacation rentals. Over 150 people were employed in a task force of both the finance department and police to initiate tax audits and action against those who operate illegal rentals and who fail to declare the income. This task force has created a program called the "Domus Network" which retrieves data from the internet that allows investigators to identify certain landlords with multiple properties (Martini, 2016). This data is then matched to field observation and surveys to determine details regarding the vacation rental activity. However the biggest obstacle for this approach still remains the issue of gathering precise data off the Airbnb website without sending

them official requests (Martini, 2016). This program is still new so it remains to be seen how successful it will be.

## 2.3.2 Obstacles to Regulation

While several different solutions have been tested by major cities, none has proven completely successful yet in regulating the tourist vacation rental listings.  A major gap to these approaches lies in a lack of necessary identifying information regarding the location and identified owners of the properties used as tourist vacation rentals (Minor, 2015). The challenge for Venice and cities around the world in regulating these tourist vacation rentals is not only to try to control the number of listings,  but also identify those who list unregistered and illegal properties.

Even when regulations are present, many homeowners violate the laws because there is often little enforcement due to the lack of necessary information that cities can use to locate the properties and the owners, especially when they are unregistered. In San Francisco, owners regularly violate the city's 90-day annual limit on rentals, and most properties lack proper registration (Said, 2016). The city attempted to step up enforcement by requiring online sites like Airbnb to ban listings unless they have a registered license number, especially for violators with multiple listings, and collecting a 14% city hotel tax on short-term rentals (Said, 2016).  Airbnb refused to comply, and responded with their position that it is the city's responsibility to police registrations, not theirs.  Instead, Airbnb maintains Terms of Service that require owners to comply with local regulations (Gottlieb, 2013).

In Italy, owners typically do not register their properties and consequently do not pay the

tax-it is estimated that in Italy, only one in four owners report that they list their homes for rent (Martini, 2016). Although Venice has one of the most complete registries of any major Italian tourist area, at least 33% of all vacation rental listings, including those that are not on Airbnb, are still unregistered (Martini, 2016). Trying to trace rental payments back to owners has been difficult, since payments are done between tenant and owner and therefore is not trackable by the city (Martini, 2016). In addition, property owners are not required by Airbnb to provide anything other than a picture, email, and phone number for contact. Only after a booking is made does the property owner communicate arrival information directly with a guest. As a result, Airbnb and other listing sites only provide as much information as an owner provides, usually showing a general area of where the property is located. There are options to submit forms of ID such as governmental or driver's license, but Airbnb does not verify any location data given by those who list on the site.

### 2.3.3 Obtaining Data on Listings

A common problem in enforcing regulations in Venice is the lack of available centralized data on which properties are being used illegally as vacation rentals and the names of the owners, so that they can be pursued by law enforcement. Data can be imprecise due to the limitations and data collection bans that companies make in order to keep their users information untouched. Using the number of reviews per property to estimate how often each is rented, analysts attempted to determine how many nights each listing was rented (Chen, N). In Seattle, for example, such data indicates that an average stay in a short-term rental is 5.1 nights, with around 72% of guests leaving reviews.

Even with information on rental times and reviews, some cities do not know the exact location of the properties that need regulating or the names of the people who own them. This missing data disadvantages cities trying to enforce regulations. Cities like Venice need to identify the rental properties and their owners so they can stop those who do violate the regulations in place.

Despite the difficulty in obtaining location data on vacation rentals however, Barcelona has managed to develop software that scrapes data from online vacation rental sites in search of properties that are unregistered with the city. In that city, where 9,000 apartments are officially registered, the software has identified 6,000 properties that were not (O'Sullivan, 2015).

Until late 2015, it was not difficult to get information on the occupancy rates of vacation rentals on Airbnb as the site allowed hosts to mark their online calendars each time a booking was made (Stulberg, 2016). This data could then be obtained and used to determine how often a property was rented. Once the option to indicate booking information on calendars was removed by Airbnb, it became more complicated. One way to resolve this lack of data was developed by Airdna. Rather than using the calendar, the company uses an algorithm based on historical data collected to identify instances when a property becomes unavailable to determine the likelihood of occupancy (Stulberg, 2016).

## 2.3.4 Reaction and Opposition to Regulatory Policies

While some cities seek to control the tourist rental market, online listing sites and property owners support the growth of the industry and oppose regulations. Airbnb and its competitors defend the vacation rental industry, claiming that it makes up only a small portion

total housing and has little, if any, effect on the local market. According to these major tourist rental listing websites, vacation rentals represent only a fraction—on average 2%— of a city's total housing inventory (Minor, 2015). In addition, opponents to regulation point out that tourist rental units in the cities are normally concentrated in areas of historic significance: locations where affordable housing is not typically found (Minor, 2015). Vacation rental owners also justify that the extra income is necessary to afford their home or augment their savings, and that it is the government's responsibility to provide affordable housing. (Minor, 2015).

Companies like Airbnb are resisting regulation by organizing their users to help defend their rights (Tusk, 2016). These websites have millions of dollars to combat regulation by creating clubs and unions of home sharers that support online platforms and apps to keep users informed (Dougherty, 2015). Airbnb hosts in Chicago have brought legal action against the city for regulations they claim violate their rights to privacy, to communicate anonymously over the internet, and to use one's own property, among others (Associated, 2016). The law in question requires Airbnb to share with the government all information about hosts and their guests including where they live, how much was earned and how many nights the property was occupied (Associated, 2016).

It would seem that Airbnb is gradually becoming more receptive to collaboration. The company has recently negotiated deals with certain cities to collect taxes owed by its hosts since lost tax revenue has been at the center of the controversy (Kokalitcheva, 2016). In New Orleans, Airbnb worked together with the city to establish regulations on vacation rentals. Together, they implemented a "pass through" registration system whereby information on property listed on the site will be turned over by Airbnb to the city for enforcement (Litten, 2016). Hosts will also be

able to obtain permits for legal registration of the property within the Airbnb site (Litten, 2016).

Recognizing that they are in competition with vacation rentals, hotel lobbyists seek controls to limit the number of tourist rental properties on the market (Trejos, 2016). Tourist vacation rentals are changing the type of lodging tourists choose. Airbnb offers properties with more space and amenities than a typical hotel room. Over one hundred million people have booked private homes on Airbnb, diminishing hotel business (Smith, C, 2016; Edwards, 2013).

## 2.4 Housing Initiatives for Young and Middle Class Families in Venice

In Venice, the high growth of the costs of property has gradually led to the depopulation of the middle class from the historical center, in particular newly established families, who instead settle mainly in the area of Mestre (Osservatorio 2014). One of the challenges in trying to keep these families in Venice is the strong tourism industry and exponential growth of tourist rental apartments, which has increased the cost of 30-40% of the houses in a short time and removed housing from the market for residents (Osservatorio, 2014). While housing assistance exists in the Veneto region through both public and various private charitable and religious entities, it is largely directed at a low income population that qualifies for government help. Other cities that share the same housing concerns with Venice, have begun to respond with new initiatives to make housing affordable for middle class residents in light of the tourist rental industry.

### 2.4.1 Current Housing Policies and Initiatives in Venice

Current regional policies governing access to social housing in Venice dates back to 1996, when the economy, labor market, urban structure of the city and the presence of foreigners were substantially different than today (Osservatorio, 2012). In response to the financial crisis of 2008 and subsequent economic difficulties, in 2012 the Italian government initiated a housing plan to offer new social housing for rent at low cost to those not poor enough to avail themselves of social housing and not sufficiently solid economically to afford a free-market rent (Osservatorio, 2012). The intended beneficiaries are families and young couples among others.

There are several agencies involved in the social housing system in Venice, each with its own function. Edilizia Residenziale Pubblica or "ERP" is Italy's public welfare housing system created with public subsidies for the purposes of being rented at rents lower than the regular housing market (ERP). In Venice, the municipality of Venice handles the allocation and assignment of all ERP funded housing. However, the housing units are managed by the Azienda Territoriale per l'Edilizia Residenziale or "ATER". To qualify for ERP funded housing, an individual must have Italian citizenship or be a citizen of a member of the European Union legally residing in Italy, and have total household income not in excess of 24,793 euros for one person with adjustments made based on the number of household members, dependent children, including unborn, of up to 28,942 euros for a family of four (ERP).

In Venice, the average price of subsidized ERP housing in Venice is 160 euros per month or 1,920 euros per year (Tantucci, 2016 November). Rents vary from just 20 euros per month for a 72 square meter apartment in San Marco to 1,000 euros for a 120 square meter apartment in Santa Croce (Tantucci, 2016 November). In Giudecca, a 60 square meter ERP apartment can cost as little as 130 euros per year (Tantucci, 2016).In October 1994, the city established the creation of an agency called Osservatorio Casa to support the creation of housing policy and initiatives and to assist making in the sector (Citta di Venezia). Its programs, in particular, have been aimed at the construction of a permanent monitoring of of data, such as to allow a framework for housing policies. Osservatorio studies and interpret the housing situation in the municipality and including changes over time, especially with respect to the complex issues of social demand and poor housing conditions. From there, Osservatorio builds highly targeted housing policies with a view toward meeting social demand and reflecting the continuously

changing dynamics of the Venetian housing system. Currently, there is a new and more widespread need for housing support and there is a gap between the regulatory framework and the real situation. In addition, the city has redeveloped and revitalized three areas of east Castello for predominantly residential use to help to counteract the demographic decline of historic Venice and bring productive activities and services to the area to encourage the entry of stable younger population (Osservatorio, 2014).

In 2016, the city instituted tax initiatives that both encourage residency in Venice and seek to increase revenue on properties used for vacation or tourist rentals. New tax discounts and exclusions were created by the government tax office - the Imposta Municipale (IMU) on the property taxes for municipal services also known as "TASI" in 2016 in an attempt to boost the property market (Guide, 2016).

## 2.4.2 Affordable Housing Assistance Practices Post Airbnb

Cities around the globe are experimenting with new initiatives to meet the needs for affordable housing while still enjoying the economic gains from the sharing economy (Shafroth, 2016). Several different initiatives have been proposed to make housing affordable for locals of middle income who do not qualify for social housing while simultaneously benefitting from revenue generated by the tourist vacation rental industry. A previously discussed, while regulations and control of the short term vacation rental industry is often the first line of action to protecting housing stock and market from the growing sharing economy, other ideas to help make the residential market more affordable are emerging.

Cities are beginning to see the tourist vacation rental industry as a potential source of funding for affordable housing. In Seattle, some Airbnb hosts who oppose regulations are asking the city to join, rather than fight, the vacation rental market. Rather than setting caps or limits, the initiative suggests that a better way to address the housing crisis would be to use tourist rentals as a source of revenue by imposing additional taxes on them. Revenue created from extra taxes would go to supporting affordable housing in the city (Feit, 2016).

Chicago passed an ordinance in June 2016 imposing an extra tax on short term vacation rentals above the already imposed 17.4% hotel tax (Shafroth, 2016). Revenue from the newly imposed 4% surcharge is slated to be used for affordable housing. This represents yet another initiative to use the vacation rental market to provide housing to those who cannot afford it. In New York City, vacation rental owners now pay a 14.5% hotel tax which includes both sales and occupancy tax (Gottlieb, 2013). This idea of using the vacation rentals to fund projects seems to be catching on. New Orleans contributes $1 from every tourist vacation rental per night toward affordable housing (Litten, 2014).

In Venice, tourist taxes are imposed on both traditional lodging and vacation rentals. These taxes are currently not charged by Airbnb and it is up to the individual owners to collect them from their guests. Many vacation rentals never do so which gives tourist rentals a competitive advantage over traditional accommodation (Gottlieb, 2013). More importantly, Venice is missing out on accommodation taxes from owners operating illegal rentals which could be used to fund affordable housing for young Venetians and families.

## 2.4.3 Common Types of Public Assistance for Housing Purchase

Government bond loans are often used to help families who have difficulty qualifying for a mortgage to move from renting to owning. Such loans can be structured to allow for repayment policies, lessening the burden on the government while still reducing rental costs (Jacobs, et al. 2007). A more direct, but more costly, method of government intervention in the housing market is government assisted mortgage programs, which can include changes in down payment, interest rates, and financing options (Carter, 1997, Boelhouwer, Doling, & Elsinga, 2005, Smith, 1981).

It also may be possible for the government to decrease the amount of money required for housing programs by using private lenders to finance social housing (Carter, 1997). In France and Germany, policies that encourage the private sector to provide property at sub-market prices through grants, tax concessions, or low interest loans have been fairly successful (Haffner, Hoekstra, & Oxley, 2009, pg 267). Private funding not only decreases the cost to the government, it can increase competition between landlords, which helps to keep rental prices in check (Haffner, Hoekstra, & Oxley, 2009, pg 267-268).

Policies can also blend the concepts of renting and owning. This method can be implemented in many ways, but two useful examples are the policy of "Shared Ownership", an English policy that allows a resident to share ownership with the government and slowly buy the entire property back from the state, much like a private mortgage, and the policy of "Right to Own", which is a policy from Finland that is designed to increase rental availability for a middle-income population in an expensive real estate market (Boelhouwer, Doling, & Elsinga,

2005, pg. 76-80). These policies are interesting for their applicability in high cost housing markets and have both been fairly successful (Boelhouwer, Doling, & Elsinga, 2005).

Finally, tax concessions can allow some renters to purchase property, increasing the number of homeowners and lightening the demand for rental property (Smith, 1981). One popular initiative to assist encourage renters to purchase is to lower the tax they pay on property (Smith, 1981). The money saved on taxes can be used for a down payment or for other costs a buyer would otherwise be unable to afford.

## 2.5 Background Conclusion

Venice is facing depopulation problems which are spurred by a variety of issues, one of which is the cost of housing. Tourist rental apartments are very popular in Venice, and there are serious concerns that these temporary residences have a significant influence on the cost of housing and disturb the atmosphere of local neighborhoods when too many are concentrated in one place.

The vacation rental market has been growing since the popularization of online rental platforms such as Airbnb and VRBO, and Venice is not the only major city that is experiencing these problems. For property owners, it is appealing to rent to tourists who can pay a much higher per-night rate than a long term tenant and to not be bound by long term leases.

Attempts by municipal governments to regulate the industry have been made in Venice and other cities, but these policies have had limited effectiveness as there is insufficient information about the vacation rentals to enforce them. There are new initiatives being experimented with in the hope of using the vacation rental market to improve housing affordability and enforcement of regulations on the market.
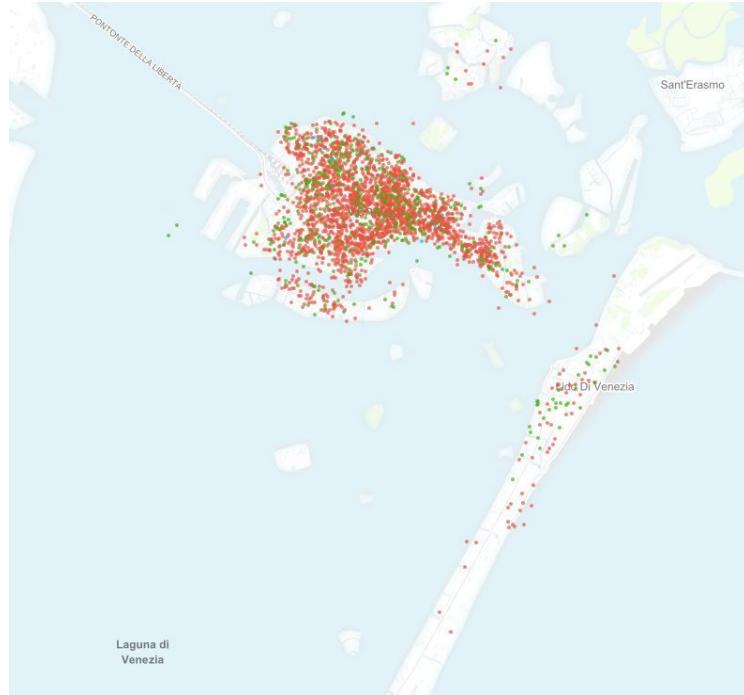
# 3. Methodology

This project is intended to help Venice resolve housing issues by examining the effect of the tourist rental industry on the city and exploring policies to make affordable real estate available to locals. We have the following objectives for this project.

1. To investigate Venice's online vacation rental market
2. To determine patterns of ownership for housing in Venice
3. To investigate existing housing assistance programs in Venice
4. To analyze the applicability of tourist rental regulation policies to Venice's situation

This project is designed to further understand how the vacation rental industry in Venice directly affects the supply and demand of Venetian housing. The group took advantage of tax records provided by the of City of Venice, real estate data, and the information on individual properties obtained from Airbnb. The data we compiled on our own allowed us to perform more accurate calculations of the occupancy rates of vacation rentals, as they often go underreported. Using this data, we analyzed the impact of vacation rentals on the housing system in Venice by estimating how many listings are rented commercially, and in what areas of the city.

This project frequently references tourist vacation rentals and the vacation rental market. For our purposes, a tourist vacation rental is a residential property that overnight visitors pay to stay in. We focused specifically on the online vacation rental market, which is the domain of websites that allow the average property owner to list their property or a room as a short-term rental -  the archetypal example being Airbnb. The target area of our study was the main islands of Venice.

**Figure 5:** Image from InsideAirbnb (http://insideairbnb.com/venice/): Red dots represent full apartments or houses for rent, green dots represent single rooms for rent in a home.

Our project considers Venice in the modern era - from 1951, when local population of Venice peaked, up until the current day. For vacation rentals, we analyzed real time data gathered by our own code, and data from the year preceding our project obtained online and through various organizations. For example, Figure 5 shows a map of current Airbnb rentals in Venice. We assume that the popularity of vacation rentals became significant in the period after 2008, the year Airbnb was founded and when the global financial crisis significantly increased the number  of room sharing sites (Logan, T., Reyes, E. A., & Poston, B., 2015). The methods we adopted to achieve the objectives listed above are described in detail in the following sections.

# 3.1  Investigating Venice's Online Vacation Rental Market

This objective aims to create visuals such as an online widget and infographics such as graphs and charts of Venice's vacation rental market that will assist in the recommendation of policies, the tracking of trends in the tourist vacation rental market, and may be useful to groups doing similar work in the future. We collected essential data regarding housing type, location and availability through analysing data found on rental websites in order to use it as visual and textual support for other objectives.

## 3.1.1 Program tools to gather online vacation rental website data

In order to collect data about the vacation rental market, the team used computer scripts to 'scrape' or collect the information such as listing identification number, property location, host identification number, approximate location and price from listing websites in large amounts. The team reviewed an existing script for the website Airbnb, provided by Tomaso Minelli, that uses the Ruby programming language in order to better envision the new script to successfully extract information about the listings available on the Airbnb website. As a first step, the group documented each section of code in order to understand what the script was executing and make it easier for future groups to use.

Once the code was fully understood, it was edited to collect the data we were primarily interested in, including the number of vacation rentals, the latitude and longitude of the listing as reported by the owner, the availability, the rental cost, the user identification number, and number of rooms. This data allowed the group to create an online map that shows the occupation

of the city on the daily basis, as well as begin to accumulate data to create a master list of available Airbnb properties in the historical center. This information is a useful tool and means of proving concepts that are explained in the Results and Analysis section of the report.

### 3.1.2 Review and gather data from websites

During the preparation term of the project the group found several tourist rental websites from which we could gather desired data such as location, availability and type of rental. The first step in this part was to select the website with the most listings and useful data available. We reviewed Airbnb, Booking.com, TripAdvisor sites, and HomeAway sites to determine which had the most complete data.

Since Airbnb is significantly larger than its competitors and the Venice Project Center has already worked on projects including Airbnb analysis, we decided to focus primarily on analyzing Airbnb data. Through an automated script written in the Ruby programming language our team gathered information on available Airbnb listings, such as their listing ID, number of free rooms, location, host, and price per neighborhood. This data was stored on a PostgreSQL database and then, using a second Ruby script, organized and published to Firebase, a free online database tool made by Google. Storing information in a database was necessary due to its size, since PostgreSQL is made for handling very large datasets. We analyzed the gathered data with another Ruby script, calculating things such as average price, number of listings per neighborhood, and occupation trends.  We analyzed the distribution of popular listings, distribution of full house rentals versus private room rentals and more details that are described in the analysis of this data.

This data is interpreted by an online widget created with HTML and Javascript, and visually represents the data we collect in real time in the form of maps, graphs and charts for public viewing. The online widget is discussed more in depth in the next section.
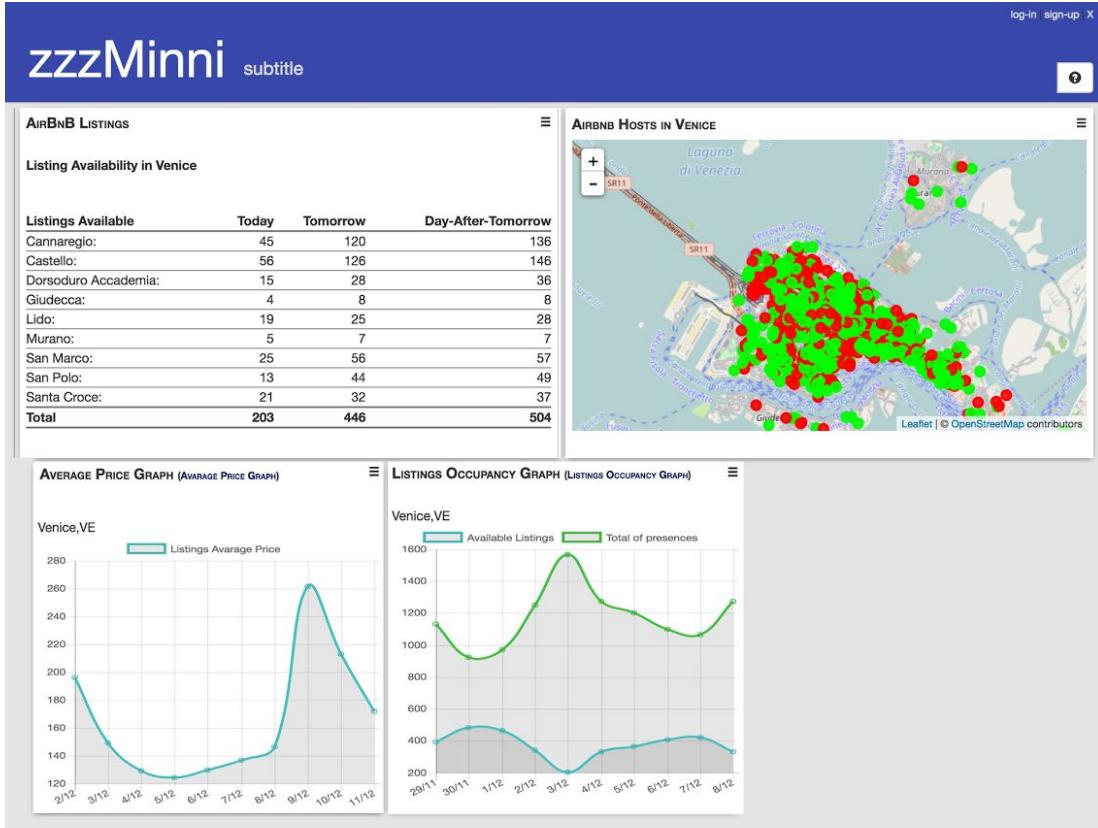
### 3.1.3 Determining accuracy of gathered data

The team acquired extensive data on the tourist vacation rental market in Venice from Murray Cox of InsideAirbnb and Airdna, a company that uses algorithms and data gathering to aggregate information on Airbnb rentals. The team reviewed the data sets and reports provided by InsideAirbnb and Airdna in conjunction with our own data gathering to analyze the historical and current tourist rental market in Venice.

### 3.1.4 Creation of Venice Dashboard Widget

In order to show the data gathered by the team from Airbnb website, we designed and created an online widget for the Venice Dashboard. This widget helps to display information relevant to other objectives such as full housing rental trends, possible unregistered rentals, tax avoidance and other topics discussed in their respectful sections. The widget will also assist in raising awareness of the current vacation rental trends that are occurring in the city.

An implementation of a GeoJson map that displays a dynamic map of Venice is the core of the widget. The map shows each listing our scraping code finds and their approximate locations using markers of different colors, such as red for occupied listings and green for available listings (Figure 6, Airbnb Hosts in Venice Widget).

**Figure 6:** Airbnb Online Widgets Created by the Team (Screenshot from Venice

Dashboard)

Next to the map we placed rows that show the availability of listings in each district for three consecutive days, taken from the firebase described in the previous section (Figure 6, Airbnb Listings Widget). Finally, the widget has two graphs that display information availability and average costs of listings from Airbnb in the past 10 days of data scraping (Figure 6, Listings Occupancy and Average Price Widgets). All of these widgets have been created using templates provided by Tomaso Minelli as method of displaying information online in real time.

## 3.2 Determining Trends in Residential Housing in Venice

The Venice Project Center acquired housing tax data known as the Imposta Municipale (IMU) from the City of Venice. We also received data related to municipal services taxes, and data provided to us by multiple other organizations such as ATER and IRE. This data was used to establish trends in housing ownership and provide a better understanding of housing distribution on the islands of Venice.

### 3.2.1 Organize tax data on Venice's public housing stock

The IMU data that was given to the team in the CSV file format that shows plain text separated by commas, was organized and moved into the project center database for use in future projects. The organization was done primarily in Excel and PostgreSQL software programs, and specifically involved conversion of files from PDF format, cleaning textual data for possible anomalies such as typographical errors, and determining what types of information provided in these files. An estimate of the total number of houses in Venice was generated from the size of this dataset. We attempted to look for trends in use, ownership, and location of the properties within Venice. We created datasets to help us illustrate details about the current condition of Venice's housing market for use by future groups.

### 3.2.2 Create graphics to help visualize housing availability in Venice

The team created infographics on cost, occupancy, and ownership demographics to help visualize the tax market data. We primarily used QGIS, an open-source mapping software, to generate visuals that demonstrating the patterns we found in housing throughout Venice. By compiling these trends, we created a visuals to display the datasets we collected, making patterns in ownership visible. The visuals can be found through our report, specifically in our results section 4.1, where the housing patterns we discovered in Venice are discussed.

### 3.2.3 Update Venipedia housing information

We expanded the available information related to housing on the data resource website, Venipedia, by adding updated data related to the tourist rental market to the existing 'Accommodations' page. Also, since no page previously existed that had information about housing in Venice outside of the context of tourism, we created an additional Venipedia page with information about the residential housing market in terms of housing agencies and available housing programs and initiatives to help those who do not speak Italian navigate the somewhat complex system.

## 3.3 Comparing and Adapting Financing Programs to Assist Young Venetians in Acquiring Property

In addition to exploring the private real estate market using tax data, we investigated the public housing supply. The group investigated current methods to assist locals in acquiring housing through extensive research on various programs and the housing owned by these organizations. This included both public and charitable organizations.

### 3.3.1 Extend Research on Public and Charitable Housing Agencies and Initiatives in Venice

Prof. Carrera and Venice Project Center assistants identified possible repositories of information on housing assistance in Venice. The team also interviewed Mr Minelli, former director of the public housing agency known as the IRE in Venice. He was able to list the major housing assistance agencies in Venice.

Based on his advice and on our own research we identified several entities that are involved in housing initiatives for Venetians with significant real estate holdings including the IRE, ATER, the Catholic Diocese of Venice or "CURIA", and the City of Venice. We performed extensive research on each agency to understand the history, workings and interrelations in terms of use and availability of housing stock. Since much of the information on these entities is available only in Italian, it was necessary to read and translate considerable documentation to be used in our analysis, final assessment and recommendations.

In addition to finding more complete information about the housing assistance in Venice, we also conducted a more focused search on housing assistance programs in Venice. We also

researched other cities for new initiatives created in response to the effects of the tourist vacation rental industry. Since much of the information on housing initiatives and programs is available only in Italian, it was necessary to read and translate considerable text to be used in our analysis and recommendations. The most relevant of these initiatives were then analyzed for potential applicability to Venice and for incorporation into the Recommendations section of this paper.

## 3.3.2 Collect Property Data of Patrimony of Charitable and Public Housing Assistance Agencies

We conducted focused research on the properties each housing agency has under management. We were given numerous sets of data from these organizations containing the housing units they own. Properties were identified and details about location, size and current use were collected and entered into a database for ease of analysis and for inclusion as part of a newly created Venipedia page.

Detailed information about locations of properties involved in housing assistance was acquired through extensive research in Italian and by the VPC contacting organizations for their internal spreadsheets, which were provided. However, a significant amount of these spreadsheets contained irregularly formatted information and addresses containing insufficient information to find them, making these properties difficult to map and impossible to use for cross referencing.

## 3.3.3 Create Venipedia Pages for Public and Charitable Housing Agencies Programs

Once we completed our research on the public and charitable housing agencies in Venice and created the database (see Sections 3.2.1 and 3.2.2), we further examined and organized this information. We also added a new Venipedia page with information about patrimony, or property belonging by ancient right or endowment, and initiatives of Venice and public and charitable entities that provide housing to residents including the IRE and ATER. The Venipedia pages give the history of each organization and details regarding the properties they provide for the people of Venice and some of their housing initiatives and programs.

References and links to the pages created during this step are referenced below in the Results and Analysis Section 4.

## 3.4 Analyzing the applicability of tourist rental regulation policies to Venice's situation

In order to analyze the applicability of tourist regulation policies, it was necessary to determine which issues are most prevalent in the Venetian vacation rental market. Previous research indicated that foreign ownership of property being used for commercial reasons may be an area of consideration for regulation, discouraging non-residents from buying property to make a profit (Hospitality, 2016). Additional research of housing regulation policies was performed by the group on site in Venice. The group has visualised the information gathered, making it accessible to anyone through infographics such as charts and maps.

### 3.4.1 Create a list of common housing issues associated with the tourist rental market

The team researched and investigated articles and studies about existing housing issues associated with the tourist rental market indicated in Sections 2.3 and 2.4 of our Background chapter in order to investigate which regulations would be applicable to the particular situation in Venice. From this research, we collected and organized the most common housing issues which included subletting, tax dodging, avoiding registration as well as entire home rather than single room rentals so that we may use this information in analyzing issues of particular concern for Venice.

## 3.4.2 Determine if whole house vacation rentals impact Venice's housing market

Using the tax data provided to the team by Venice Project Center, as well as the research that has been done using available online sources, the team analyzed to what extent whole house rentals are present. First, the team investigated the scope of the issue and determined how well is it applicable to Venice. This was done by comparing the relative percentages of whole apartment and private room rentals, and by comparing this ratio to other popular tourist cities by using the data available at InsideAirbnb and data provided by Tom Slee, an author who has published a book about the sharing economy and does analysis of Airbnb. We found that this was a common issue in Venice relative to other tourist rental related problems. The data necessary to examine this issue is also readily available from website scraping, making it an excellent issue to pursue for further research. We used data available for purchase from Airdna to help confirm that we were generating accurate real time numbers by ensuring confirming that our data on rental types and total number of rentals matched theirs within a reasonable error percentage. We continued our investigations by making comparisons of the percentage of full apartment rentals by neighborhood, and the relationship between full apartment rentals and expected landlord profit.

## 3.4.4 Determine appropriate rental regulations for the problems applicable to Venice

For the issues including full-house rentals, unregistered rental properties, and tax avoidance, the group investigated solutions that other cities and countries applied when

encountered with the same issues. To demonstrate the existence of these issues and in order to be able to present the data in an organized visual, the group created an Excel spreadsheet and a Compendium of the main areas of regulation enacted by other cities. These documents have since been consolidated and refined, and can be found in Appendix C. Recommendations about promising policies are included based on the information analyzed as part of the Results & Analysis portion of this paper.

# 4. Results and Analysis

This section of the project report discusses the final results of the team's work on the objectives throughout the term, explains the work produced and results discovered at the final stage of objective completion. The section focuses on past the vacation rental market in Venice, Airbnb Data, Airbnb Widget for Venice Dashboard, the workings of housing assistance agencies and the properties they own for use as public housing and vacation rental regulation policies of other cities as applicable to Venice.

## 4.1 Residential and Vacation Rental Housing in Venice
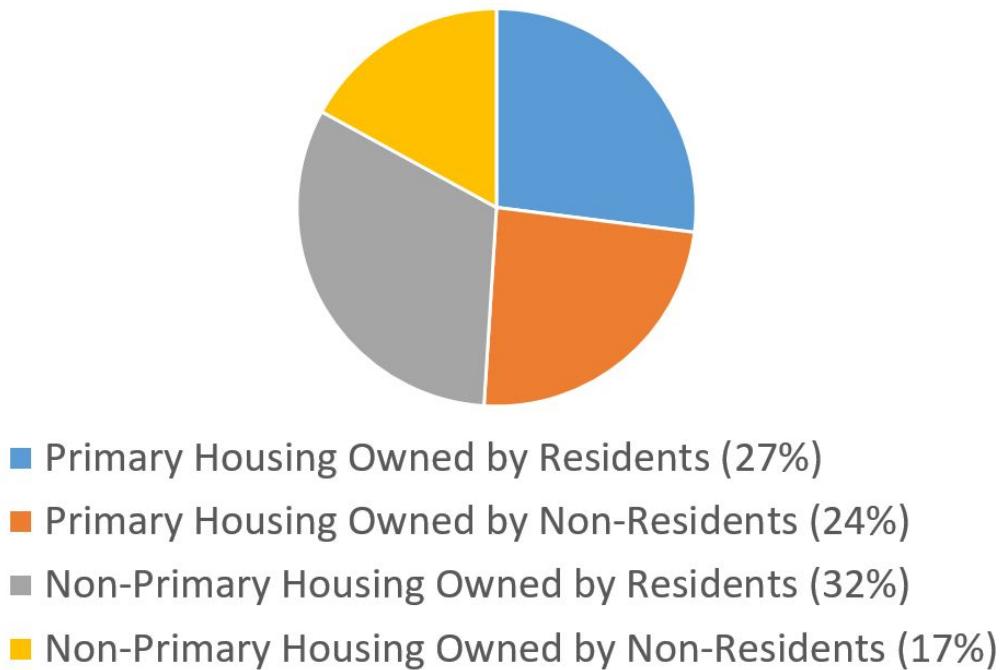
In this section, we present the results of our study of the the IMU and TASI data and our analysis of the patterns of ownership for both residential and vacation rental housing in Venice. We also present our analysis of the data and research on the tourist vacation rental industry and its effect on the residential housing market in Venice.

### 4.1.1 Residential Housing Ownership and Use in Venice

According to city property tax data and estimates based on census data, there are approximately 38,000 residences in the historic center of Venice. Using columns in the data relating to property owners' place-of-birth, we determined that individuals who were not born in Venice own about 80% of residential properties in Venice.

Approximately 51% of residential properties are listed as the owner's "PRIM RESIDENZA", or "Primary Residence" The other 49% (18,620) of the total Venetian residences
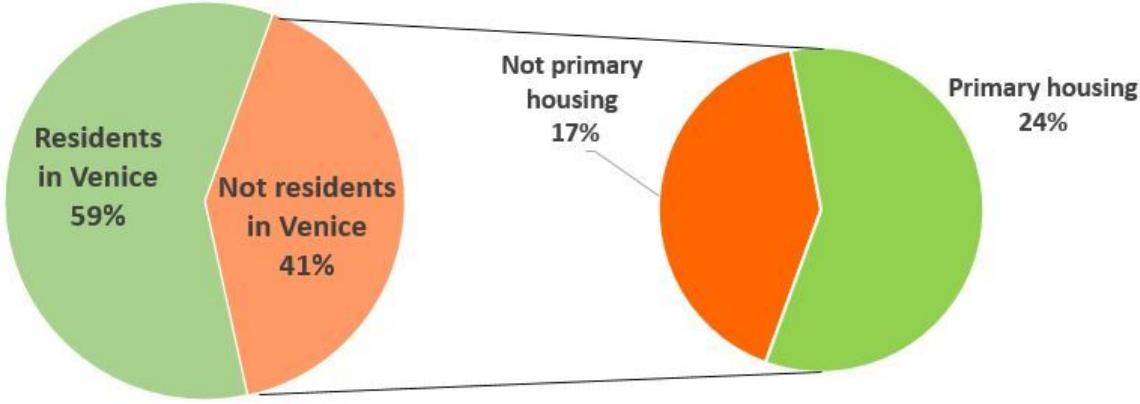
are listed as non-primary residences, indicating they could be secondary homes or tourist rentals. Another column in the data set lists 24% of residential property in Venice in the tax category of either "Popular" or "Ultra-Popular", meaning that they are government housing for low income citizens and those in need of housing assistance.



**Figure 7:** Primary housing owned by current residents and non-residents in Venice.

After further analysis of the IMU tax data, we were able to determine that 59% of residential property in Venice is actually owned by current Venetian residents. These are people that may be born outside of Venice, but are currently registered as residing in Venice. Non-residents own approximately 41% of the residential property (about 15,580 homes). As shown in Figure 8, of these 15,580 homes, approximately 17% (6,460) are non-primary

properties and 24% (9,120) are marked as 'primary housing' owned by individuals who do not reside in Venice.



**Figure 8:** Primary housing and non-primary housing by property owners who are not current residents of Venice

Since there are some uncertainties in our interpretation of each data field, we are not able to determine exactly what kind of properties are defined as both a primary residence and owned by non-residents. This data may require further investigation by future teams to clarify its meaning.

By integrating the percentages from property ownership data with the data on property use gleaned from TASI data, we were able to deduce approximate values for various statistics about the residential market. Of the 18,620 properties that are not currently primary residences, we estimate that, non-Venetian residents own only 15,580. We determined, therefore, that Venetian residents own the remaining 3,040 properties, or about 12.5% of the total non-primary residences.
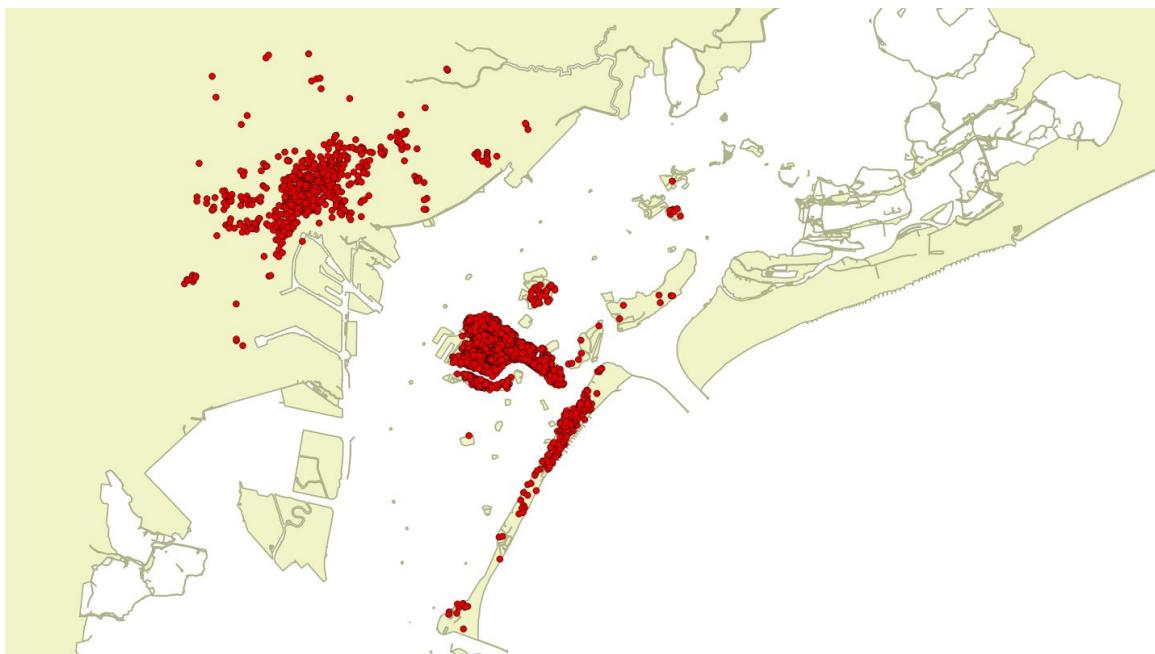
## 4.1.2 Overview of Vacation Rental Data

Using city property tax data and estimates based on census data, we were also able to determine and map the approximate locations of 84% of the total 38,000 residential properties in Venice as shown below in Figure 8. We estimate that between 5,000 and 10,000 properties are used primarily as tourist vacation rentals.



**Figure 9:** Dwellings in the historical center of Venice (Obtained using data from IMU)

Nearly 5,200 of these homes are listed with Airbnb as tourist vacation rentals. As Figure 9 shows, these properties are concentrated around Mestre on the mainland and in the historic center of Venice and the lagoon. The map in Figure 9 illustrates the heavy concentration of properties in historic Venice, totally 4,000 or 77% of all Airbnb listings in the area, as shown in Figure 10.



**Figure 10:** All Airbnb listing in Venice (InsideAirbnb, Oct 2016)

**Figure 11:** Airbnb rentals in the historical center (InsideAirbnb, Oct 2016)

To determine whether the concentration of tourist vacation rentals in the center of Venice had an effect on housing in Venice, we analyzed historical data provided by Airdna and Inside Airbnb to determine trends in listings. Airdna tracks daily performance of millions of Airbnb listings throughout the world to get data for commercial and investment analysis. InsideAirbnb is a website created by an activist, Murray Cox, interested in investigating the impact of Airbnb on neighborhoods in popular tourist destinations. We examined several Airdna reports featuring occupancy rates, seasonal demand, and revenue generated by thousands of listings in Venice, and received approximately 14 months of detailed spreadsheets about listings in Venice from Inside Airbnb for us to use in our analysis.
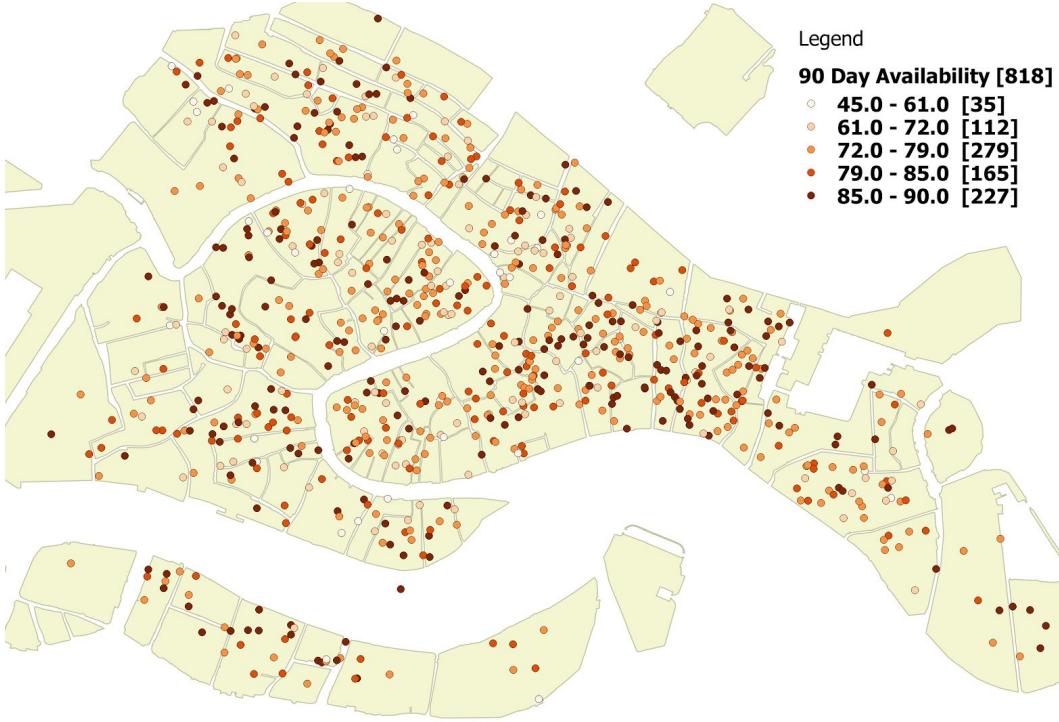
The detailed InsideAirbnb data contains a large number of information fields about each listing, including the Airbnb ID numbers of the listing and the host, the latitude and longitude

locations of various listings as reported by owners, the number of listings held by the same host, the number of reviews per month, and whether the listing is a full home, private room, or shared room.

## 4.1.3 Rates of Occupancy and Availability of Vacation Rentals

Data about the availability of each listing for the coming year at the time of data gathering was provided by InsideAirbnb and analyzed by the team to determine rates of occupancy of tourist vacation rental listings. However, examining the 365 day availability data made it apparent that most hosts do not update their calendar that far in advance, so it is more useful to look at 30, 60, and 90 day availability data.
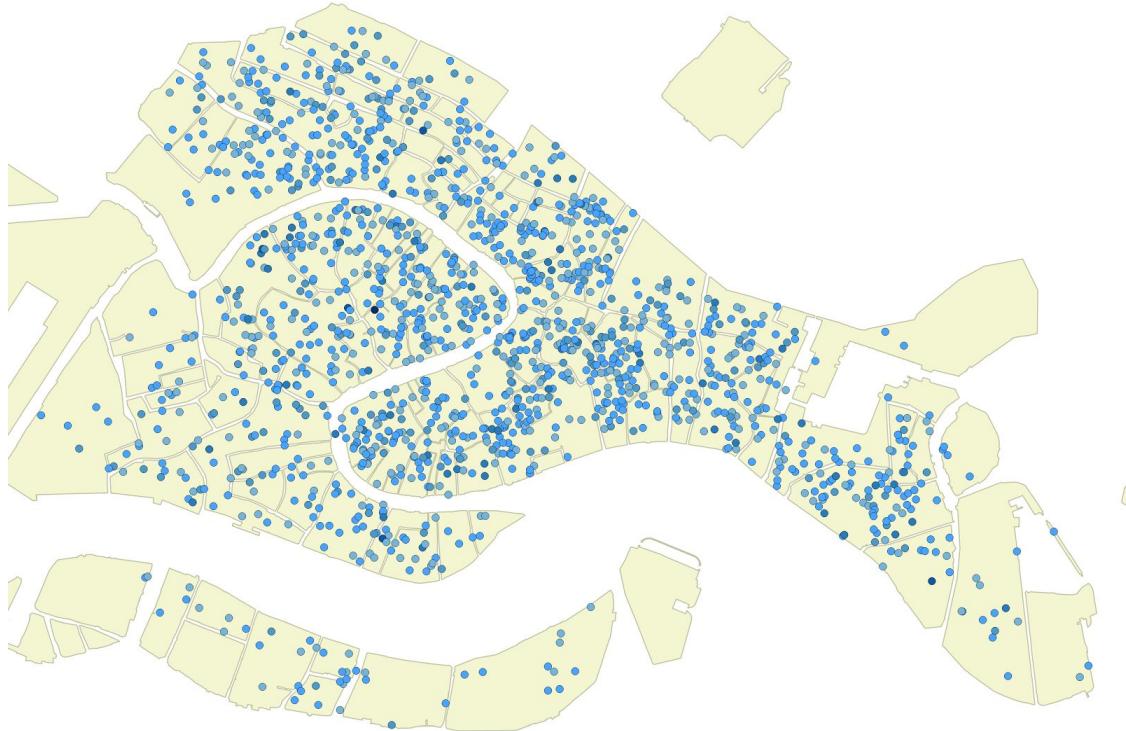
One way to identify listings with high availability over a longer period of time, rather than a single open month, is to search for listings with greater than 50% availability by multiple measurements. For this set of results, we defined 'high availability listing' with greater than 15 day availability over a 30 day period and has greater than 45 day availability over a 90 days. Within the historical center this identifies 818 out of 4038 listings, or about 20% of the total listings, shown in Figure 11. The major problem encountered with this method of plotting future availability instead of past occupancy is that listings whose hosts are not currently active and are not updating their calendars or accepting bookings are also sometimes included as having high availability if they left their calendar open before they stopped checking the site. Therefore, some listings in Figure 11 may be marked as having very high availability when they are not active at all.

**Figure 12:** High availability listings on the historical center (InsideAirbnb, Oct 2016)**.**

More complex analysis of the number of days a month a listing was available, and how it changes over time, could eventually be used to retrospectively determine the number of days a listing was occupied. Because hosts have different methods of opening availability for future months of the calendar for availability, this method needs to be applied carefully to avoid drawing erroneous conclusions. One way to approximate occupancy is to use the number of reviews per month. InsideAirbnb estimates that reviews represent 50% of bookings, we chose to match their methodology. To estimate 90 day occupancy, we looked for listings whose first review and most recent review were left at least 90 days apart and had at least an average of at least 1 review per month. Using this method of analysis we found approximately 2000 listings in the historical center that we estimated as having greater than 90 day occupancy. Then, to avoid including people who rent out an extra room for most of the year, we also removed all private

and shared room listings, resulting in our final estimate of greater than 90 day occupancy, Figure 12. This graph contains 1,549 listings, or about 38% of the listings in the historical center.
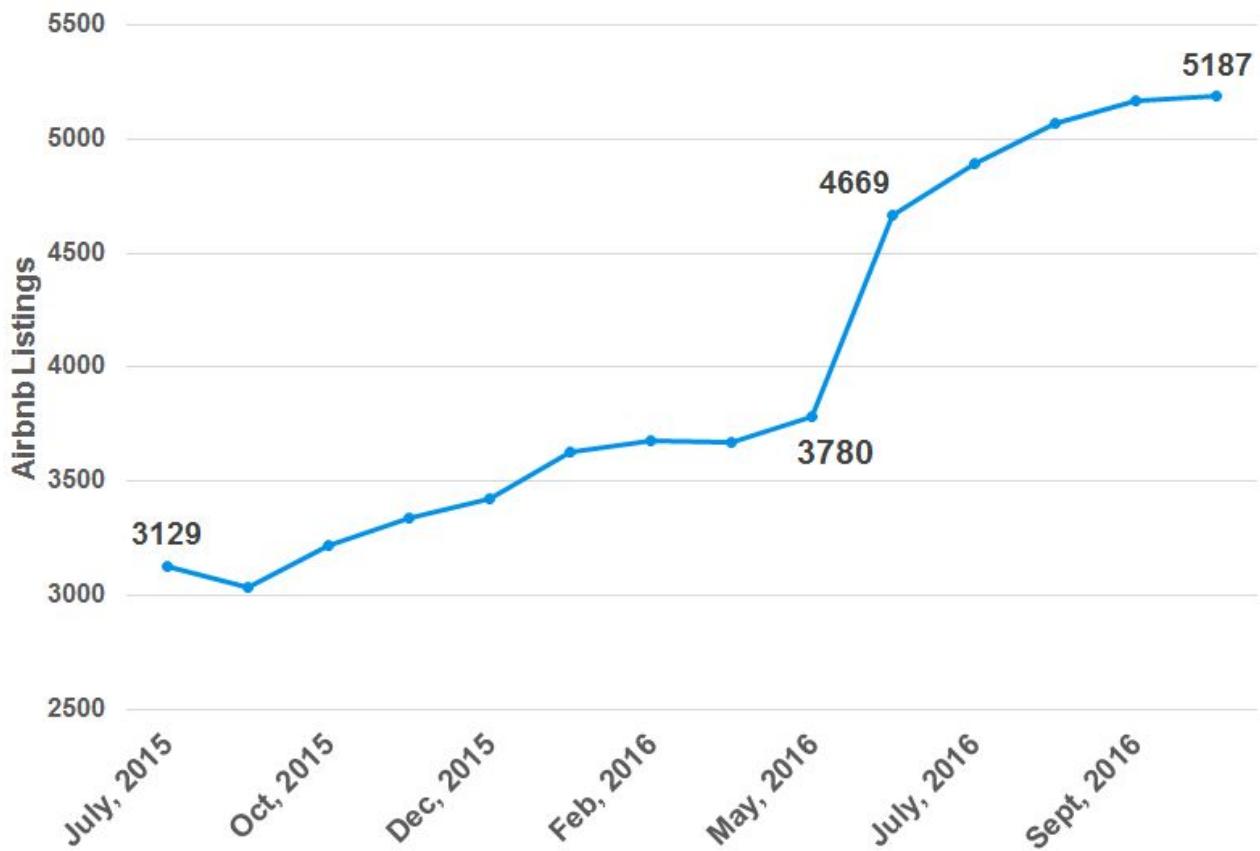


**Figure 13:** Estimate of whole house properties with greater than 90 day occupancy (InsideAirbnb, Oct 2016). Darker blues indicate properties with the biggest gap between their first and most recent reviews.

We determined that a better method to calculate occupancy would be daily analysis, rather than monthly. However, since daily data was not available to us, we created a method to collect it, with a Dashboard widget discussed in section 4.2 below.

### 4.1.4 Extent of Vacation Rental Listings

The team analyzed aggregate data over time, including the growth of listings in the past year and what percentage of those listing were on the historical island rather than on the mainland portion of Venice (Figure 14).



**Figure 14:** Number of Airbnb listings in Venice showing how the number of listings is growing (InsideAirbnb, 2016). Created using data collected by Murray Cox between July, 2015 and October, 2016.

The number of Airbnb listings in Venice have gone up, increasing by about 60% in one year. This graph was created using the data received from Murray Cox of InsideAirbnb and shows the growth of Airbnb listings in Venice from 7th of July of 2015 until 5st of October 2016. As can be seen on the graph in Figure 14, the number of Airbnb listings have rapidly increased, most dramatically between the months of May and July, where almost 1000 new listings were added to vacation rental market. The summer rise of listings is a result of a tourist season that starts in May when the weather becomes warm and more and more people are planning for vacations and end of school trips. Closer to the month of July, Venice becomes populated by tourists causing more hosts to put their apartments and homes for rent on websites such as Airbnb (U.S. News, 2016).

The growth between May and June can be attributed to beginning of the peak tourist season during the summer. However, the number of listings did not significantly decrease back to its original level at the end of peak tourist season - in fact, it continued to rise slowly through the end of the data data collection curve.

The data in Figure 15 shows the percentage of listings in the historical city rather than the mainland of Venice from 1st of October 2015 until 1sth of September of 2016.
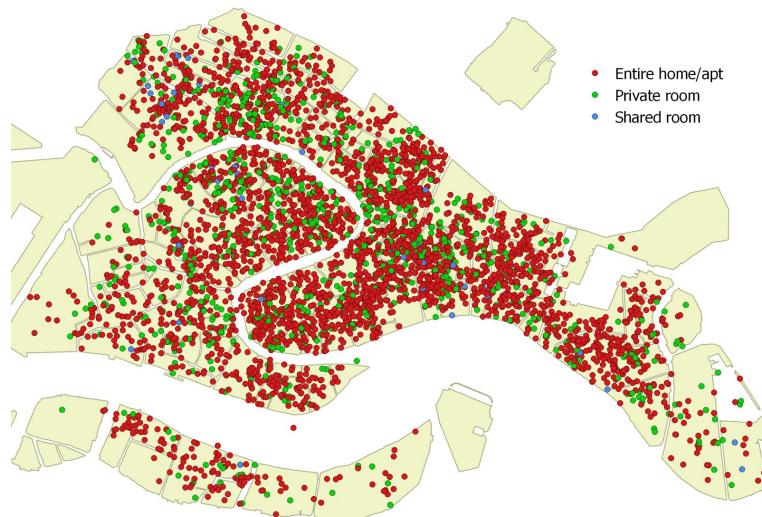
**Figure 15:** Percentage of vacation rental listings in the historical center, rather than the mainland or small surrounding islands (InsideAirbnb, 2016)
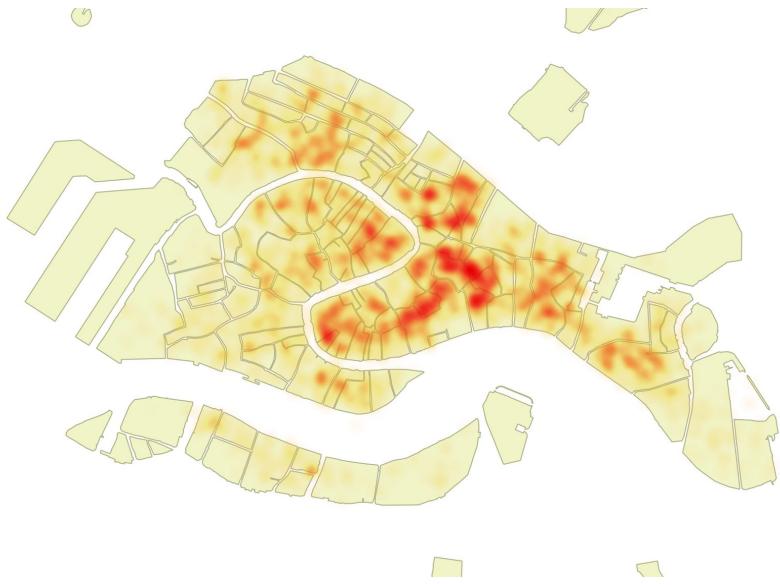
The graph shows the rise in the relative number of listings up until June of 2016 after which the percentage drops approximately 12% until the month of September when it starts to climb back up slowly. This transition occurred in the same month as the sharp rise in the number of in the total number of listings, indicating that a disproportionately large amount of the listings that appeared to take advantage of the summer tourists were in Mestre, or on the mainland portion of Venice, not in the historical center. If this growth was disproportionate due to a small growth in the historical center, it would be possible to interpret that as a positive sign for the housing market, however the number of listings in the historical center is still going up - the listings on the mainland are just going up faster. This may have a negative effect on Venice because it encourages daytrippers, who tend to spend very little money compared to people who spend the night on the island (Connor, et. al., 2015)

## 4.1.5 Impact of Vacation Rentals by Type

The team focused on full house rentals because they are likely to have the biggest impact on the residential housing market. Private room and shared room rentals have much less potential negative effects on the housing market as they are not the type of housing that Venetians typically seek. These listings are operated in a more traditional bed and breakfast style and are still owner occupied and provide property owners with the opportunity to supplement their income. Private room listings are a reasonable way to use the vacation rental market to encourage overnight tourism while minimizing the potential impact on the housing market. Therefore, the team determined to focus our analysis on the Airbnb listings composed of full homes. A map and a heat map of full home rentals in Venice are visible below, in Figures 16 and 17.
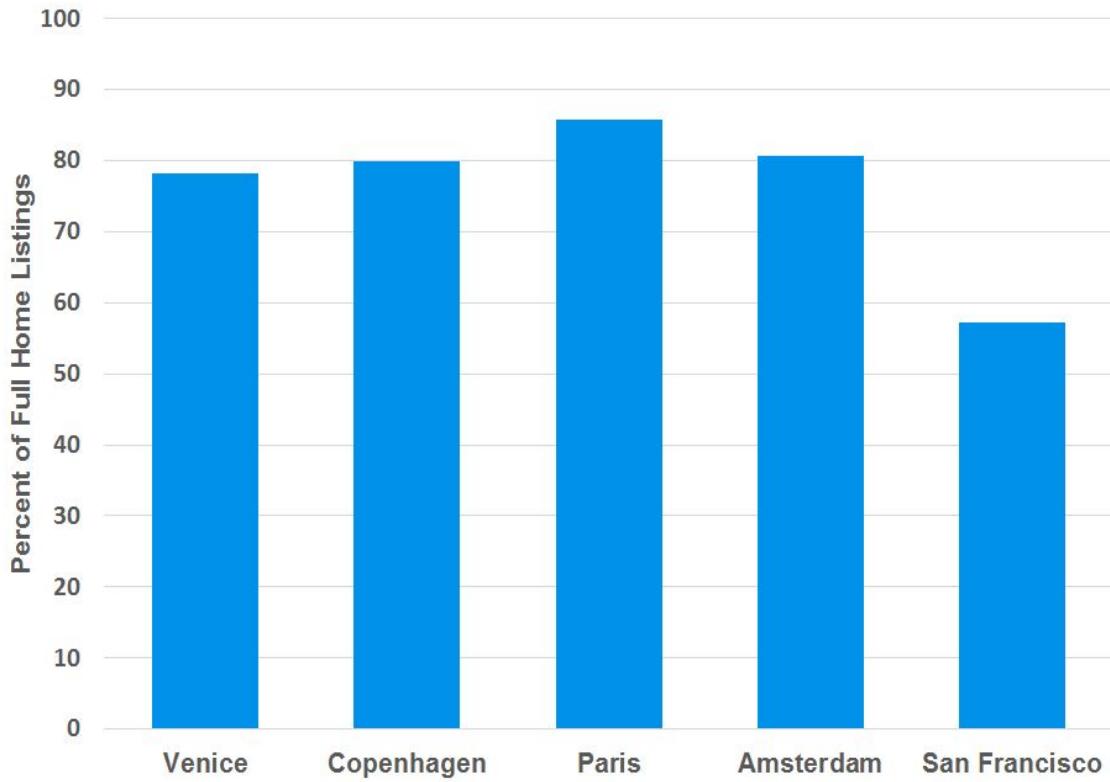


**Figure 16:** Map of approximate locations of vacation rentals, categorized by room type.

(Inside Airbnb, 2016)**.**

**Figure 17:** Heatmap showing vacation rentals, weighted based on room type. (InsideAirbnb, Oct 2016) The highest concentration of tourist rentals is the neighborhoods of Cannaregio and San Marco.

According to the InsideAirbnb data from October, 78.8% of the listings are entire houses or apartments. Private rooms make up 20.1% of the listings, and the remaining 1.1% is shared rooms, which would have a similar impact on the housing market to a private room but are far less common on Airbnb. Almost 8 of every 10 listings may be not owner occupied, suggesting that they are probably owned specifically for vacation use. Data about the percentage of full home listings, also available from InsideAirbnb and shown in Figure 17, reveals that it is common to have a composition of over 70% full home rentals, and virtually no city with a significant tourist presence had less than 50%.

**Figure 18:** Analysis of Airbnb listings showing percentage of full home listings (as opposed to partial home listings) for selected cities (InsideAirbnb, 2016). In Venice 79% of all Airbnb listings are full homes.
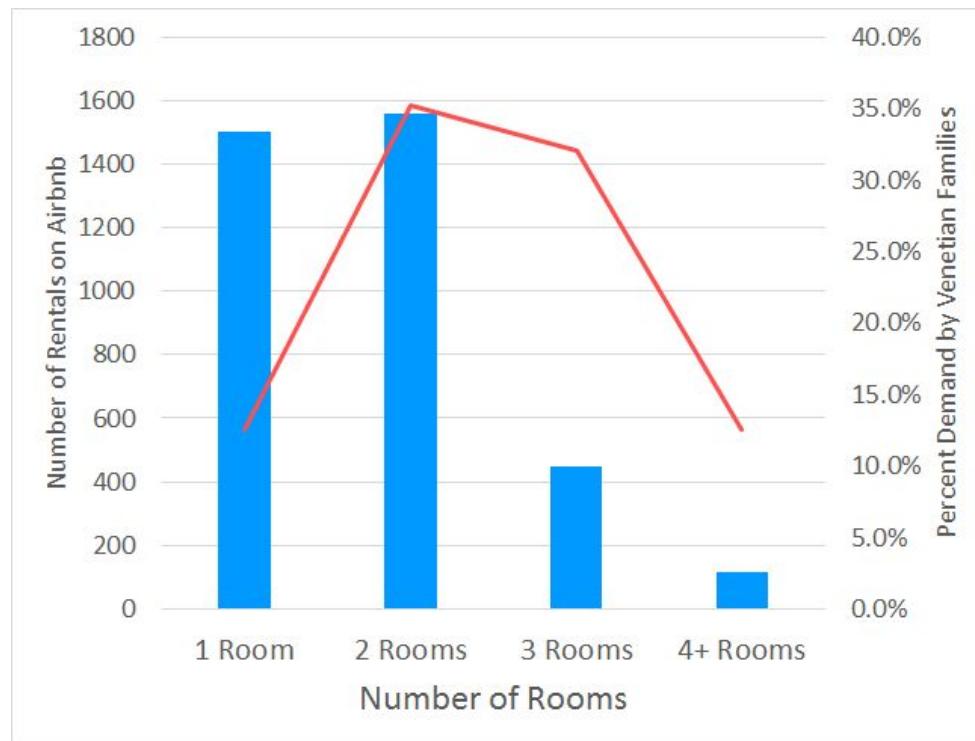
The high percentages of full home rentals worldwide suggests that Airbnb is used more like a hotel room than a more conventional bed and breakfast platform.

## 4.1.6  Residential Housing and the Price of Vacation Rentals

Tourist vacation rentals in the one to three bedroom category are most likely to affect housing most desired by young Venetian families and couples.  According to data provided by Osservatorio Casa, the size of apartments that are in the highest demand by Venetians are two to three bedroom apartments.  Seventy five percent of Venetians desire housing of this type (Osservatorio, 2012).

Our analysis of revenue generated by Airbnb properties per size and occupancy was based on data collected by Airdna. This data was perhaps the most conclusive in demonstrating the impact of tourist vacation rentals on the price of the local Venetian housing market. A one bedroom vacation rental apartment in the month of October can generate between $2,690 and $3,741 per month compared to an average of only $600 to $700 per month for the same category housing on a residential lease, as detailed in Section 2.1.2 above (Airdna, Oct 2016).

The fact that it can be so much more profitable to rent an apartment to tourists and the growth of Airbnb suggests that these apartments may in some cases be purchased purely as a business venture.
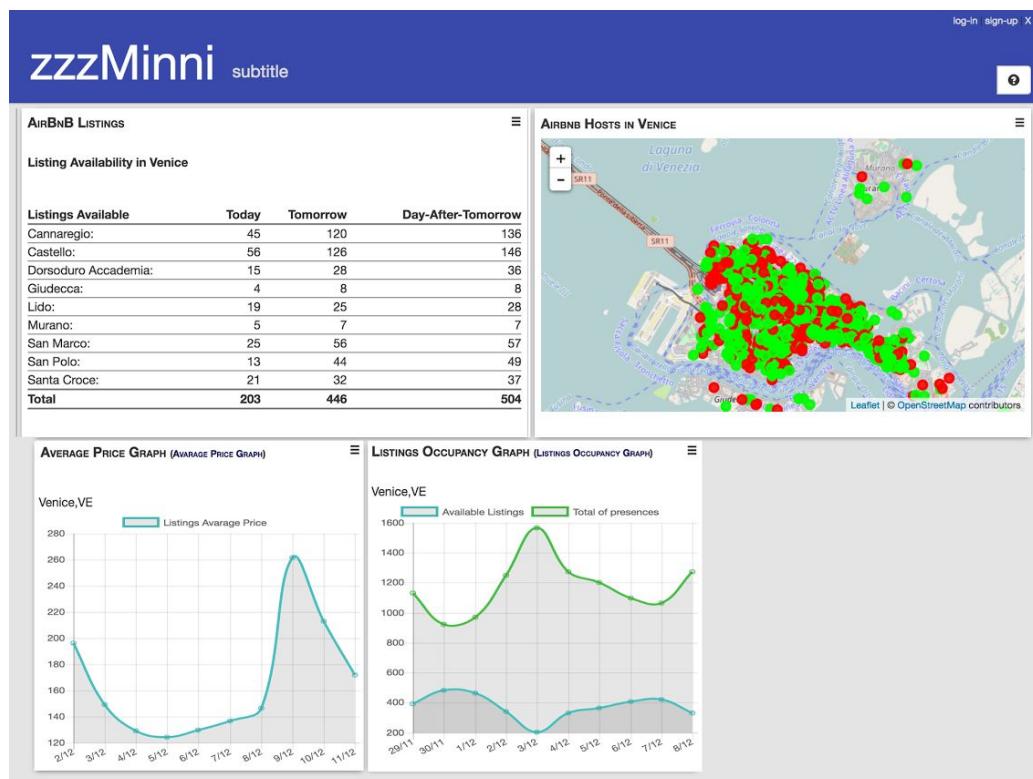


**Figure 19:** Relationship between the most common rental types on Airbnb and the type of housing demanded by Venetian families (Osservatorio, 2012)

In overlapping the data between demand for type of apartment by Venetians and that of the most common Airbnb listing shown in Figure 19, team concluded that some of the properties that are most in demand by tourists are the same that young Venetians and families are having difficulty affording: two bedroom apartments. Therefore, having an adequate supply of this size property may be problematic for the city especially if the number of tourist vacation rental listings continues to rise.

## 4.2 Airbnb Widgets for the Venice Dashboard
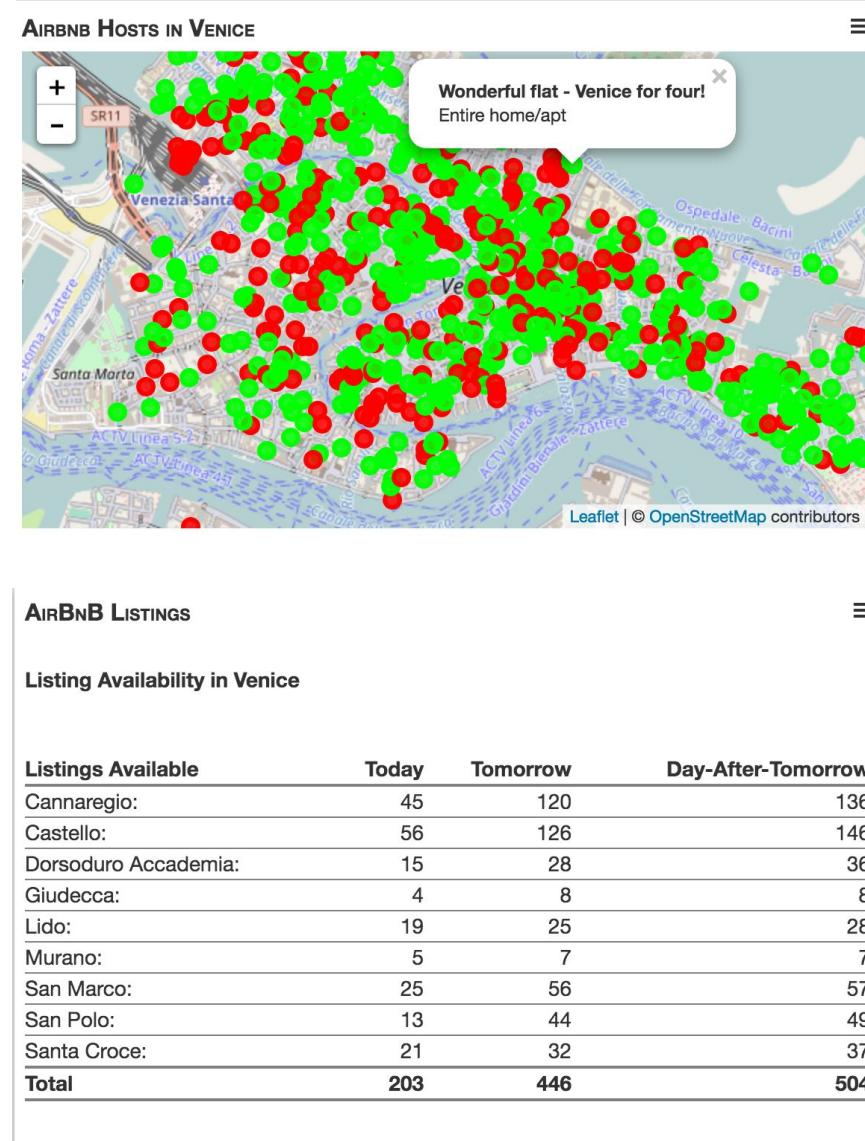
To avoid relying on static data that must be purchased or requested from organizations such as InsideAirbnb and Airdna, our group has created multiple online widgets that collect and display data from Airbnb website such as listings' availability, approximate location, cost trends, name, type and occupation across the nine districts of Venice (Figure 20).



**Figure 20:** Airbnb Online Widgets Created by the Team (Screenshot from Venice Dashboard)

These widgets allow users to visualize the data that our scripts gather from Airbnb, displaying it an easy-to-read manner. Our team hopes that these widgets will prove to be useful tools for anyone working on monitoring or regulating the vacation rental market in Venice. The

two widgets we created,  "Airbnb Hosts in Venice" and "Airbnb Listings,"  allow users to

monitor the availability, location, type and name of each Airbnb listing we are able to record.



**Figure 21:** Airbnb Hosts in Venice and Airbnb Listings online widgets (Screenshot from

Venice Dashboard)
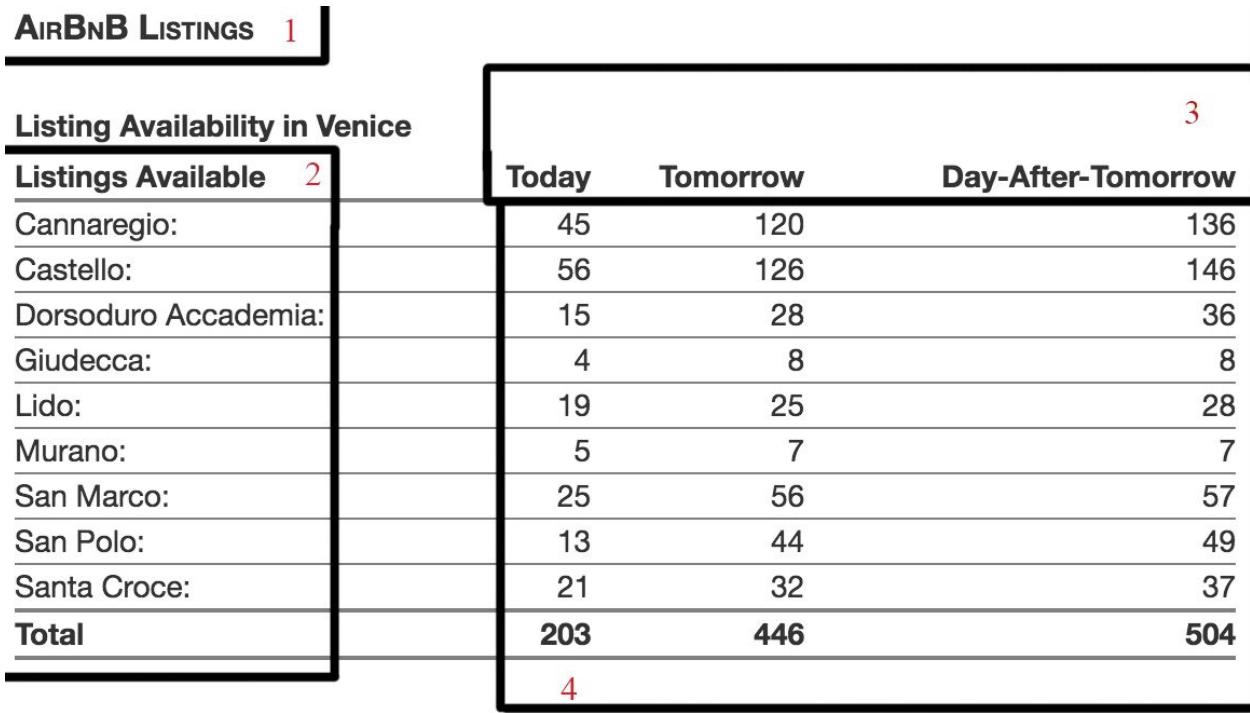
The "Airbnb Hosts In Venice" widget in Figure 20 displays data for listing availability on

the map using green and red dots for available and unavailable listings respectfully. Additionally,

the widget map provides approximate coordinate locations of AirBnB listings, showing the given location of listings as they are reported by owners on AirBnB website and recorded by the widget. Additional detailed information about each individual listing such as name and type is accessible for viewing by clicking on any of the listings.

The "Airbnb Listings" widgets displays the number of available listings in nine districts of Venice for three consecutive days including the current day and the two that follow. This widget is less interactive, however the data it is displaying allows us to monitor the busiest and most popular districts in Venice when it come to Airbnb Listings.

## 4.2.1 "Airbnb Listings" and "Airbnb Hosts in Venice" Widgets Overview

We started the design for the widget by first making a list of pertinent information that we needed to include for optimum visualization and ease of understanding. In this section, we discuss the individual components of the widget and an explanation of their functions (Figure 22).

**AIRBNB LISTINGS**  1

**Listing Availability in Venice**

| Listings Available  2 | Today | Tomorrow | Day-After-Tomorrow  3 |
|---|---|---|---|
| Cannaregio: | 45 | 120 | 136 |
| Castello: | 56 | 126 | 146 |
| Dorsoduro Accademia: | 15 | 28 | 36 |
| Giudecca: | 4 | 8 | 8 |
| Lido: | 19 | 25 | 28 |
| Murano: | 5 | 7 | 7 |
| San Marco: | 25 | 56 | 57 |
| San Polo: | 13 | 44 | 49 |
| Santa Croce: | 21 | 32 | 37 |
| **Total** | **203** | **446** | **504** |

4

**Figure 22:** AirBnB Listings Widget Overview (Screenshot off the Venice Dashboard). Box 2 indicates list of districts.  Box 3 displays time scope. Box 4 shows number of available listings

## 1. Name of the widget

This field shows the name for the given widget.

## 2. Listings Available in Districts
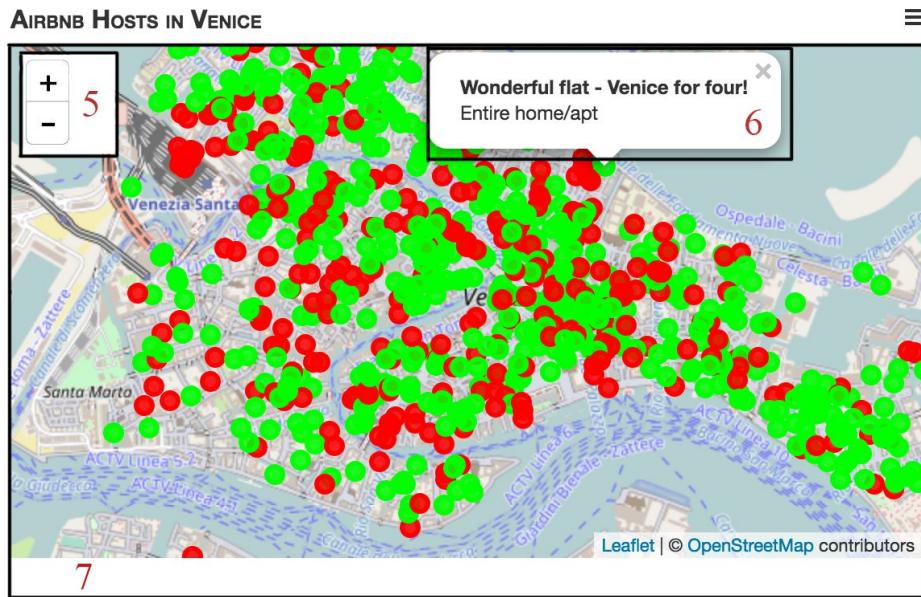
This part of the Widgets allows the user to see what districts of Venice are currently being monitored for listing availability in Venice as well as the total that will include the sum of the values received for each district.

## 3. Time Period

The widget is meant to show the availability of listings for the present day and two consecutive days marked as "Today", "Tomorrow" and "Day-After-Tomorrow".
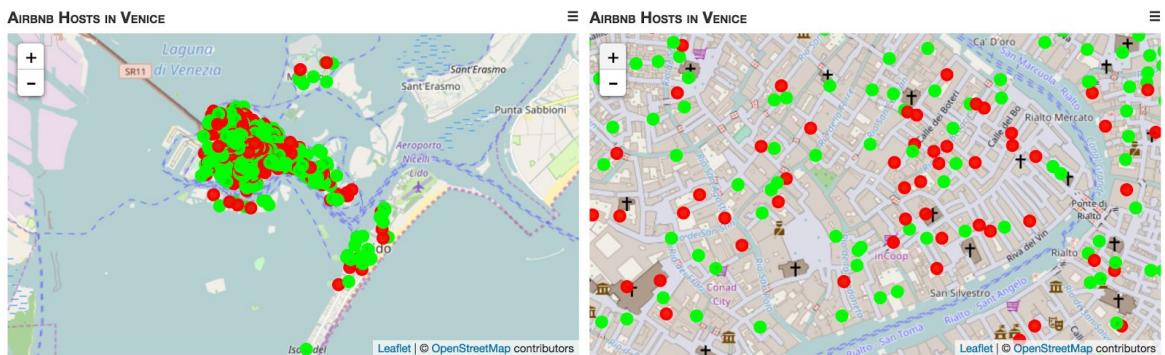
## 4. The Values

These values represent the number of available listings discovered on Airbnb website for the given scope of time and place (parts 2 and 3). On the bottom there is a combined total value for the available listings for each of the three days.



**Figure 23:** Map Widget Overview (Screenshot off the Venice Dashboard)

**5. Zoom Tool**



**Figure 24:** Map Before (left image) and After (right image) Zoom Tool application.

The zoom tool on the widget is responsible for zooming in and away from the map allowing for more clear or general information regarding the location of each listing. The

screenshots above demonstrate the widget's map before (left side of screenshot) and after (right side of screenshot) the zoom has been applied.

**6. Details Pop Up Window**

Our widget features the ability for the user to see the details regarding each listings recorded from Airbnb website, that can be accessed by pressing on the listing circle. The list of information in the pop up window includes name of the listing (written in bold) as well as its type.
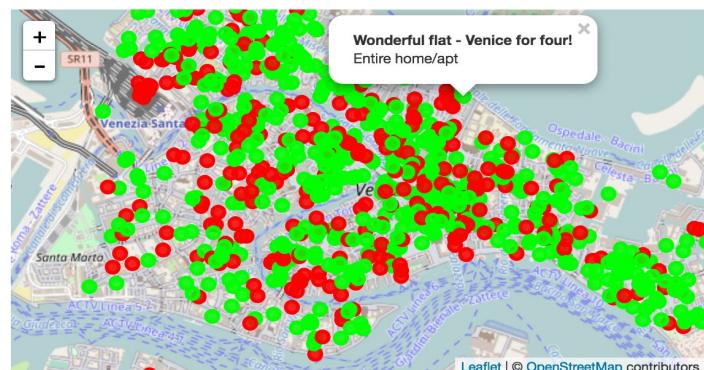
**7. Interactive map**

Interactive map is the core of the widget. The map itself is the plane map canvas that is populated and color coded (Red - unavailable listing, Green - available listing) by the script that takes information from Airbnb website.

## 4.2.2 "Airbnb Listings" and "Airbnb Hosts in Venice" Functionality

As the scraping script runs daily, the widget will continuously receive updated information about the AirBnB listings and their data such as type, approximate location, name, listing ID and district of the listing. The widget (screenshot on the right) will show the available and unavailable listings in real time using the color coding for each marker as "Red" for unavailable and "Green" for available listings, which will display the current state and availability of Airbnb listings in Venice.

The map widget collects every listing that is available in the day and

stores it on the map as a marker, accumulating every AirBnB listing in Venice over time. The widget will check available listings of the day and their ID against those already existing in the list. If the listing is new, the widget will create a new marking. If the listing has previously been seen, the widget will update the status of the marker changing its color to green (Figure 23).

## 4.2.3 "Airbnb Listings" and "Airbnb Hosts in Venice" Widgets Analysis

Using the widget map and the availability widget as a base for analysis, the team observed a few trends in the Airbnb listings including popularity and the level of occupation across the various districts. As of Saturday, December the 3rd, the number of available listings in Venice had been low, at around 23% of the tracked listings being available. The following two days, however, the widget had predicted availability of 51% and 57% respectively (Figure 6). We later compared the actual numbers for Sunday, December 4th and Monday, December 5th which were in line with the widget's prediction. The team noted that weekends are a busy time for Venice, as the tourists arrive on the island and rent out apartments for the weekend.

Examining the map widget, it can be seen that for the period the widget has been running, districts such as Castello, Cannaregio and San Marco have a greater number of listings compared to districts such as Lido, Murano or Dorsoduro in this period of time. The most populous locations are where listings are situated around large Venetian landmarks such as San Marco square and Rialto Bridge. Available listings decreased by approximately 53-65% during the weekends in November observed by the team.
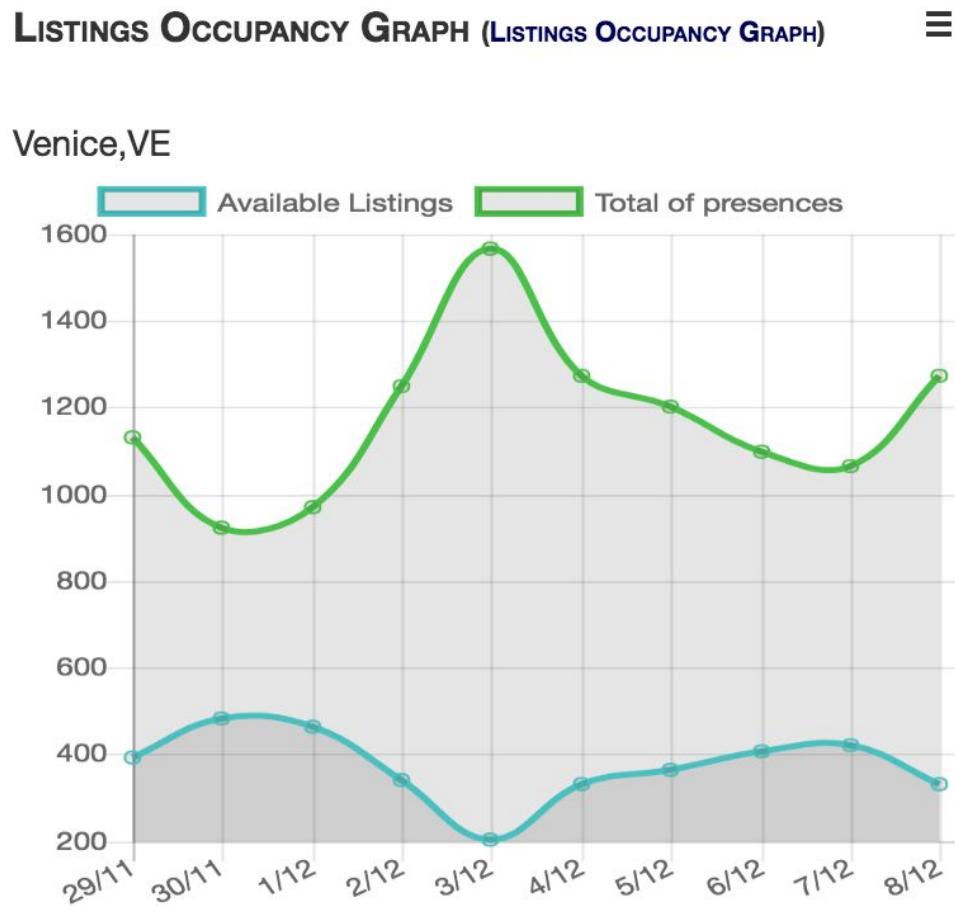
These trends in housing availability have become observable by recording information over four weeks. These measurements will become more precise over time, as more listings are

picked up and tracked during busier seasons. In order to fully maximize this widget's potential in providing a crucial data regarding these trends: if this widget continues to be maintained for future use, it will provide important information that can be used as background for further research on concepts such as availability, occupancy, popularity trends, as well as provide ideas for where the most profitable places for the districts may be situated.

## 4.2.4 Data Visualisation Widgets

In order to successfully visualise collected data for further analysis the team has created two graph widgets "Listings Occupancy Graph" and "Average Price" that display the availability, cost and occupancy (Figure 25) (or as it's called on the widget, "presence") information throughout a 10 day time period. These widgets are more simple compared to the previously mentioned ones and are intended to be another way of displaying the data that is shown on the "AirBnB Listings" widget.

## 4.2.5 Listings Occupancy Graph Widget



**Figure 25:** Graph Widget for trends of Availability, Cost and Type of listings

The first (blue) graph on the widget successfully shows the fluctuation of AirBnB availability throughout the districts of Venice in the past seven days and future three days using the data scraped from the AirBnB website. Meanwhile the second (green) graph allows to see the approximate number of people staying in Airbnb rentals in Venice over a ten day period. This is calculated using a method from "Vivere a Venezia", research paper that estimated that the

average number of occupants per home in Venice is 2.3. Using that number, we used the following formula to create a graph of average occupancy throughout Venice.

---
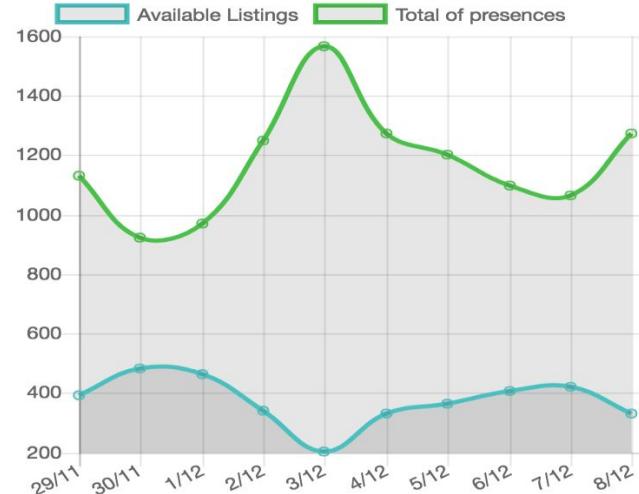
**"(Listings Total - Listings Available)*2.3 = Occupancy"**

---

One of the important functionalities of this widget is that it can be used to track the trends of listing availability and occupancy more closely, as it shows data from the previous week with a two day prediction into the future.

## 4.2.6 Availability and Occupancy Graph Analysis

One way in which our team used this graph widget and its data is establishing the weekly trends for the Airbnb listing availability. As shown on the screenshot on the right, for example, the graph of the overall availability falls as the Friday and Saturday approach. This trend can be explained by the tourists arriving on the Island to spend the weekend and leaving shortly before the start of the work week. During the weekend days, the overall population in Venice rises and it is visible on the availability chart as it falls significantly as Saturday approaches. The occupancy graph uses the information we gather on the total number of listings in Venice, the number of available listings, and the average rooms
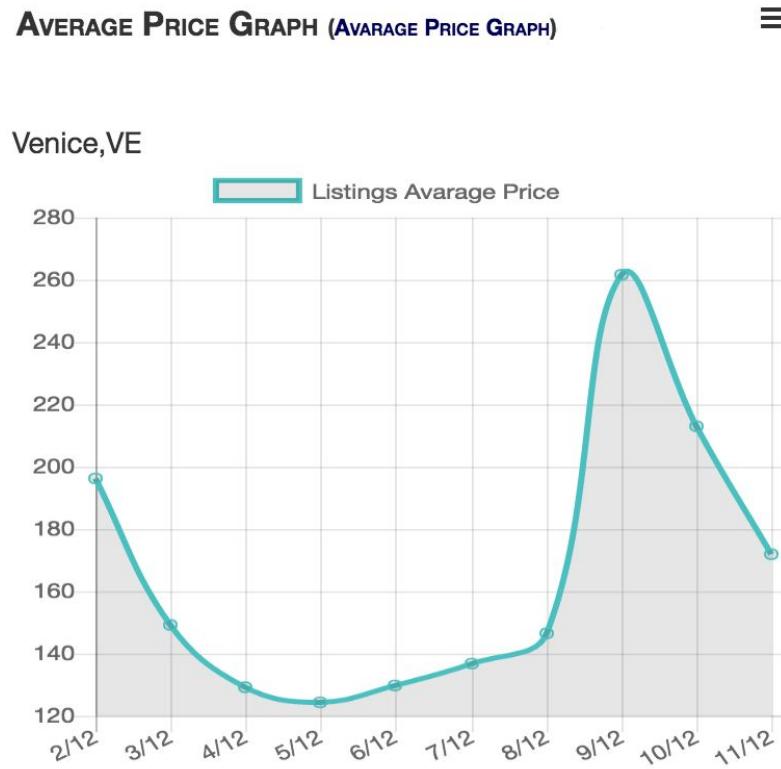
per listing in order to determine roughly how many people are staying in Airbnb locations in Venice. We observed a strong correlation between available listings and the number of people staying in Airbnb rentals, as the listings become unavailable as more people to stay in Venice. This relationship between the two graphs can easily be seen in the time period from the 1st until the 4th of December as the graphs produce similar and inverse behaviour. Based on three weeks of running these graphs and closely monitoring them, it can be easily noted that during the weekends, Venice experiences high inflation of arrivals as the availability of listings goes down between Friday and Monday while the occupancy rises during the same period of time.

## 4.2.7 Average Price Widget



**Figure 26:** Graph Widget for Average Price in Euros Display Throughout the City of Venice

The second widget shows graph of the average price throughout the city of Venice (Figure 26). This Graph Widget operates on the same ten day time frame (past seven days, present day and two days in future) as the Availability and Occupation Graph widget and serves similar purposes of visualisation of data collected by our team from AirBnB website. The values displayed on the graph are the average values of the prices from each district that allow to monitor the price trend throughout the city as a whole.

## 4.2.8 Average Price Widget Analysis

To determine the average price using this widget, data must be monitored and graphed for weekly analysis of certain behavior and trends in pricing throughout the city, such as the one that can be seen on the screenshot on the right.

December 8th is national holiday in Italy called "Feast of the Immaculate Conception." As shown on the graph, the prices for that day and especially the preceding Friday and Saturday are much higher than those throughout the week. That peak in price can be explained by the popularity of the holiday and the number of people traveling to Venice to witness the celebration on Thursday and enjoy the long weekend in the Historic Center. As the popularity of certain days is high, the demand for the listings rises and owners raise the prices of their listings. This trend has been observed by the team every weekend throughout the past month, when prices peaked around Friday and Saturday, falling as Monday and Tuesday arrived. However, using the visualisation graph, we can observe this anomaly and explain it using information about the local events and holidays that take place in the city on this date.

# 4.3 Public and Charitable Agency Residential Housing in Venice

In this section, we discuss our research on public and charitable housing programs in Venice. This information was incorporated into Venipedia webpages on housing in Venice. Information on these programs is useful to assist those in need of housing assistance in Venice who reside in the city and do not speak Italian as well as those interested in this information for other purposes. The city of Venice offers various housing services to residents that may facilitate the process of finding affordable housing and remaining in the historic center. The goal of Venice is to keep as many residents as possible in the city. Our goal is to further that purpose by providing important information on these resources to those who cannot navigate the system in Italian.
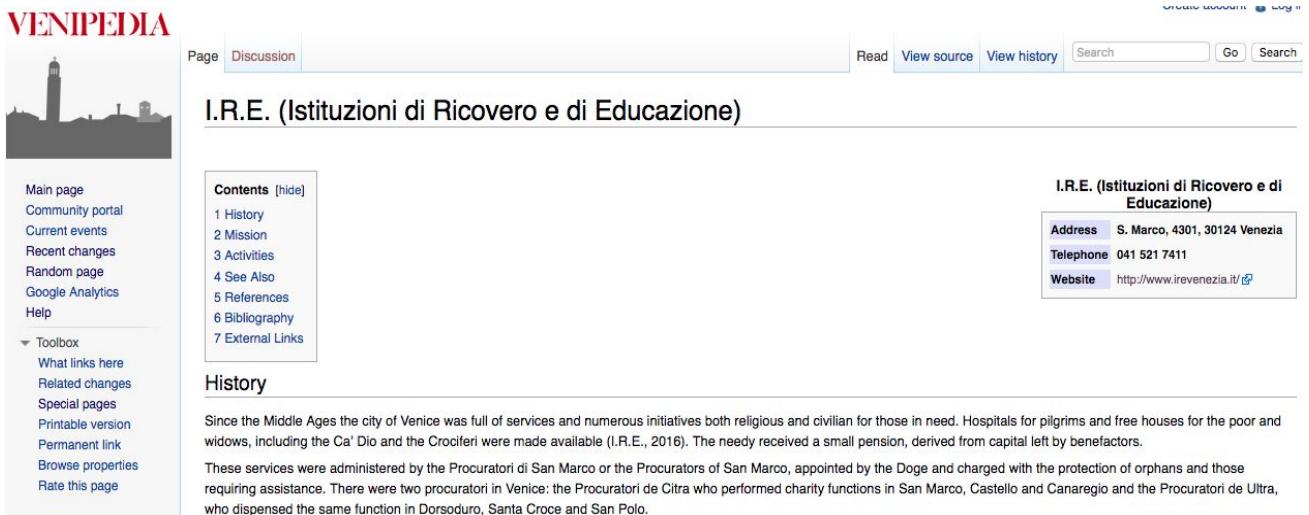
Venice has a great number of housing units of architectural and historical value but also many that are in a deteriorated state and unsuitable for habitation. In this ancient city, there are economic and structural issues with many of the buildings. The renewal of housing stock to meet the needs of Venetians and to preserve neighborhoods requires a collaboration between public and private interests. Tax incentives and private restoration projects are examples of ways to renew the affordable housing market and bring Venetian residents back to the city.

## 4.3.1 History of Venetian Housing Agencies and Charities

The history of Venetian Housing Agencies dates back to the Middle Ages when the city of Venice first offered numerous services and initiatives both religious and civilian for those in need. Many of the city's housing agencies including "IRE" or Community Assistance Program and "Azienda Territoriale per L'Edilizia Residenziale della Provincia di Venezia*" (ATER) have

seemingly overlapping responsibilities and services that make access to affordable housing confusing and difficult to navigate. An understanding of the evolution of each and their missions helps clarify understanding of the system. To that end, we created additional pages to the Housing Venipedia which can be accessed online.



**Figure 27:** Screenshot from ATER Venipedia page:
http://www.venipedia.org/wiki/index.php?title=ATER_(AZIENDA_TERRITORIALE_PER_L%27EDILIZIA_RESIDENZIALE_DELLA_PROVINCIA_DI_VENEZIA).

**Figure 28:** Screenshot from I.R.E. Venipedia Page
(http://www.venipedia.org/wiki/index.php?title=I.R.E._(Istituzioni_di_Ricovero_e_di_Educazio
ne))

## 4.3.2 Public Residential Housing
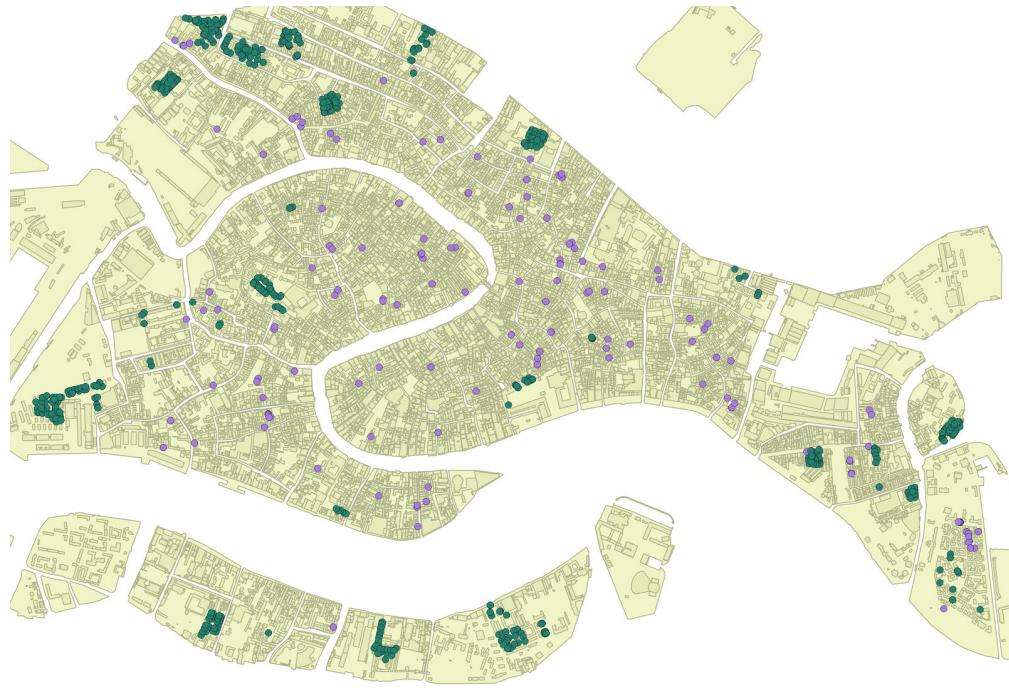
Forty percent of all housing available for rent in Venice is public (Osservatorio, 2014). At

the end of 2011, the public housing in the City of Venice, included terraferma, totaled over

10,000  units (Osservatorio, 2012). Approximately 4,900 are municipally owned and another

5,300 are managed by ATER (Osservatorio, 2012).   Of the total properties owned by the city,

approximately 2,300 are part of Venice's patrimony (Osservatorio, 2012).  The bulk of Venice's

residential patrimony is in the historic center where over 1,700 properties are located

(Osservatorio, 2012). This represents some of the greatest housing wealth by a city in Italy.

Because these properties are owned by the city for use as public housing, the represent a

considerable portion of housing stock that is not at risk for conversion into tourist vacation

rentals.

Properties owned by the city of Venice and managed by ATER are maintained by INSULA, the agency that is responsible for maintenance of the city's infrastructure. On average, these city owned properties are nearly filled to capacity and have a 95% occupancy rate (ATER). Considering the high demand for public housing, there is little room for these properties to be used by middle class Venetians who do not have serious demonstrated need.

ATER currently has total assets of 11,411 units including 7,784 units of subsidized housing and 2,013 units of low-income housing (ATER). In addition, it has 1,227 units under management for other entities (ATER). Some of these properties are listed in detail under the Section 2.4. In total, 11,024 units are residential and 387 are non-residential (ATER). The total yearly revenue from rents collected on these properties is € 16,098,405 of which € 11,056,056 are ERP and € 3,608,474 are not (ATER).

In addition to the units detailed in Appendix A, which it maintains, the IRE frequently offers low cost housing for rent and individual apartments for sale (IRE).

According to a study done by University of Venice IUAV, there is a high concentration of public IRE and ATER housing in the heavy tourist area around Strada Nova in Cannaregio and around school campuses (Figure 29).

**Figure 29:** Map of IRE (purple) and ATER (green) properties. Data from City of Venice

Of the 882 units there, 400 belong to the city, 264 to ATER and 123 to IRE (Bertasi, 2016). However, the population decline in Cannaregio is also the greatest, with a decrease from 25,000 in 1981 to barely 16,000 today in the area of Strada Nova, rio della Misericordia and Fondamente Nove (Bertasi, 2016). In addition, Cannaregio has 8,300 square meters of abandoned space, 11,00 square meters of underused space, and another 26,000 or 77% of the total space, are empty (Bertasi, 2016). Furthermore, there are 74.8 hectares, the equivalent of 107 football fields or 750 thousand square meters of abandoned space in the historic center of Venice which has a total size of 798 hectares (Bertasi, 2016). Murano has the equivalent of 4.5 football fields of usable space as 40% of the kilns there have been closed (Bertasi, 2016). It would

appear that these open and abandoned spaces in Cannaregio and Murano both can be further developed as potential housing for middle class and young Venetians.

Affordable housing in Venice requires an investment to subsidize those who have difficulty staying in the city. Venice also has considerable space that is in dire need of renovation before it can be used as housing. Finding the funding is a potential roadblock for Venice to resolving the issue. Solutions for Venice may include using revenue collected from owners of vacation rental properties either in the form of fees for licenses, tourist taxes, penalties for illegal or non complying rentals and higher taxes on the income derived from tourist vacation rentals. The money collected from regulations on the tourist rental market could be reinvested to support and subsidize the local market for young Venetians and families.

### 4.3.3 Charitable Organization Housing

The Venetian Curia has substantial real estate assets, primarily as the result of bequests and donations. The five separate institutions which include the Diocesan Institute for the Sustenance of the Clergy, the Seminary, the Opera Saint Mary of Charity, the Ente Diocese Patriarch of Venice, and the Pious Nine of the Clergy Congregations own 460 properties, 270 of which are apartments (Tantucci, 2010). Of these, 160 are in the historic center of the Venice. Most all are rented to individuals who have difficulty affording housing and who receive assistances from the Curia (Tantucci, 2010).

### 4.3.4 Housing Initiatives and Programs for Venetian Young and Families

Rental assistance is mostly available to help low income citizens, but some initiatives are in place to help middle-income residents in the historic center of Venice. These initiatives are

designed to assist young Venetian couples and families to obtain affordable housing (Osservatorio, 2012).  In 2011, the city started an innovative program called Bando Autorestauri designed to restore dilapidated and unusable housing without financial investment by the city. Under this program, the city leases certain apartments in historic buildings for four year renewable leases to individuals willing to accept responsibility for their restoration in return for reduced rent.  A total of 88 families were involved in this program, which resulted in the return of the same number of properties to the usable housing stock (Citta di Venezia; Osservatorio, 2012).  These families would have otherwise not been able to reside in Venice, not being able to afford housing market offerings and having too much to qualify for public assistance.

In addition, the city initiated a program called Provo Casa for the renovation of housing in the historic center of Venice. This project is funded 75% by the Department of Youth in conjunction with 25% contribution of ATER Venice (Provo Casa).  This innovative initiative is designed to increase the availability of affordable housing for young people while simultaneously regaining housing stock by using buildings that would otherwise be vacant due to need for renovation.  Once the buildings are restored, the project requires they be rented those between the ages of 18 and 30.  Leases are for an initial period of three years, renewable for another two.  Included in the program is training for residents on social and individual responsibility.  Sixteen buildings which had previously been vacant were restored to provide housing to 115 Venetians who had difficulty finding affordable housing.

The city is also developing residential housing in the Sant'Elena section of Castello which will yield 250 units intended for young Venetians. The complex, totals 57,080 square meters and includes the headquarters of the Municipal Transport Company shipyard in Venice as

well as 11,090 square meters of former boatyards (Citta di Venezia). The Sant' Elena area is located in the eastern part of Venice, the most distant from the bridge that connects the historic city of Venice to the mainland. From the point of view of infrastructure and mobility, this area is disadvantaged in particular with respect to the main access points to the city, and to the areas with the highest concentration of services and commercial activities. The intervention and redevelopment in this area responds to the need to meet the substantial demand for housing in Venice, particularly in the historic center.  The goal of this initiative is to increase affordable for individuals whose income prevents them from access to the social housing market, but are also not able to access to the private market or are unable to meet the costs of a mortgage (Osservatorio, 2014).

The positive impact that the Sant'Elena restoration project can generate is demographic, social and economic development throughout the Castello district. By favoring the construction of housing to groups who have particular difficulty accessing affordable housing through the open market, it responds to a longstanding and unmet demand for housing.  It also gives concrete support to the demographic crisis that has affected the historic center for decades.

In addition to the above, other initiatives include the Murano Project, in the former kilns of Murano where the city is constructing 36 lodgings, the Cannaregio Project for the construction of 40 apartments on the former site of Umberto 1 and another 70 units in the Coletti complex and in Lido where there are four programs in total, two of which have already been completed for the construction of a total of 30 units (Città di Venezia; Osservatorio, 2014).  These initiatives are combining two needs: restoration of vacant and dilapidated buildings with needs of Venetians to have affordable housing.

The Patriarch of Venice has also initiated projects with young families in mind. Ca' Noale, a property along the Strada Nova in Cannaregio was renovated and turned into twelve affordable housing residences (Tantucci, 2010). This property had previously been owned by the Patriarchal Seminary of Venice and was in a dilapidated condition despite being occupied by several families. The apartments are of different sizes, the smallest is fifty square meters, the largest is 100 square meters. The general goal for these apartments were to offer them to young families, aiming to rationalize the Church's participation in selling land and property to buy apartments in Venice (Tantucci, 2010).

After analyzing these initiatives in conjunction with the data on depopulation, we questioned the effectiveness of the programs in terms of their ability to keep young Venetians and families in historical Venice. Our project did not allow for us to determine why Venice's population continues to fall despite housing initiatives designed to help residents remain in the city. We were unable to determine whether such initiatives sufficiently met the demand of those seeking affordable housing in historic Venice.

What is clear is that more young Venetians are leaving the city every day. Public and charitable institutions such as IRE, ATER and CURIA need to focus more on collaboration to reduced rate housing for those who many not meet ERP thresholds but who may desire to reside in Venice but do not have the financial means to do so. There is considerable patrimony that is currently unoccupied that could be offered to young people and families at a reduced and stabilized rate.

There may well be many other reasons why Venetians are leaving that are unrelated to housing. The presence of affordable housing may not be enough to persuade residents to remain

in the city now that there are few services, jobs, businesses and entertainment available that are not geared for tourists. A full study of the reasons for depopulation should be conducted to determine the feasibility or need for any additional programs or housing initiatives directed at young Venetians in particular.

## 4.4 Analysis of Tourist Vacation Regulation Policies
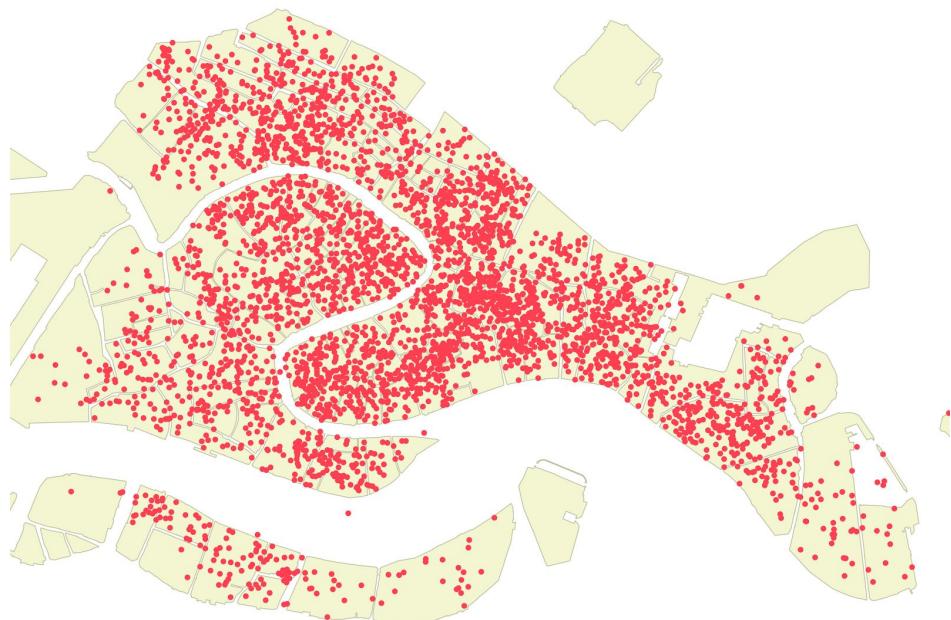
To determine whether there were regulations in place in other cities that would assist the particular issues in Venice, we analyzed tourist vacation rental regulations from many cities both in the United States and Europe as which appear as Appendix C.

There are basically ten different major categories of regulations used by other cities for the tourist vacation rental industry: registrations and permits, mandatory inspections, requiring insurance, requiring a local contact person, requiring notification and approval of neighbors, restricting based on geographical limits, limiting rentals to primary residence, restricting number of days, requiring minimum stays, and imposing taxes. As regulation of tourist vacation rentals is still recent and continuously in flux, it is difficult to quantify the success of any particular policy's effect of this emerging sharing market. In Appendix C, we have provided a compendium of the regulatory laws of several major cities. We focused our attention on the analysis of two widely used regulations: limits on the number of days and requirement for business licenses.
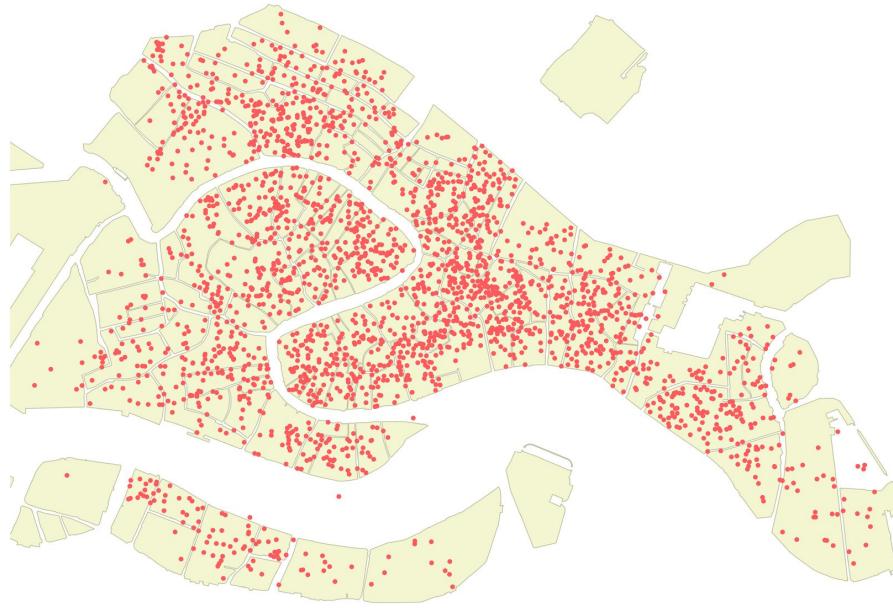
### 4.4.1 Regulation by Limits on Days

Cities such as London and Amsterdam limit the number of days per year that a property can be used as a tourist vacation rental. London has implemented a 90 day limit, and Amsterdam limits vacation rentals to just 60 days per year. The goal of this regulation is to restrict owners from using their property exclusively for tourist vacation rentals while still allowing them to rent out their property for short periods. Limits on the number of days a property can be rented discourages the practice of operating residential properties as a business.

To visualize the possible effect of a similar regulation on Venice, we created one map of the total vacation rental listings in Venice (Figure 29) and removed from it those listings available for greater than 90 days.  The team noticed a significant decrease in density, down to 2000 listings (Figure 31)



**Figure 30:** Airbnb rentals in the historical center. (InsideAirbnb, Oct  2016)

**Figure 31:** Airbnb available for less than 90 days (InsideAirbnb, Ot 2016)
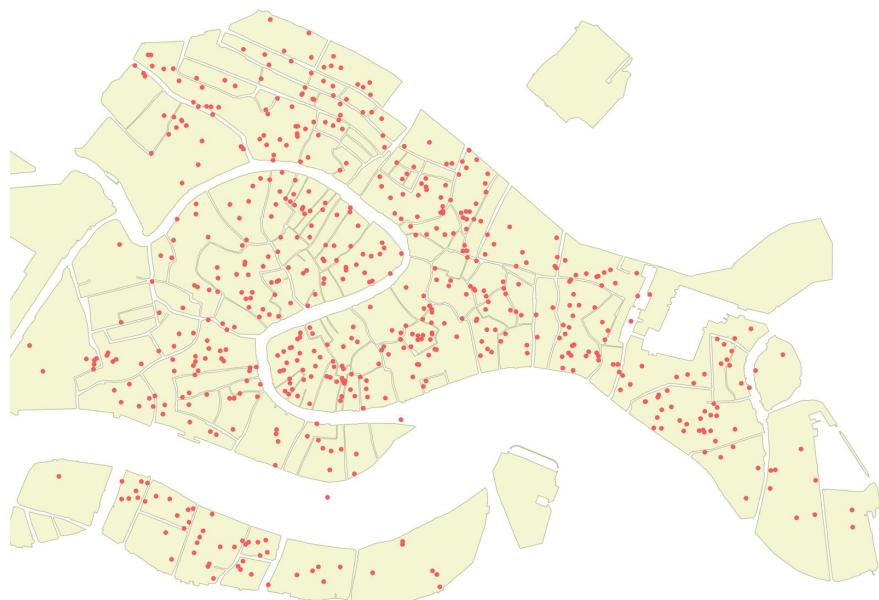
While this type of regulation that limits days to less than 90 may be effective in many cities, it may not be feasible in Venice. The city has a high economic dependency on tourism and current policies on tourist vacation rentals encourage them. However, Venice could consider adapting this type of regulation in a way that would further the goal of balancing the needs of Venetians for housing with those of encouraging tourism. Possible applications of limits include placing such limits on properties in areas of high concentration of tourist rentals or expanding the limit of days to 120.

## 4.4.2 Requiring a License for Hosts

Requiring hosts to have a license to list property is a popular method cities use to control the vacation rental market. Such license requirements can come in many forms and the effect varies widely based on the individual city. The goal of this regulation is to give cities control over who can or cannot create rental properties. Each city can select the criteria upon which
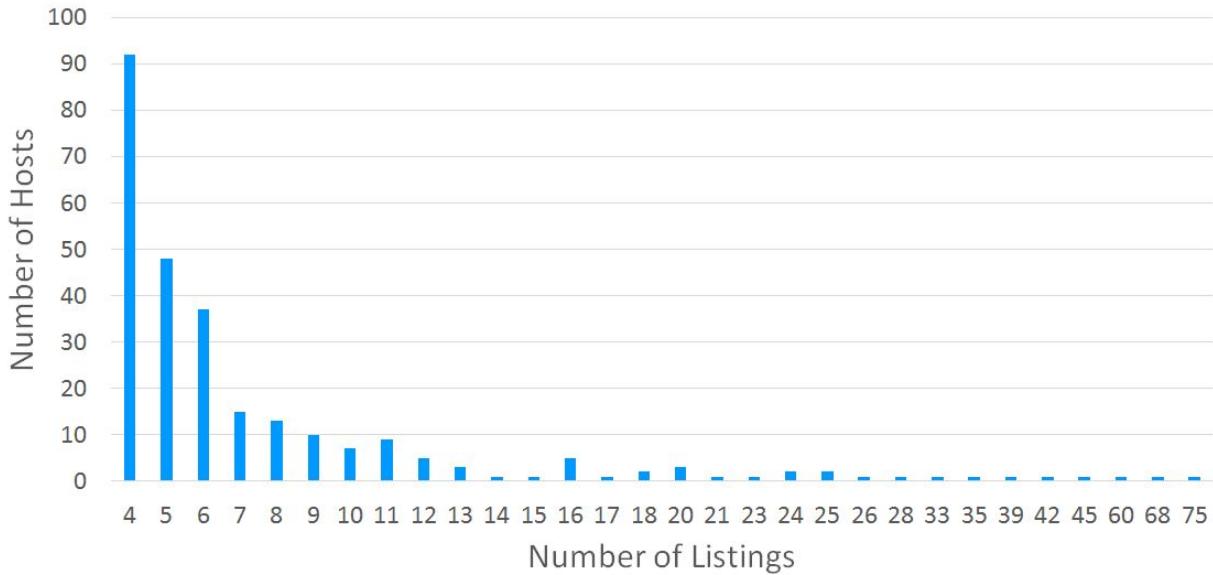
applications are accepted. Many cities, including Los Angeles and Amsterdam, require hosts to have a business license to operate vacation rentals.

Venice has already loosened its requirements for business license for those who operate up to three properties. However, if a license requirement were to be reinstated for the operation of every vacation rental, the number of tourist vacation rentals could be restricted by limiting the number of licenses to a set number. Or, for example, Venice could refuse licenses to hosts operating multiple properties. Such a regulation implemented concurrently with restrictions on number of days, would leave Venice with only around 880 listings on the market which is considerably less than the total number of vacation rentals currently on the market (Figure 32).



**Figure 32:** Projected Map of Vacation Rentals in Venice after removing properties owned by a host with multiple listings and properties with greater than 90 day availability

To further visualize the impact of this type of regulation on Venice, we created a histogram of the number of hosts owning various numbers of listings (Figure 33).



**Figure 33:** Number of Listings Per Host (Murray Cox, Airdna Oct 2016)

The team then analyzed the number of people owning greater than 3 listings and found that there are more than 220 hosts with 4 or more listings, making up 45% of the total listings on the historical center. It is also interesting to note that the median of the entire dataset is 3 which is considered commercial use.

Analyzing the data we acquired from IMU, we were able to conclude that 26% of all residential properties in Venice are owned by individuals who do not currently reside in Venice, either in the historical center or in Mestre. Some of these properties may be owned by non-resident speculators to be used as vacation rentals. Venice could impose a limitation on licenses requiring applicants to be residents of the Veneto. This may be a way of reducing vacation rentals and disincentivizing speculators from purchasing homes in Venice. Rentals could be

further reduced by requiring hosts to have residency in the historic center of Venice in order to apply for a license. This further narrowing of residency requirement would disallow residents of Mestre who make up a significant part of the non-resident owner group. Such a regulation would affect around 45% of those currently owning residential property in the historic center.

While an extreme implementation of requiring a business license for every host may contradict Venice's existing policies and its interest in the revenue generated by the tourist vacation rental industry, the city can use license regulations as a tool to regulate the market. This type of regulation could be adapted in the future to respond to increases in numbers of tourist vacation rental listings.

### 4.4.3 Analysis of Difficulty in Enforcement of Regulations

What is clear from the analysis, however, is that most of these attempts at regulation presuppose that the properties are registered and able to be located by the city authorities. Such regulations are currently ineffective as they involve cooperation on the part of property owners for their enforcement. Not one of these regulations can be enforced unless or until hosts are legally registered. As detailed in Section 2.3 of the Background chapter of this paper, the majority of property owners in Venice are not registering their properties and the city does not know where the properties are located. Any regulations in place in other cities that require registration for enforcement are likely to not have success in Venice.

For example, Venice already has some of the major categories of regulations in place such as registration with the city and requiring business permits for more than three properties but has difficulty enforcing them as detailed in Section 2.3 above. While currently difficult to

enforce, these regulations and those used by other cities should not be discounted and are still important to impose. Imposing additional regulations such as geographical limitations on where vacation rentals can exist will be of great benefit to Venice's ability to monitor the industry and to keep particular neighborhoods such as Cannaregio from remaining overpopulated with tourists. And as more ideas and methods of locating the properties and their owners, emerge, such as neighbor reporting of illegal vacation rentals and Airbnb database scraping to obtain addresses and other identifying behavior, these regulations will become easier to enforce.

A analysis of the regulations frequently used by cities with examples of their implementation in Appendix C reveals that no matter what attempts were made with other various regulations, it is the focus on the enforcement of the payment of taxes that will reverse impact back onto the web hosts and the tax evaders. Our analysis of the effectiveness of the regulations in other cities gave clear evidence that the only regulatory method that yielded results for other cities, and some control over the impact of the short-term rental market, involved the payment of taxes. When it came to taxes, other cities' regulations had impact both for taxes on revenue generated from the vacation rental to owners and nightly tourist hospitality tax due to local governments for each guest. As is the case with most cities, tax revenue is important to Venice as it can be used in part to fund initiatives to help residents have affordable housing.

The approach to regulation through the imposition of taxes has already resulted in formal agreements between several cities and Airbnb to automate collection and remission of tourist taxes to local governments on behalf of registered hosts. Currently, Venice does not have such an agreement with Airbnb but could certainly benefit from having such a system in place.

However, the practice of Airbnb collecting tourist taxes and submitting them directly to cities underscores the limitations of this agreement by the use of the word "registered" hosts. Our research as detailed in various sections of the Background chapter of this paper also revealed the problem that most hosts in Venice are not registered and are tax evaders. What might seem as a cooperative effort on the part of Airbnb to assist cities by collecting taxes for them, even if Venice had such an agreement, it alone would fall far short of what needs to be done.

Our analysis also revealed that when it comes to taxes, cities have concentrated their attention only on collecting  local taxes.  The amounts of these regional taxes range from 0.7% to 3.33% and only 0.9% for municipal tax (Italy).   However, there does not seem to be any focus on the larger issue of personal income tax evasion on the part of owners.  In Italy, the tax on income is progressive and ranges between 23% and 43% (Italy).  These amounts are significantly higher than the that the city would collect on a tourist vacation rental.  Having a system in place to enforce all existing tax laws, including personal income tax with hefty fines for violations, would disincentivize illegal rentals and encourage registrations of property to avoid legal issues and penalties from tax evasion.  Additionally, such regulations would enable Venice to collect millions in revenue and ensure justice to those law-abiding hosts who do, in fact, register and pay required taxes.  However, collecting these taxes would not necessarily reduce or limit the number of tourist vacation rentals in Venice but it would increase revenue for the city. Such tax initiatives as a separate short term rental tax in addition to the nightly tax already in place would mean an economic boost for Venice, putting the city in a better position to fund housing initiatives for residents .

As indicated in the Background Chapter, more and more cities are establishing additional systems with Airbnb for reporting of information on the location and ownership of properties as well as collection of taxes.  Since Venice currently has difficulty enforcing regulations due to lack of such information, having such a system in place with Airbnb would be invaluable.

A common denominator in the issues that arise in trying to regulate the tourist vacation rentals in any city is the lack of cooperation on the part of the listing sites.  Airbnb and its competitors have the information that cities need to enforce regulations but will not always share it. A possible solution for Venice would be the creation of its own listing site that all hosts with listings in the city would be required to use.  Such website could be created with relatively low investment and would empower Venice to regulate the vacation rental listings  in the ways cited above and ensure that taxes are collected with each booking.  The endorsement of such a website by the city of Venice, would also increase confidence in tourists who are often unsure of the legitimacy of rentals posted on listing sites that do not check whether or not they actually exist. Tourist vacation rental owners that do not comply with listing their properties on the Venice site could face heavy penalties as a deterrent.  A Venice maintained listing site could be used as a model for other cities.

# 5. Conclusion

During the course of our project, we explored the supply and demand balance of the residential housing market of Venice, particularly in the context of the potential impact of tourist vacation rentals on property and rental prices. We were able to identify data that suggests that the Airbnb market in Venice is particularly strong and has a high potential for commercial usage. We reached this conclusion using Airbnb rental listings in Venice from the past year to examine various facets that may indicate that a rental is being listed in such a way to potentially increase demand on the residential market of the city, including a high percentage of full home rentals, high rates of availability and estimates of occupancy, and hosts owning multiple listings. Large portions of the Airbnb listings in Venice were included in one or more of these categories, most notably that almost 80% of the listings on the historical center are full home listings, and that 25% the hosts owned about 60%s of the listings in Venice, indicating a high number of hosts controlling more than one listing. These points indicate that there is commercial use of Airbnb within the historical center of Venice, however, that information alone is not enough to draw connections to the housing market with any degree of certainty.

In order to connect the information known about commercial use of Airbnb to the residential housing market in Venice, we examined property tax data (IMU) from the government of the City of Venice. Based on our estimates of the total number of dwellings, entire home listings make up 9%, or almost 1 in 10 of the dwellings in the historical center. This is an unusually high number, as Airbnb often makes up less than 5% of the housing market, even in large cities with a substantial tourist presence. The city should strongly consider regulating the

growth of this market, because it has grown by about 60% in the past year, the equivalent of over 1900 listings, and if it continues growing at a similar rate, the amount of transient housing in the city may become problematic for residents.

Since it is a profitable venture to rent an apartment in Venice, it seems very likely that as permanent residents move out, a high number of their apartments are purchased and used for tourist rentals. However, since we are unable to accurately view the correlation over time, we are unable to determine whether it is the cost of purchasing and renting that is driving long term residents out, or if they are leaving the city for other reasons. Airbnb has simply grown to fit into what might have otherwise been vacant apartments or a solution for people unable to sell their homes due to low demand.

The team began the process of collecting the data necessary to draw correlations between the vacation rental market and the residential housing market through the creation of an online tool that gathers data from Airbnb and collects data autonomously every day. We also started monitoring trends in the residential housing market by looking at data about property taxes and municipal services  taxes. Additionally, we studied aggregate data about Venetian ownership of property which could be the subject of future research, especially if it could be cross-referenced with the locations of Airbnb apartments.  Statistical correlations between the vacation rental market and the cost of housing in Venice were unable to be made because of limitations on the available data.

In addition to our research of the vacation rental market, we studied the public housing stock of Venice, and acquired basic data on about roughly 5800 of these properties. We found that many addresses in the files provided by the housing organizations in Venice were not

locatable because they were missing information or poorly formatted. We have begun the process of cleaning and correcting this data and have also created a partial reference map to identify which areas support the most public housing and which areas have the least. This area of inquiry warrants further study to determine the feasibility of use of public residential holdings in certain areas of the city currently densely populated with tourist vacation rentals.

Finally, we researched methods of regulating the growth of the tourist rental market and determined which we believed would be feasible for Venice based on our detailed analysis of detrimental vacation rental traits are the most prevalent in the city. The team's recommendations for Venice appear below in Section 6.3.

# 6. Recommendations

In Sections 6.1 and 6.2, the team offers several recommendations for future VPC researchers on monitoring and improvement of the widget as well as tips for data storage and organization. We are hopeful that our ideas will be of assistance in furthering the goals of this project.

Section 6.3 presents the team's recommendations for the city of Venice regarding regulation of tourist vacation rentals and housing initiatives and incentive programs. It is our hope that our ideas will serve as talking points for future policies that may address some of the difficulties Venetians face in finding affordable homes.

## 6.1 Future Consideration for Vacation Rental Widgets for VPC

This section contains the team's proposals for maintaining and improving the widget. These recommendations includes several crucial aspects or steps that our group thinks will be useful for the future users of this widget. These topics include widget maintenance and usage and possible ways of improvement.

### 6.1.1 Widget Monitoring Recommendation

The widget this group created is automated and runs daily, however the scripts that gather the information for it are capable of performing multiple runs per day. Running the scripts more than once a day can increase the amount of data that they pick up and give a better estimate of occupation and price data, due to the most common check in/out time at noon, which will

make certain listings available on the market. As most checkout times for vacation rentals are around 12pm, the script should be run more than once per day, ideally once before 12pm and once after. Any more than two runs per day should be evenly spread out, although we do not recommend running them within less than four hours between each other.

In addition to running the script for the widgets on a daily basis, the team recommends certain dates and time periods when the widget should be closely monitored due to the high chance of more listings becoming available in the days preceding these events which can be picked up by our scripts. These dates include:

- International Holidays

- Local (Venetian and/or Italian) Holidays

- Tourist Season Months (May through late September)

These above periods are typically when the number of total listings rises as local renters open up their listings for incoming flows of tourist and other visitors. During these days, the trends of availability and occupation for Venice can be clearly noted using our designed graph and map widgets. Since large sets of data are not accessible through the widget itself, the data gathered from every run of the Airbnb scripts can be obtained from Tomaso Minelli from the Venice Project Center or from a member of the Housing Team.

## 6.1.2 Improving the Current Widget

There are a few ways that our team envisions the widget can be improved or modified but unfortunately, with the limited amount of time we had, we were unable to perform during this project. These propositions for improvement are:

- Implement an option for the graph widgets to choose the displayed data in the month and year format in addition to the already existing week format.

- Combining the three graphs that currently exist into one widget, with the ability to select which graph to view as well as the time scale.

- Create layers for the map widget that can be switched between while observing the widget. These layers will allow to display recorded listings by type, availability, and room number. Additional layers can be added if more information can be scraped off the Airbnb website.

These changes will allow to display different types of information in real time while keeping it simple, especially for the purposes of using it for visualisation.

# 6.2 Recommendations for Handling Data

Throughout the term, the team had worked with multiple data sets that we created and that were given to us by different housing organizations. Since many different people and organizations have different ways of storing and organizing this information, the team had encountered endless difficulties, specifically related to format and storage in which data was given to us. Here we would like to discuss some useful ideas and work habits that the team thinks will be useful for future projects to consider when approaching task at hand and dealing with large data sets.

## 6.2.1 File organization and Storage

One of the key aspects of good data handling is organization and store of data. It is important to be able to identify the methods that will be applied to the data at hand and make sure that the format in which the data is stored fits the tool/task that it will be used for. In order to

ease the difficulty with data organization for the future teams, we propose the following steps once team(s) receive data sheets to work with:

- Identify the format of the data

- Create a spreadsheet with all the data file's names, links and comments

- Store the data on Google Drive in a special folder dedicated exclusively for the data files.

- Link every file to the spreadsheet to have easy shortcuts and control over data

- Comment out and fix any problematic files

- Reformat or re-write files that do not match before you starting the analysis of the data.

- Fix any issues or address them to professor or request it again from the source in the different format to fit your needs.

- Analyse the data, noting on each of the files if they are perfect, usable, or unusable for your goals.

## 6.3  Recommendations for the City of Venice

To alleviate the housing problems for Venetians, particularly the young, this project has developed the following recommendations based on extensive research, data collection and analysis of the totality of the available information.

### 6.3.1 Regulations on Vacation Rentals

The ability to regulate tourist vacation rentals hinges on the ability to track properties across many platforms including Airbnb.  We propose the city of Venice do the following:

- Require vacation house rental sites to automatically report vacation rentals to the city for registration as in New Orleans and Chicago

- Require that Airbnb include taxes for each booking that would then be remitted directly to the city as in San Francisco and Amsterdam

- Create geographical limits on the number of properties that can operate in areas that are already densely populated with tourist rentals, notably Cannaregio and San Marco

- Enact zoning laws to preserve certain neighborhoods from transient population

- Impose hefty fines on unregistered vacation rentals as in Barcelona and Paris

- Prohibit the eviction of long term paying tenants for the creation of short term vacation rental property

- Granting business licenses for tourist vacation rentals only to city residents

- Create a city operated listing site where owners are required to list their properties and tourists can book directly as they do with Airbnb

## 6.3.2 Affordable Housing Initiatives and Incentive Programs

The feasibility of an affordable housing scheme requires a more in depth financial and legal analysis beyond the scope of this report. We recommend that prior to exploring any housing initiatives further, the city determine the level of interest on the part of young Venetians and families in living in the historic city center. A full study of the reasons for depopulation should be conducted to determine the feasibility of any programs or housing initiatives.

Recommendations about housing policies are included based on the information summarized in and included in the Analysis portion of this paper. We have several recommendations for the city:

- Impose additional taxes and fees on the tourist rental market to be used to subsidize affordable housing for young Venetians and families

- Invest in the renovation and reconstruction of abandoned and empty space in the historic center.

- Focus more on housing initiatives for those who many not meet ERP thresholds, but who may desire to reside in Venice and do not have the financial means to do so, particularly young people and families.

- To assist young families interested in home purchase, intervention by the city in support of mortgage applications through negotiation with the banking system for more favorable rates.

- Tax incentives and facilitation of renovation for those interested in making properties available to Venetian residents at affordable rates.

- Tax reductions or initiatives for property owners who currently rent to tourists during the summer, such as in Lido, to make their properties available to Venetian students during the school year.

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# Appendix A: IRE Patrimony

**Vitale Michiel**

An ancient hospital was attached to the Augustinian monastery of the island of St. Helena since 1175, when founded by the bishop of Castle Vitale Michiel. In 1407, after the lapse of the first convent, all it passed to the Olivetan monks. The IRE in 1978, in memory of the ancient hospice, dedicated the property to Vitale Michiel. It consists of 4 double apartments and 3 single apartments, all ground floor houses intended for older residents.

**Marc'Antonio Morosini**

It arose as a bequest of Captain Marco Antonio Morosini (1508) in favor of the poor sailors. It had consistently been used to house sailors' until the current pensions were adapted to provide seafarers a dignified old age. Today, it is among the hospices IRE maintains best adapted for the use by elderly couples. It consists of 7 double and 4 individual apartments located between the ground floor and first floor. These apartments share a common courtyard.

**Bernardo Dona'**

In 1714, Dona Bernardo made a will leaving a house in San Lio with his income in order to found a future hospital for beggars. After long disputes by heirs, annuities were combined with those of the House of Refuge and the Orphanages. In 1978, the IRE restored it with specially designed facilities as a home for the elderly, primarily for women. It consists of 10 individual studios and one double, equipped with kitchenette. It offers large common areas and laundry.

**Badoer**

This property was built by the Partecipazio family, later called Badoer, in the 8th Century for the care of widows. It consists of 14 rooms equipped with a kitchenette and shared bathroom facilities are shared. It is primarily all male.

**Bocco Scrovegni**

This property was founded by Maddalena Scrovegni, Padua, in 1421 up to . Its original use was to house for 13 poor widows. It has continuously been maintained by the Procurators of St. Mark de Citra. Today, it houses couples and individuals of both sexes in two double apartments on the second floor, 4 single on the first floor and a ground floor single apartment. It offers a lounge, communal laundry and large garden.

**Ludovico Priuli**

Inherited from the estate in Ludovico Priuli in 1569, its original use was to house 12 men and a chaplain under the direction of relatives of the Priuli family, who were to ensure that the men who were housed were unmarried and of long standing Venetian heritage.

Today, it consists of 9 single rooms with kitchenettes, spread over three floors, each with common toilets. It is exclusively male housing.

**Pietro Brustolado**

This building was originally a hospital founded by Peter Brustolado and inherited at his will in 1316. It is the second oldest hospice still active after the one named for Renier Zen. Today it houses couples and individuals of both sexes in five studios, two doubles and three singles on the ground floor to the first floor, with private facilities and shared garden.

**Marco Polo**

This hospice is in line with the tradition of the oldest hospitals of the Venetian islands, especially Murano of which there were once 18. During the nineteenth century, it was managed by the city shelter, Casa di Ricovero, along with other city hospices. The IRE Board of Directors decided in the 1980s to purchase and renovate this house with a garden on the island of Mazzorbo at Burano. It was named after Monsignor Marco Polo, who was the parish priest of Burano. It consists of a house divided into two floors: on the ground floor there is an apartment for couples and four rooms with common toilets on the first floor. It has laundry room and large common garden.

**Opera Pia Maddalena**

Used for couples or individuals of both sexes, this building was opened after major restoration efforts in 2009. It consists of 3 double and 6 individual apartments divided over three floors (first, second and third). On the ground floor there are spaces for common activities.

# Appendix B: Glossary

**Housing**: Alloggiamento

| **ENGLISH** | **ITALIAN** |
|---|---|
| **Lodging** | Alloggio |
| **Apartment** | Appartamento |
| **House** | Casa |
| **Rooming house** | Affittacamere |
| **Hotel** | Albergo |
| **Entire lodging** | Alloggio intero/ Intera casa |
| **Room** | Stanza |
| **Rooms** | Locali |
| **Bedroom** | Camera da letto |
| **Bed**: | Letto |
| **Bathroom** | Bagno |
| **Kitchen** | Cucina |
| **Rent/Rental/Renting** | Affitto/Proprietà in affitto/Affittando |
| **For rent** | In affitto |
| **For sale** | In vendita |
| **Furnished** | Arredato |

| ENGLISH | ITALIAN |
|---|---|
| **Unfurnished** | Non arredato |
| **Shared** | In comune/Condivisa |
| **Private** | Privato |
| **Canal view** | Vista canale |
| **Shower** | Doccia |
| **Heat** | Riscaldamento |
| **Washing machine** | Lavatrice |
| **Dryer** | Asciugatrice |
| **Security Deposit** | Cauzione |
| **Period of Stay** | Soggiorno |
| **Temporary** | Temporaneo |
| **Monthly discount** | Sconto mensile |
| **Reservation** | Prenotazione |
| **Deposit** | il versamento |
| **Security deposit** | Deposito di sicurezza |
| **Unregistered** | Non registrato |
| **Permit** | La licenza |
| **Tourism** | Turismo |
| **Tourist** | Turista |
| **Population** | Popolazione |

| ENGLISH | ITALIAN |
|---|---|
| **Depopulation** | Spopolamento |
| **Residents** | Abitanti/Residenti |
| **Exodus** | Esodo |
| **Citizens** | Cittadini |
| **Work** | Il lavoro |
| **Transportation** | I trasporti |
| **To plan** | Pianificare |
| **Development** | Sviluppo |
| **Projects** | I progetti |
| **Social abandonment** | desertificazione sociale |
| **Tax incentives** | Incentivi fiscali |
| **To facilitate** | Agevolare |
| **To speed up** | Velocizzare |
| **Public housing** | Case popolari |
| **Access**: | L'accesso |
| **Neighborhood** | Quartiere |
| **Capacity** | Capacità |
| **Carrying capacity** | Portata |
| **Total** | Totale/complessivo |
| **Percentage** | Percentuale |

| ENGLISH | ITALIAN |
|---|---|
| **To rate** | Valutare |
| **Data** | Dati |
| **Foreign** | Straniero |
| **To own a house** | Possedere una casa |
| **To mortgage** | Ipotecare |
| **Downpayment** | il anticipo in contanti |
| **Financing** | Finanziamento |
| **Affordable** | A prezzi accessibili |
| **Unaffordable** | Insostenibile |
| **To qualify** | Qualificare |
| **Regulations** | la normativa |
| **Restrictions** | restrizioni/limitazione |
| **Tax records** | Documenti fiscali |
| **Photocopy** | Fotocopia |
| **Impact** | il urto |
| **Short-term** | a breve durata |
| **Loss** | Perdita |
| **Laws** | Legislazione |
| **Violation** | Infrazione/contravvenzione |
| **To enforce** | Imporre |

| **ENGLISH** | **ITALIAN** |
| --- | --- |
| **Low income** | Reddito basso |
| **Grant/subsidy** | Sovvenzioni |

# Appendix C:

# Compendium of Regulations

## Amsterdam

- Limit of less than 10% of short term rentals in the private zone, regulated by the issuance of permits

- Residents in subsidized or public housing are not permitted to offer short-term rentals.

- Primary residences can be used for up to 60 days of short term rental per year. Once rented Airbnb removes them from site

- No more than 4 guests per stay

- Minimum stay must be 7 nights or greater to encourage business use of vacation rentals

- Agreement with Airbnb to collect tourist taxes as of February 2015

**(Sources:** Dutch News. 2016, December; O'Sullivan, 201

## Barcelona

- Registration required

- Yearly cap on number of registration

- Fines 60,000-600,000 euros for illegal rentals

- Neighbor Reporting of Illegal Rentals

(**Sources**: Lomas,2016; Tun, 2015)

# Chicago

- Owner must have home or office in the city

- Agreement with Airbnb to collect tourist taxes as of February 2015

- Pass through registration

(**Sources:** Associated Press, 2016; Kolakowski, 2016)

# London

- Limit of 90 days per year per rental

- Must have official authorization for more than 90 days

- Beginning 2017, Airbnb will remove properties that have already been rented for 90 days unless host can show approval

(**Sources:**  Booth, 2016; Wolf, 2016; O'Sullivan, 2016)

# Los Angeles

- Illegal in residential neighborhoods prior to June 2015, rentals of primary residences for less than 120 days a year allowed in June 2016

- No short-term rentals in rent stabilized, or assistance housing, units

- No multiple listings

● Agreement with Airbnb to collect hotel taxes as of July 2016

**(Sources:** Butka, 2016; Kokalicheva, 2016)

# New York

● No short term rentals under 30 days

● Fines up to 7,500 for each violation

● No rentals in residential buildings

**(Sources:** McHugh,2016; Montali, 2016; Kolakowski, 2016)

# Paris

● Must have authorization from the Mayor of Paris for any rental of less than 1 year

● 25,000 euro for violation for each property

● Must have insurance

● Must pay tourist city tax

**(Sources:** Pap.fr, 2016; Tun, 2015)

# San Francisco

- At least $500,000 in liability insurance

- Unlimited rentals permitted when host is present and a maximum of 90 nights when the host is not present

- Agreement with Airbnb to collect tourist taxes as of October 2014

**(Sources:** Barber, 2016; Kokalitcheva, 2016: Skift, 2016)