



# WPI

## **Leveraging Tourist Rentals to Make Housing Affordable for Venetians:**

### **A Feasibility Study of Casa Peota and Fairbnb**

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# **Abstract**

This project identifies how Venetians can leverage income from tourist rentals so that residents and visitors can stay in Venice sustainably and affordably. We assessed the housing and short-term rental markets in Venice. Income from tourist rentals covers the gap between what Venetians can afford and the cost of housing. This project is the foundation for Casa Peota, which will help Venetians to finance housing, and for Fairbnb, a platform for short-term rentals that makes social contributions to the community.

# Executive Summary

The cost of housing in many of the most popular tourist destinations is now out of the reach of many residents. In Venice, Italy, the growth in tourism has been so strong that many housing units that once provided homes for residents are now rented to tourists. The residential population of Venice was just under 56,000 in 2015 and has been on the decline since 1952. The daily tourist population in Venice was 67,000 in 2015, and the number of daily tourists recently surpassed the residential population in 2011. The goal of our project was to help establish **a balance between visitors and residents so that both can stay sustainably and affordably in Venice.**

To accomplish this goal, we assessed the availability and cost of housing and short-term tourist rentals in Venice. We used this information to develop a sustainable model for an average **Venetian couple to buy their own home by leveraging income from short-term tourist rentals.** Our study showed that this **model is feasible** in Venice's strong market for tourist rentals. Income from short-term tourist rentals could **cover the gap** between what a typical Venetian couple could afford and the cost of a mortgage for a typical €300,000 home.

This model will provide the foundation for a new startup in Venice known as **Casa Peota.** The income from tourist rentals is strong enough for residents to repay a loan for the 20% down payment to Casa Peota and to repay a loan for the typical mortgage of 80% of the purchase price. We also developed the online prototype for **Fairbnb**, a new short-term rental platform, that provides the functionality of Airbnb as well as social contributions to the local community.

## Housing Market and Mortgage Analysis in Venice

Our assessment of the housing market in Venice included the **availability and cost of housing as well as its affordability** for Venetians. In Venice, we examined the **market of units for sale** with multiple bedrooms in order to identify units suitable for short-term housing rentals. The **median price of a home in Venice is around €300,000.** The average Venetian couple with two incomes makes €44,000 per year. Financial planners recommend that such a couple only pay 30% of their monthly income towards housing, which means **the average couple could afford to buy a €180,000 home.** The difference between the average price of a home, and what the average Venetian couple could afford is a gap. The **goal of our project is to close this gap using the income from tourists** who stay in rooms in these units using short term rentals. The gap is illustrated in Figure I, below.

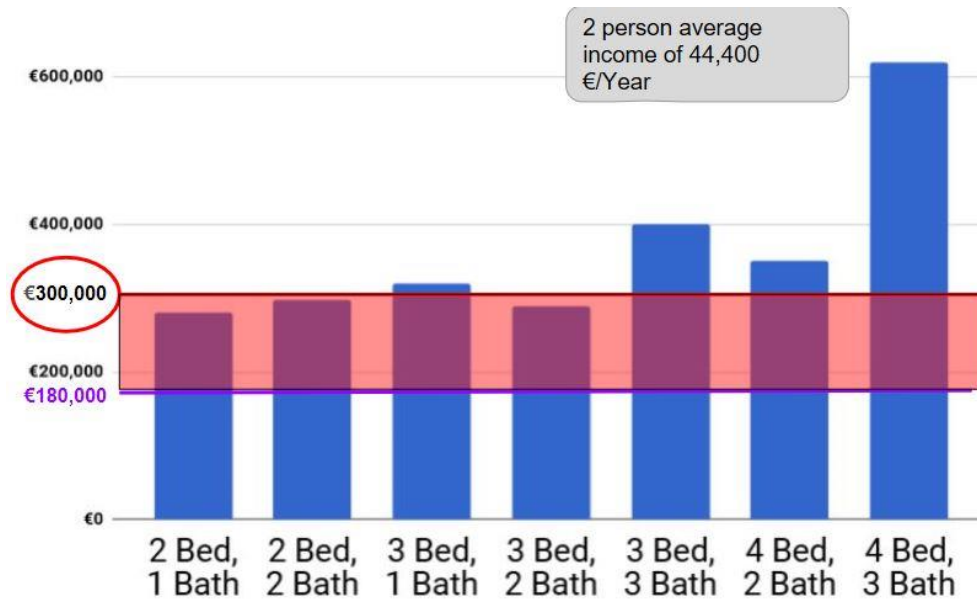


Figure I: Gap Short Term Rentals Plan to Fill

Given the median prices of the Venetian housing market, our analysis concluded that homes with **two or three bedrooms and one or two bathrooms represent the best values available**. We identified these type of units as optimal since they **represent around 2,410 listings around the median price (€300,000)**, and these homes offer comfort, space, and some offer room to grow for a Venetian couple. This inventory does not take into account potential restoration costs.

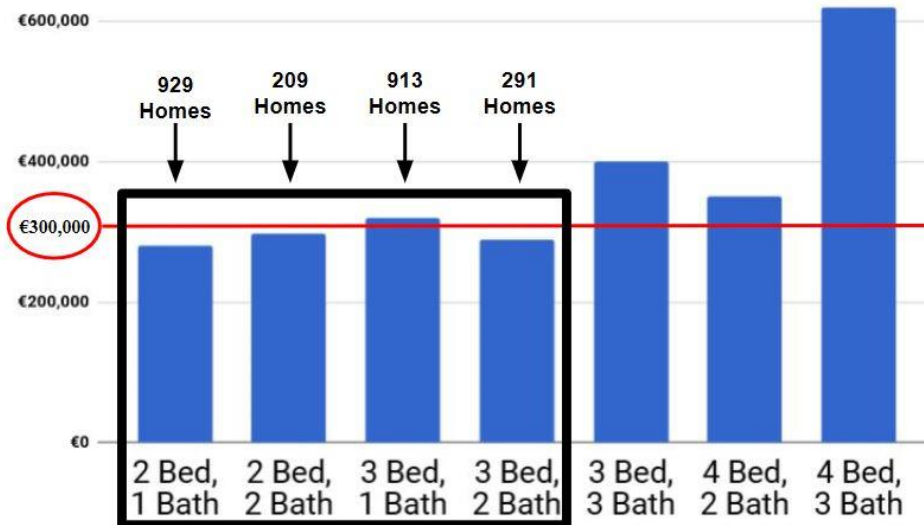


Figure II: Homes for a Good Value for a Venetian Couple

**Casa Peota** aims to fill the gap between what is available and what Venetians can afford. Purchasing a home requires a down-payment of 20% of the purchase price, with 80% financed by a mortgage. As illustrated on the left-side column in the Figure below, a **monthly payment of €1,800 is required for a mortgage for 80%** of the purchase of a €300,000 home.

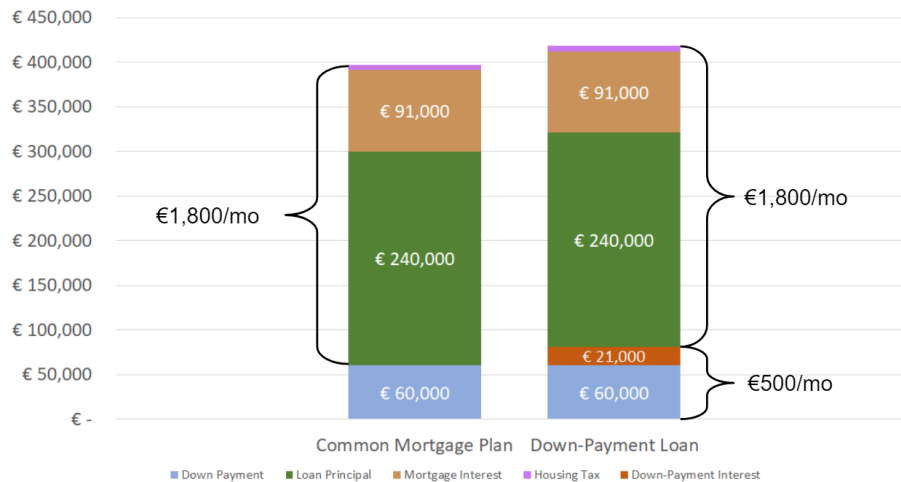


Figure III: Mortgage Structure with/without Down-Payment Loan

In this figure, the right-side column shows that the monthly **payments for the entire mortgage would total €2,300 per month** (to cover both the traditional mortgage and the downpayment).

Thus, the typical Venetian couple earning a combined €44,000 per year could afford a monthly payment of €1,100 per month, resulting in the **gap that Casa Peota** aims to fill.

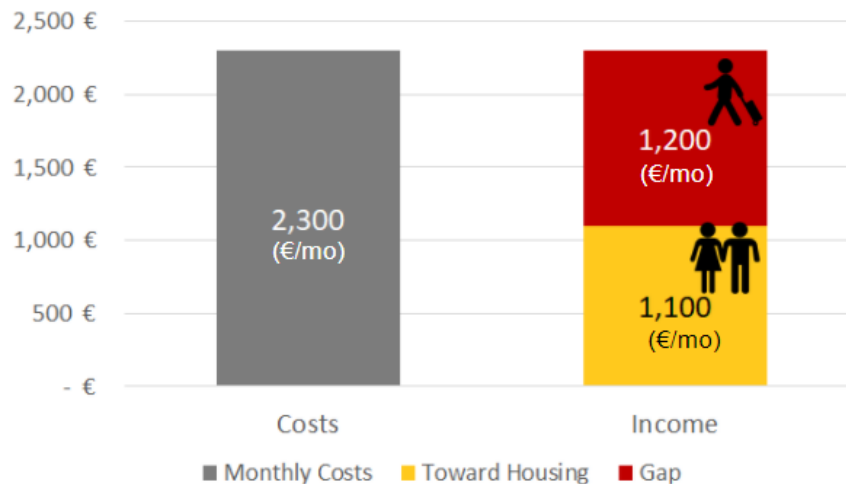


Figure IV: Monthly Mortgage Payment Gap

Since the goal is for residents to pay only **30% of their income**, the gap shown in red is €1,200 per month. With the help of Casa Peota, this gap can be filled using tourist vacation rentals.

### Short-Term Rentals Analysis: Inside Airbnb

In order to afford a mortgage for a €300,000 property, residents must earn an additional income of €1,200 per month through vacation rentals. We analyzed data from Inside Airbnb, created by Murray Cox, about listings on Airbnb Venice from October 2016 to September 2017. The **average price per night is €100 for a Private Room** across the city, as shown in the figure below, with some variation by neighborhood.

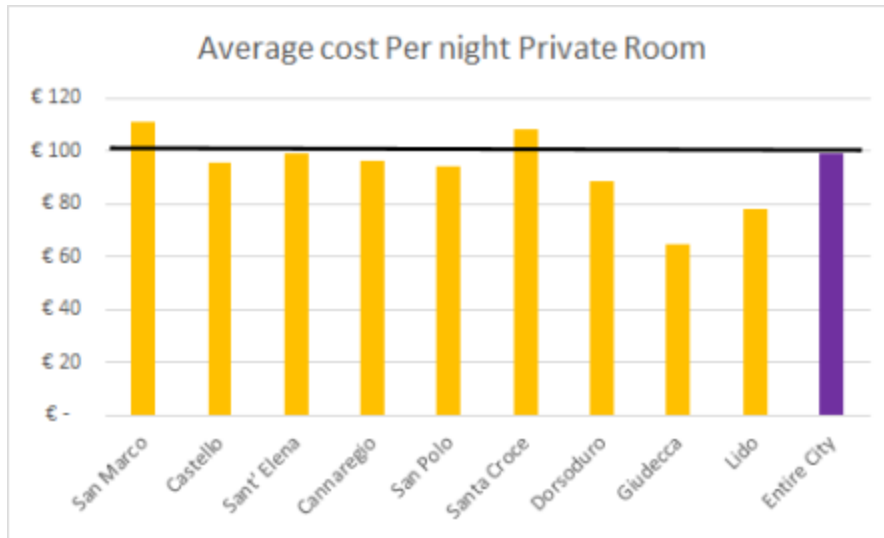


Figure VI: Average Price per Night of Private Rooms in Venice

The separate sestieri are all around €100 per night, indicating that the specific location within Venice is less critical in providing an income to Venetians from short-term tourist rentals.

At an average price of €100 per night for a private room, **residents must rent out the room 12 nights per month (40% of the year)** in order to earn an income of €1,200 per month. This is one of the central findings of our analysis, which found that **this target is feasible**, as the **average annual occupancy in Venice is 51%**. Significant seasonal variation, as shown in the figure below, influences when these nights might be rented to tourists.

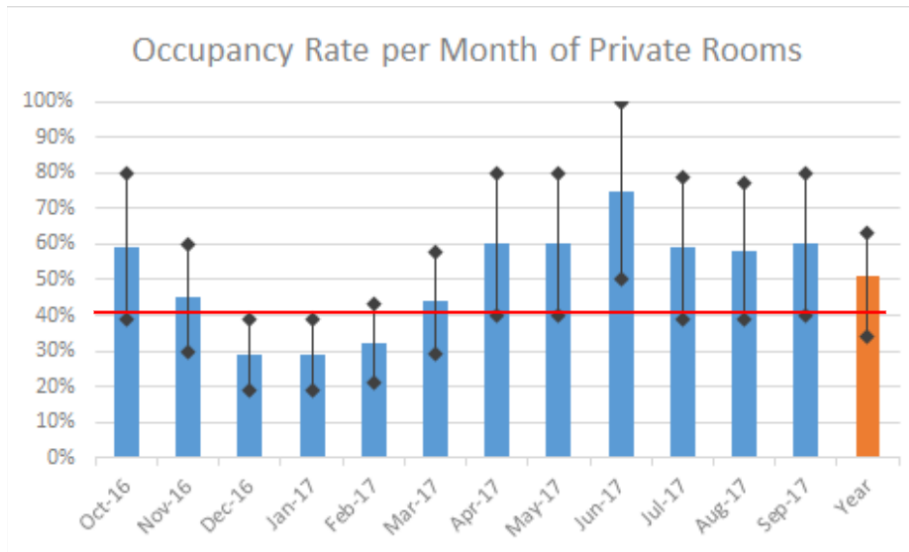


Figure VII: Average Occupancy Rate by Month

Put another way, the target of renting a room 12 nights per month in order to pay the mortgage can be met in every month except for December through February, when only 9 nights per month are rented out, on average.

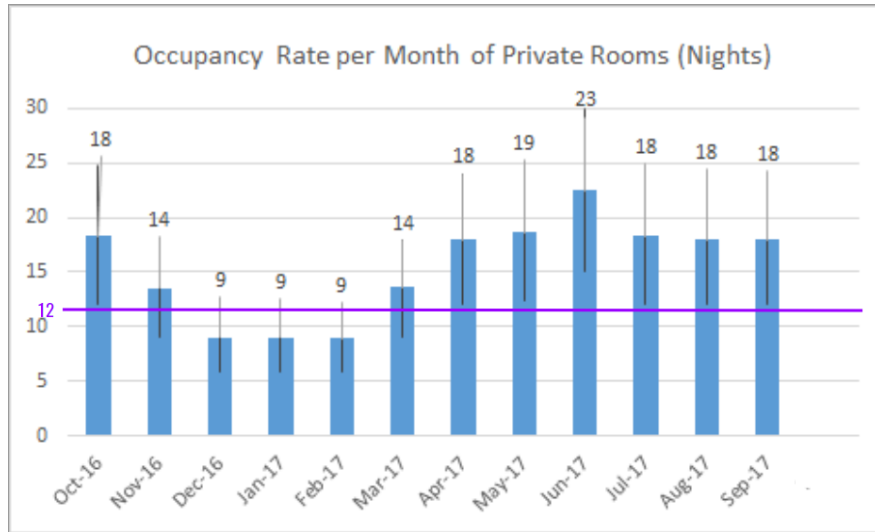


Figure VIII: Average Occupancy Rate by Number of Nights

Despite the lull in rentals from December through February, the overall annual goal for the number of nights rented can be met by renting a room at the average occupancy rate for the other eight months (March through October). The income from tourist rentals required to pay the mortgage can be met by renting for parts of the year only. If the room is rented out at the average occupancy rate from March through October, the **resident can live tourist-free November through February.**

The length of the mortgage affects this analysis. The examples above assume a mortgage of 15 years. If the duration of the mortgage is lengthened, then the occupancy required to meet the target goal changes. When the mortgage plan is faster, this means that there must be more tourist in their home to fill the gap due to a higher monthly payment.

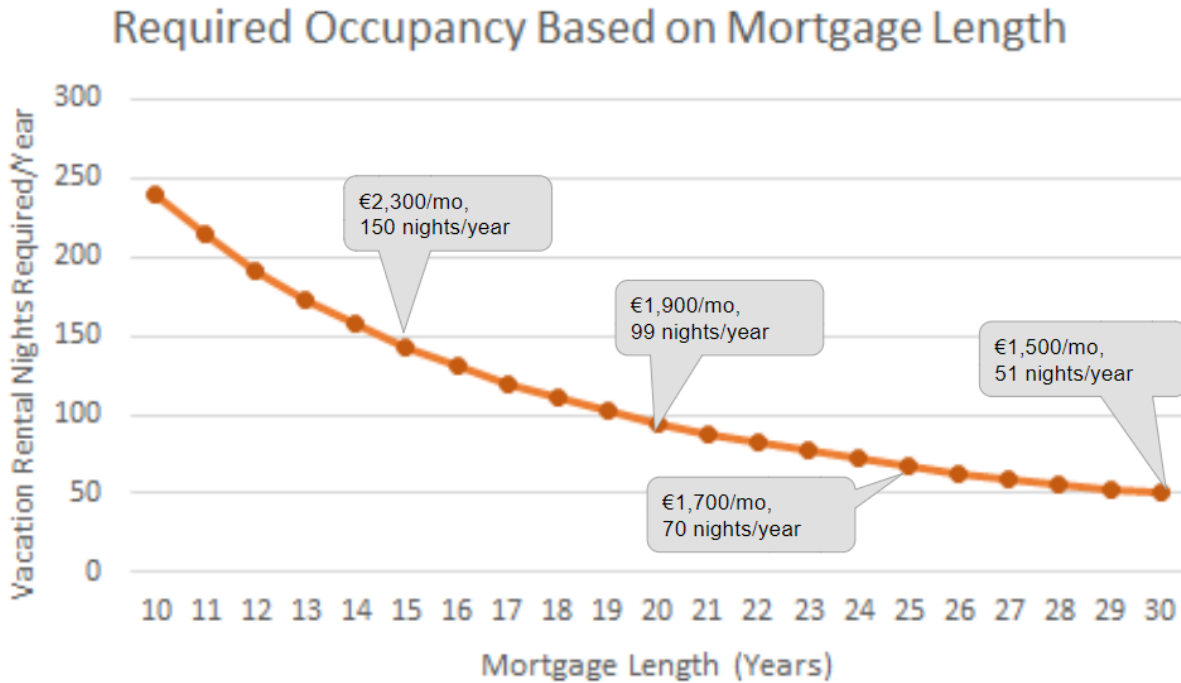


Figure IX: Required Occupancy Based on Mortgage Length

The number of nights that a tourist must stay in the home decreases as the length of the mortgage is extended. If the residents wanted to own the property in 10 years, they would have to rent a private room for almost half of the year. With a 30-year mortgage, the residents would be required to rent out a private room for 51 days during the year.

#### **Fairbnb: Equitable Short-term Rentals**

Any online rental platform could potentially provide income from short-term rentals to pay the mortgage. Airbnb charges a 15% commission on the cost of rentals. Our project also developed the prototype for a different online platform that also had a social purpose, Fairbnb. Fairbnb is similar to Airbnb, but reinvests at least half of the commissions from online rentals in local projects to support and revitalize the local community. Additionally, Fairbnb would have restrictions on what and who could list properties, including: the host must be the resident of the home being listed, the listing must be a private room, and the host can only list one home at a time. During the course of this project, we created a non-functional mockup of what the Fairbnb website could look like. The main features we want to showcase are how a host would add a listing, and how a guest would make a reservation. The mockup is only scripted to demonstrate the main features that a fully-implemented Fairbnb website should have.





		
Short term rental service	✓	✓
50% of the fee is invested in local projects	✗	✓
Restrictions on listing	✗	✓

Figure X: Airbnb vs. Fairbnb

### Summary

Based on the analysis of the housing market and short-term rental market through Inside Airbnb, we create an affordable mortgage plan in which income from tourist rentals provide the resources for Venetians to afford to buy a home in Venice. The affordable mortgage plans included two options. In one, the purchaser of the property rents a private room and maintains occupancy at 12 nights per month throughout the whole year in order pay off the mortgage. In the second, residents could rent the room at the average occupancy for the months that are most in demand and still meet their target. Casa Peota could help provide resources for a mortgage plan that includes a down payment. Fairbnb could help Venetians to rent to tourists and support local causes. Both Casa Peota and Fairbnb are feasible startups and we recommend that plans proceed in launching them so that both tourists and Venetians can afford to say in Venice. Though our study examined the concepts of Casa Peota and Fairbnb specifically in Venice, the conceptual framework of this project could be applied elsewhere, and thus the scope for implementation is much wider and its potential impact much broader.



# Table of Contents

<b>Abstract</b>	i
<b>Executive Summary</b>	ii
<b>Table of Contents</b>	ix
<b>List of Figures</b>	xi
<b>Authorship</b>	xii
<b>Acknowledgements</b>	xv
<b>1.0 Introduction</b>	1
<b>2.0 Background</b>	3
<b>2.1 The Resident Population of Venice and Rising Tourism</b>	3
<b>2.2 Short Term Rentals' Effects on Housing</b>	4
<b>2.2.1 Short Term Rentals' Effects on Housing around the World</b>	5
<b>2.2.2 Tourism's Effects on Housing in Venice</b>	6
<b>2.2.3 Best Practices to Address Airbnb's Effects on Housing</b>	7
<b>2.3 Housing in Venice</b>	7
<b>2.3.1 Residential Housing Accommodations</b>	7
<b>2.3.2 Mortgage Payment Options</b>	8
<b>3.0 Methodology</b>	9
<b>3.1 Assessing the availability and cost of housing in Venice.</b>	10
<b>3.2 Investigating the availability and profitability of tourist accommodations in Venice</b>	10
<b>3.3 Developing mechanism(s) that will make housing accessible and affordable</b>	10
<b>3.4 Developing a mockup for an equitable and sustainable short term rental platform</b>	10
<b>4.0 Venice Housing Market: The Gap</b>	11
<b>4.1 Gather and Analyze Housing Information</b>	11
<b>4.2 Leverage Tourists to pay Venetians' Mortgages</b>	13
<b>5.0 Short-Term Tourist Rentals in Venice</b>	17
<b>5.1 Inside Airbnb</b>	17
<b>5.2 Price of Private Room Listings in Venice</b>	17
<b>5.3 Analysis of Required Occupancy Rate</b>	18
<b>5.3 Fairbnb Concept and Website</b>	20
<b>5.3.1 Fairbnb Mockup</b>	20
<b>6.0 Casa Peota Plan Variations</b>	22

<b>6.1 Mortgage Plans</b>	22
<b>6.1.1 Common Mortgage Plan</b>	22
<b>6.1.2 Borrowing Entire Cost of the House</b>	24
<b>6.1.3 Down-Payment Mortgage Plan</b>	25
<b>6.1.4 Options to Modify Mortgage Structure</b>	27
<b>7.0 Conclusions and Recommendations</b>	29
Works Cited	31
Appendices	35
Appendix A	35
Appendix B	35

# List of Figures

- Figure 1: Pie Chart Showing Short Term Rental Displacing Residential People
- Figure 2: Resident Population vs. Avg. Daily Tourist Population of the Historic City of Venice
- Figure 3: Percent of Listings that are Multiple Listings
- Figure 4: Price per Square Meter from 2014 to 2016 (Enlarged in Appendix A)
- Figure 5: Overnight Stays in Venice from 2003 to 2015 (in 1,000s)
- Figure 6: Statistics on Airbnb's usage in Venice, Italy
- Figure 7: Map of Venice from Inside Airbnb showing Airbnb listings
- Figure 8: Median Housing Cost in Venice
- Figure 9: Gap Between Housing Median and Average Venetian Couple Income
- Figure 10: Ideal Homes for a Venetian Couple
- Figure 11: 15 Year Mortgage Loan Breakdown
- Figure 12: Monthly Mortgage Payment vs. Average Venetian Income
- Figure 13: Gap Between Monthly Mortgage Payment and Income Toward Housing
- Figure 14: Mortgage Structure with/without Down-Payment Loan
- Figure 15: Down-Payment Monthly Mortgage Payment Breakdown
- Figure 16: Average Price per Night of a Private Room in Venice
- Figure 17: Occupancy rate per month of Private Rooms
- Figure 18: Average Occupancy Rate by Number of Nights
- Figure 19: Price and Occupancy Rate in Venice Based on Location
- Figure 20: Airbnb vs. Fairbnb
- Figure 21: Mortgage Structure Comparison
- Figure 22: Monthly Mortgage Payment Structure
- Figure 23: Down-Payment Mortgage Structure Comparison
- Figure 24: Monthly Down-Payment Mortgage Payment Structure
- Figure 25: Paying by Month: Down-Payment Loan
- Figure 26: Occupancy Rate vs. Review Scores
- Figure 27: After Loan Payment (Monthly)
- Figure 28: Required Occupancy Based on Mortgage Length
- Figure 29: Full Property Rentals Effect on Tourist Occupancy

# Authorship

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1.0 Introduction	Charles Steele, John Cerce, Erick Moo, Samantha Smith	Charles Steele, John Cerce, Samantha Smith, Erick Moo
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2.1 The Resident Population of Venice and Rising Tourism	Erick Moo	Charles Steele, John Cerce, Samantha Smith, Erick Moo
2.2 Short Term Rentals' Effects on Housing	Samantha Smith	Charles Steele, John Cerce, Samantha Smith, Erick Moo
2.2.1 Short Term Rentals' Effects on Housing around the World	Samantha Smith	Charles Steele, John Cerce, Samantha Smith, Erick Moo
2.2.2 Tourism's Effects on Housing in Venice	Samantha Smith	Charles Steele, John Cerce, Samantha Smith, Erick Moo
2.2.3 Best Practices to Address Airbnb's Effects on Housing	Samantha Smith, Charles Steele	Charles Steele, John Cerce, Samantha Smith, Erick Moo
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3.4 Develop a mockup for an equitable and sustainable short term rental platform	Erick Moo	Charles Steele, John Cerce, Samantha Smith, Erick Moo
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# 1.0 Introduction

As world travel has become increasingly popular and cheaper, residential housing has been converted into tourist accommodations. Online rental sites enable tourists to stay in any available room in the most popular tourist destinations. In Venice, Italy, one of the world’s premier tourist destinations, residents can’t afford to buy houses, and, consequently, leave the island to reside elsewhere. These Venetians now commute into Venice to work in lower-paying jobs that service the tourist industry. Banks have reported that the rise in housing prices in tourist destinations such as Venice is due to the removal of housing stock from the residential to tourist sector as housing investors are willing to spend more on a property if they can supplement their income by utilizing vacation rentals (Zee, 2016). As shown in the figure below 13% of all housing in the historic city is utilized for short term rentals via Airbnb.

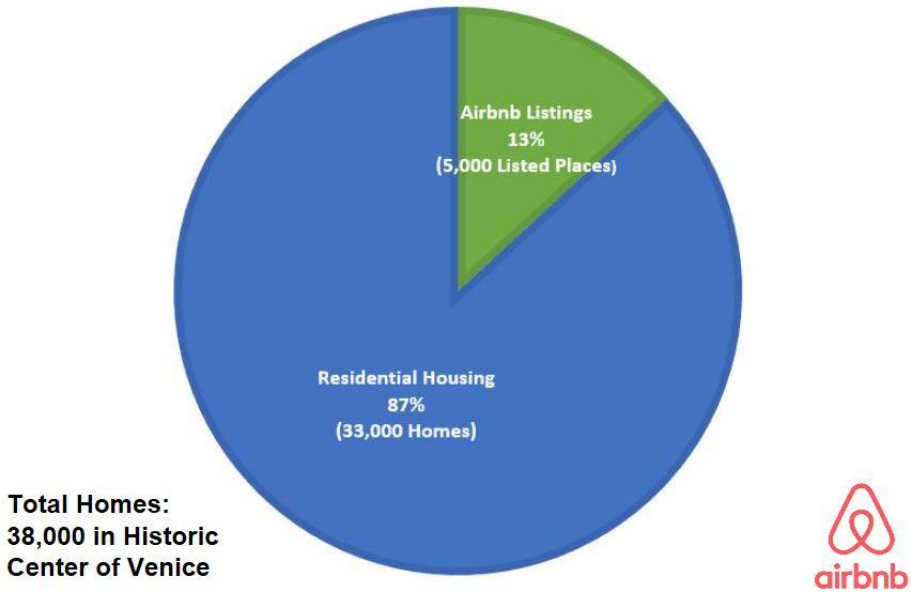


Figure 1: Pie Chart Showing Short-Term Rentals Displacing Residential Housing

Almost half of the residential population of Venice has migrated from the historic city over the last thirty years in part due to the high cost of living and to the increasing profitability of renting a property through short term rental sites (Nadeau). Occupations available in this tourism-based city do not pay enough to sustain the increased cost of living in Venice. Many property owners or foreign investors rent properties to tourists which further drives the cost of housing upwards (Hall, 2008).

Several cities are taking steps to use short-term vacation rentals to assist residents to buy their own homes. In Seattle, an organization called Loftium helps to provide a down-payment to homeowners in exchange for promising to rent the property on Airbnb. In Venice, the startup Casa Peota, plans to help Venetians buy mixed-use properties to use as a residence and as a short-term rental as a way to provide affordable housing options for Venetians. The homeowners

will pay off the down-payment and the mortgage loan by renting out a room through Fairbnb, a rental platform that allows tourists to give back to the community they are staying in.

The goal of this project is to help establish a balance between visitors and residents in Venice so that they both can stay sustainably and affordably. Our objectives for this project are:

- 1.1 To assess the availability and cost of housing in Venice.
- 1.2 To investigate the availability and profitability of tourist accommodations in Venice.
- 1.3 To develop mechanism(s) that will make housing accessible and affordable.
- 1.4 Develop a mockup for an equitable and sustainable short term rental platform

By addressing the issue of affordable housing in Venice, Venice will mitigate depopulation while maintaining its vibrant tourism industry.

## **2.0 Background**

Venice is seeing drastic changes in its residential and tourist lifestyles, receiving around thirty million tourists per year. The residential population of Venice is around fifty thousand and has been on a steady decline since 1952. Although Venice is a UNESCO World Heritage Site, the massive influx of tourists into the historic city has led UNESCO to consider adding Venice to its list of “In-Danger” sites. In-Danger sites are normally reserved for war-ravaged ruins and destroyed historical sites (Rodriguez, 2017). Some have claimed that tourist development will lead to Venice becoming one big “Disneyland,” with no rich historic presence.

Tourism puts pressure on cultural heritage and price of everyday goods, but also increases the cost of housing in Venice. The most negative social effect of these market pressures is the displacement of locals, which leads to the decline of the local culture and values. Housing that had been available for residents is now rented to tourists where there is more profit through companies like Airbnb and Booking.com.

As a result, the goal of this project is to help establish a balance between visitors and residents in Venice so that they can both stay in Venice sustainably and affordably. In this background, we first plan to look at the change in the resident population, then Airbnb’s effect in Venice, and finally what housing is like in Venice.

### **2.1 The Resident Population of Venice and Rising Tourism**

Since 1952, the resident population of Venice has been declining while the tourist population has been rising. The population of Venice has diminished more than 60% since 1952 when it peaked at 218,991 permanent registered residents. If the current depopulation trends continue, Venice will lose about 1,000 residents annually (Demographics, Venipedia). When only taking the resident population of the historic city of Venice into account, it peaked in 1951 with 174,808 people. During 2010, the average daily population of tourists surpassed the resident population as shown in Figure 2.

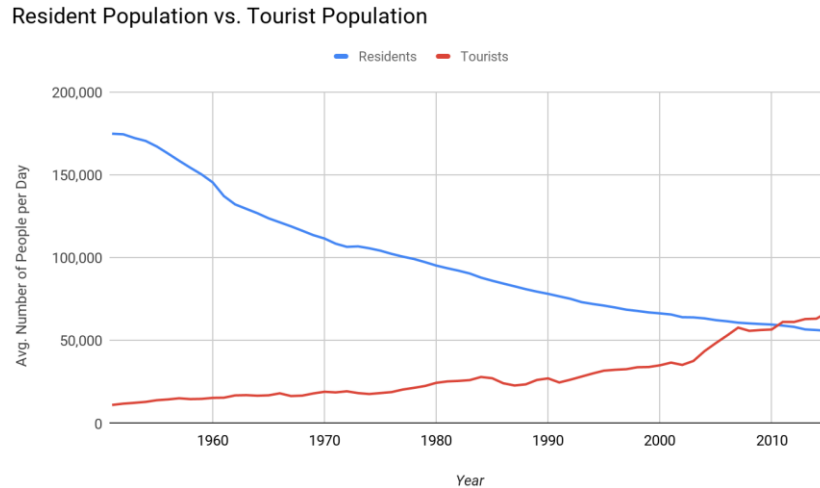


Figure 2: Resident Population vs. Avg. Daily Tourist Population of the Historic City of Venice

The impacts of tourism on Venetians include severe overcrowding of streets, intrusion on places of worship, littering and pollution, and price inflation of everyday goods (Tourist Management in Urban Areas, 2016). The severe overcrowding of Venice’s streets makes it hard for locals to move around, making it difficult for businesses in the city to meet with clients. Churches are popular tourist destinations, which creates conflicts between locals and tourists over its use. Tourists increase demands for everyday goods causing the cost of living to increase as well (Blanco, D'Ambrosio, La Manna, & Martin, "Impacts of Tourism", 2014).

Currently, the average Venetian earns about €1,309 per month after taxes, but the estimated living cost is between €871 to €1,308 per month (Cost of Living in Venice; Italy Average Salaries & Expenditures). As a result, residents leave the city because they are no longer able to afford to live there (Blanco, D'Ambrosio, La Manna, & Martin, "Impacts of Tourism", 2014).

## 2.2 Short Term Rentals’ Effects on Housing

Since launching in 2008, Airbnb has become a popular option for staying away from home. Advertisements claim that staying in an Airbnb is a home away from home, with one campaign urging consumers, “Don’t go there, Live there.” The appeal of living like a local in a foreign city combined with cheaper prices than what hotels offer makes Airbnb increasingly popular with tourists. Airbnb was created as a way for locals to reach out to travelers and offer their homes, but it has become a popular platform for people who purchase properties with the sole purpose of renting to tourists.

According to Inside Airbnb, a company that analyzes Airbnb data, if a host has multiple listings, they are more likely to be running a business, and less likely to be actually living on the property. For example, in Paris, the top host has 150 listings on Airbnb, indicating that they are

running a business (Inside Airbnb). Below is a table with the percent of listings on Airbnb that are multiple listings by city.

City	% Multiple Listings
Amsterdam	24.6
Antwerp	32.8
Asheville	39.9
Barcelona	57.5
Copenhagen	12.6
Paris	20.8
Venice	64.1

Figure 3: Percent of Listings that are Multiple Listings

This also displaces people who want to live in the city. With an entire home or apartment costing an average of \$183 per night, it is more profitable for landlords to rent to tourists than to locals (Wong, 2016).

### 2.2.1 Short Term Rentals’ Effects on Housing around the World

Airbnb and short-term vacation rental sites are contributing to the rise of housing prices because people are more willing to spend more money on properties if they think they can profit from renting it out (Zee, 2016). As seen in the figure below, since 2014 the price per square meter in Amsterdam has risen from €3,380 to €4,930.

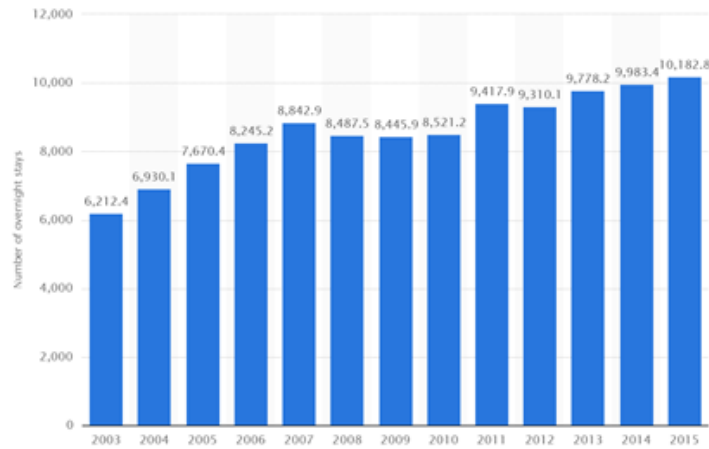


Figure 4: Price per Square Meter from 2014 to 2016 (Enlarged in Appendix A)

While this statistic doesn’t prove that Airbnb is the cause of housing-price increases, a study done in Florida showed that homes in areas that allowed Airbnb cost almost double the price of homes in areas where Airbnb was banned. A study done in New York City showed that 8,000 homes were removed from the market because of short-term rentals on Airbnb (Litvak, 2016; Ting 2016). Homes that are used for rental businesses are not available for locals to live in. The combination of increased housing prices and decreased housing availability displaces locals.

## 2.2.2 Tourism’s Effects on Housing in Venice

In Venice, tourism has drastically increased since 2008, with overnight stays rising from 8.5 million people in 2008 to 10.3 million people in 2015, as shown in the figure below.



© Statista 2017

Figure 5: Overnight Stays in Venice from 2003 to 2015 (in 1,000s)

In Venice, Airbnb accommodations are cheaper than hotels by \$85.78, on average, making it more affordable for people to travel to Venice and therefore, potentially, increasing the number of people traveling to Venice and staying the night (Wong, 2016).

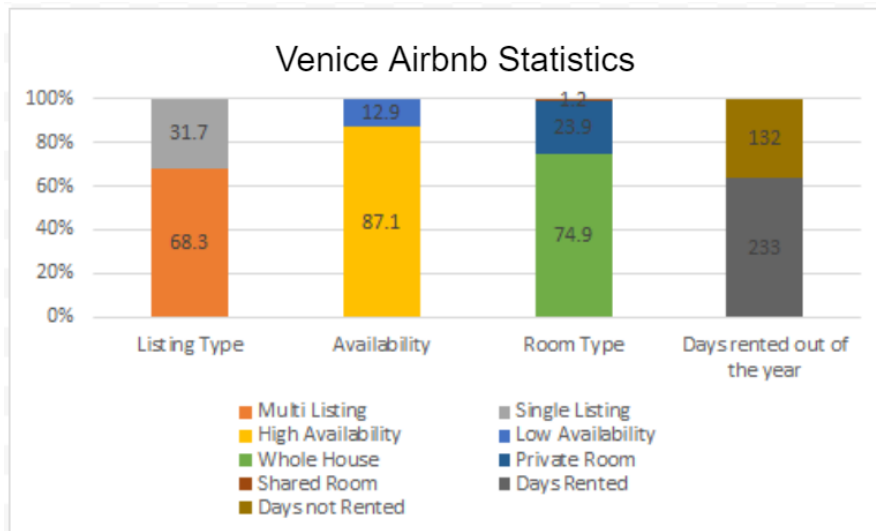


Figure 6: Statistics on Airbnb’s usage in Venice, Italy

Units that are used for the sole purpose of renting to tourists are removed from the market, displacing Venetians who want to live in the city but can’t find housing. An article in National Geographic written by a Venetian states “I would rather be unhappy here [Venice] than happy somewhere else,” (Zwingle, 2015).

The cost of housing has also risen in Venice since 2002 when it was €2,069 per square meter, versus the €4,600 per square meter it is today (Cannari, 2008; Boigenzahn, 2016). According to a study titled, “House Prices and Housing Wealth in Italy”, this rise in cost has been correlated to tourism (Cannari, 2008).

Our studies using data from Inside Airbnb suggest that this increase in the cost of housing can also be correlated to the increasing rental of properties on Airbnb. From 2002, the price of housing increased by almost €2,600 per square meter or €173 per year. Because housing prices in Italy dropped during the recession after 2008, the rate of growth is presumably greater than the one calculated above, indicating that the cost of housing increased rapidly after the advent of Airbnb (Guide, 2013).

### **2.2.3 Best Practices to Address Airbnb’s Effects on Housing**

To combat the “Airbnb Effect”-- the rise in housing costs and the displacement of locals-- some cities have required Airbnb to take some of the following steps: pay hotel or rental taxes to the city, require that hosts be present while guests are renting, not to allow rentals for more than 60 days out of the year, not to have more than four guests at a time, to require a business license and registration of rental properties with the city, and fining those who break the laws (Zee, 2016; Weiss, 2017; Surowiecki, 2013; Economic and Planning Systems, 2015).

Fairbnb is a startup that would combat the Airbnb Effect. Fairbnb takes half of the profit that they make and put it back into the community. A couple of options include helping to pay off mortgages of local Venetians as well as funding the community in the restoration and maintenance of local art. With start-ups like this one, Fairbnb will be satisfying both the tourist as well as the homeowner.

## **2.3 Housing in Venice**

Affordable housing in Venice has become increasingly hard to find. As in the city, residents have just two options to stay in Venice: rent or buy. Either is difficult to do in Venice, where most of the current occupations do not pay enough to support the high cost of living (Ross). Buying a property is expensive for residents, especially on the historic island of Venice. Renting a residence has also become increasingly expensive which creates few choices when looking for affordable housing in Venice.

### **2.3.1 Residential Housing Accommodations**

The cost of renting an apartment in Venice has become out of reach for many residents who look to work and reside completely on the island. The problem isn't a shortage of apartments and housing, as many are left dilapidated and abandoned, but it is that Venetians are unable to live on the island because the prices of these properties are too high for them to afford (Livesay). Properties which are affordable for Venetians aren't liveable due to their poor condition while liveable properties have increased in prices due to the demand (Livesay). The

permanent housing and rental prices are three times as expensive in 2008 as they were in 1999 (Hall, 2008). This is due to the high yields of the rental market where prices are inflated to accommodate tourist demand (Hall, 2008).

With inflated prices to live on the island, Venice has become one of the most expensive places to live in Italy. A single-room apartment can cost on average €740 to €900 per month in the historic city. On average, Venetians make €1309 per month after taxes. If a resident were to live with the current monthly income and cost of living per month, then they would be spending about 40%-50% of their monthly income on housing. However, it is recommended to spend about 28-33% of your monthly income on housing instead (Weliver).

### **2.3.2 Mortgage Payment Options**

In order to get the residents payment to just 28-33% of their monthly income, they must execute the proper payment plan. There are current payment plans that look to provide the needed money using tourist vacation rentals. One startup working out of Seattle, Washington called Loftium is using these short-term vacation rentals as a way for residents to make money quicker.

Loftium is a new startup that is helping people throughout Seattle buy homes by supplying their down-payment. Loftium looks to help residents pay a downpayment of 20% on a house worth no more than \$600,000. This sum supplies tremendous support because, on average, many residents only pay 8.2% on their down payment (Bernard). When a resident works with Loftium they're signed to a 1 to 3-year contract which states that they will rent out an extra room so they are able to pay back the loan. While there are consequences restraining residents to the contract, this form of loan has much less risk for the homeowner as they don't owe as much money (Bernard).



## 3.0 Methodology

The goal of this project is to help establish a balance between visitors and residents in Venice so that they both can stay sustainably and affordably. Our objectives for this project are:

- 3.1 To assess the availability and cost of housing in Venice.
- 3.2 To investigate the availability and profitability of tourist accommodations in Venice.
- 3.3 To develop mechanism(s) that will make housing accessible and affordable.
- 3.4 Develop a mockup for an equitable and sustainable short term rental platform.

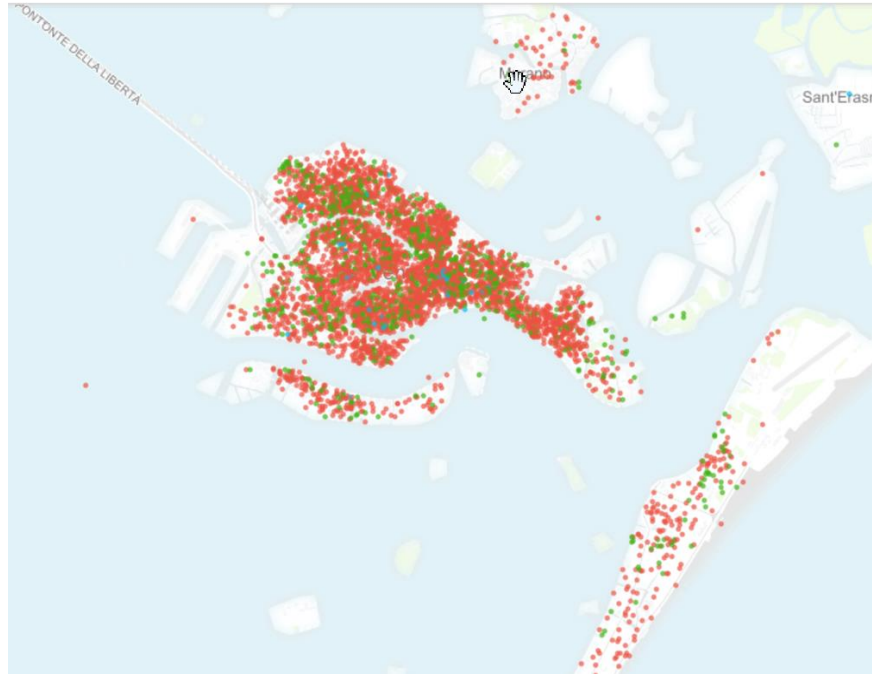


Figure 7: Map of Venice from Inside Airbnb showing Airbnb listings

Our project is devoted to tourist accommodations and residential housing on the main island of Venice. Shown in Figure 7 above are the different types of listings that are on Airbnb in Venice.

For the purposes of this project, tourist accommodations are residential homes rented through online sites such as Airbnb for overnight visitors. The residential housing includes residential apartment rentals as well as purchased housing. Available housing for sale is defined as houses that are unoccupied, for sale and cater to both tourists and residents' needs. Profitability from tourist accommodations is the profit from listings rented through online sites that allow the company to run and fund revitalization projects. Mortgages through Casa Peota are to be paid off within 15 years by renting out part of the property to overnight tourists. We will be evaluating the short-term rental market in Venice from October 2016 to September 2017.

### **3.1 Assessing the availability and cost of housing in Venice.**

The goal of this objective is to determine the types of housing, how much is available in Venice, and their cost. We created spreadsheets to look at the median price and evaluate what would be the best for Casa Peota based on median price and how many listings there are. The rental market will also be reviewed to see the difference between rental prices in the historic city and Mestre.

### **3.2 Investigating the availability and profitability of tourist accommodations in Venice**

The goal of this objective is to determine what accommodations are available for tourists in Venice and how profitable they are to evaluate if tourist stays can be used to help Venetians pay their mortgages. The factors upon which occupancy rate and price depend will be determined using data provided by Inside Airbnb on the “Get the Data” page and by Murray Cox, the creator of Inside Airbnb.

### **3.3 Developing mechanism(s) that will make housing accessible and affordable**

The goal of this objective is to find an affordable plan to decrease the problem due to the high cost of housing in Venice. With basic mortgage plans in mind, we will use further research to determine what will be best for residents in regards to housing payment plans. This information will help to find an affordable mortgage plan which will allow Venetians to become property owners in the historic city. To do this, possible plans must be devised, tested, and revised to produce a mortgage plan which is affordable and short enough to quickly accommodate Venetians looking to live in the Venice Lagoon.

### **3.4 Developing a mockup for an equitable and sustainable short term rental platform**

We are going to learn how to use HTML, CSS, Javascript, and AngularJS in order to make the mockup website for Fairbnb. We will use Firebase, a mobile and web application development platform, as a hosting provider and database management system. In order to make the website look appealing, the group will observe how different websites like Airbnb.com and Booking.com set up their interface to make it user-friendly and visually appealing. The mockup will mostly be made up of HTML and CSS code with almost no functionality. Switching between some pages and a fake login will be implemented to show the mockup aesthetics. Additionally, we need to visually showcase what should make Fairbnb different from Airbnb.

## 4.0 Venice Housing Market: The Gap

Housing in Venice has become out of reach for residents looking to live in the historic city. To determine reasons for this, we analyzed the housing market in Venice: what is available for sale and what can Venetians afford. With this information, we were able to evaluate and analyze what will be the options for residents looking to buy properties under Casa Peota.

The most desirable type of home for the price in Venice has three bedrooms. With such a unit, two rooms are available for rent with a private bathroom for the owner. A separate bathroom will help maintain privacy and separation. Smaller units with two bedrooms are also at or below the median price and may be equally desirable as the more affordable options. A variety of units priced close to the median could optimize stays with Fairbnb while paying the mortgage and a loan from Casa Peota.

### 4.1 Gather and Analyze Housing Information

Information has been gathered on housing for sale throughout the city of Venice on various real estate agency websites (<https://www.idealista.it/>, <https://www.immobiliare.it/>). Michele Montanari and Alessia Risso, interns working at the VPC, assisted us by scraping data from the websites and putting it into “scraped data spreadsheet”. Additionally, photos were taken of listings posted on the windows of real estate agencies throughout Venice and entered into a “window listing spreadsheet”. Both spreadsheets consists of: borough/general location, the cost to buy, number of bedrooms, number of bathrooms, and square meters. Finally, information was collected on houses to rent in Mestre in order to compare the monthly cost of renting on Mestre to the cost of monthly mortgage payments in the historic city.

A total of 176 data points were collected for the “window listings spreadsheet” which were found all throughout Venice at twelve different real estate agencies. Additional information from the data scrape added 4,934 listings. After we collected, categorized, and then plugged all the data into excel sheets, we deleted the repeat and erroneous data. With these listings from November of 2017, we combined our results into a single graph which depicted the medians for the housing types we chose as seen in the figure below.

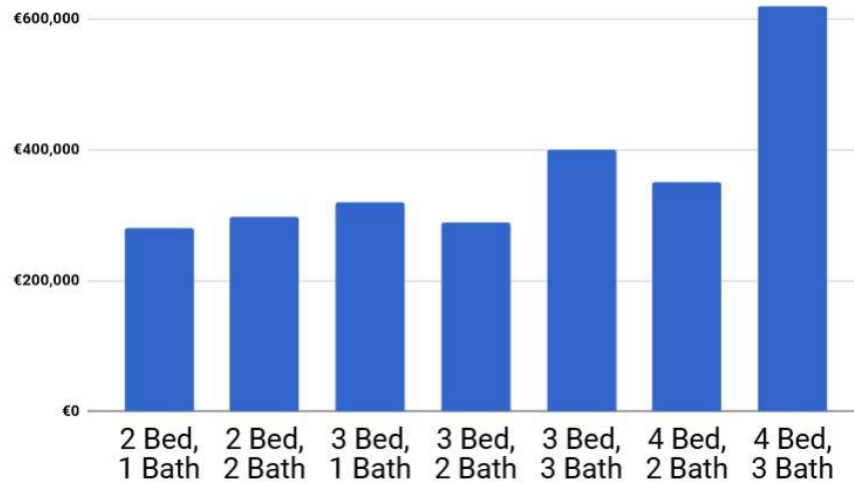


Figure 8: Median Housing Cost in Venice

Taking a closer look at this figure, we can state that the least expensive options for Casa Peota (least to most expensive) would be: 2 bedrooms 1 bathroom, 3 bedrooms 2 bathrooms, 2 bedrooms 2 bathrooms, and 3 bedrooms 1 bathroom. These would be the most feasible options for Casa Peota because they are relatively inexpensive. Next, we went on to calculate the median price of housing in Venice and determined it to be around €300,000. This median price does not include potential renovation costs. With the median housing cost we will develop a mortgage structure based on this median housing value. Next, we had to find out what the average Venetian could afford based off of an average salary. An average Venetian makes about €22,200 a year. As a result, an average Venetian couple would make €44,400 per year, and could afford a €180,000 home. Casa Peota and short-term rental services will fill the gap between what an average home costs and what an average Venetian couple can afford.

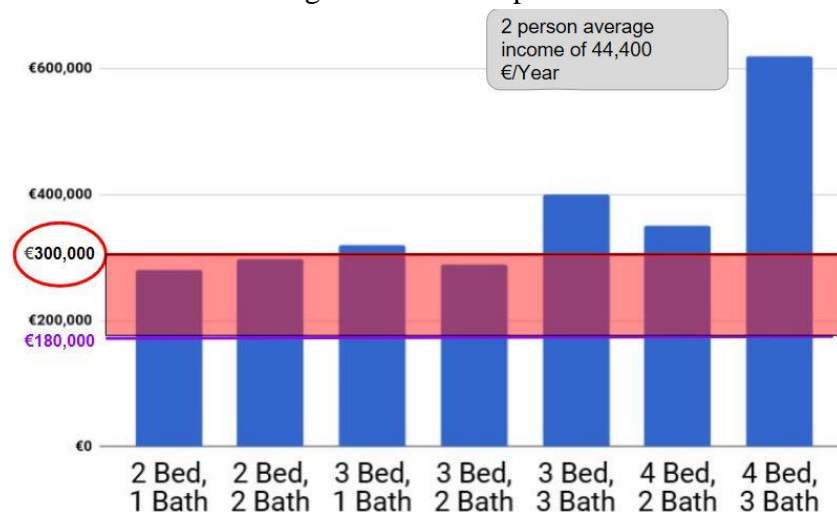


Figure 9: Gap Between Housing Cost and What Venetian Couple can Afford

Exploring the preferred housing types, we determined, based on cost and availability, that the most optimal housing for Casa Peota would be 2 bedrooms 1 bathroom, 3 bedrooms 2 bathrooms, 2 bedrooms 2 bathrooms, and 3 bedrooms 1 bathroom. Combining these four housing types' results in a total of 2,411 listings as seen in the figure below.

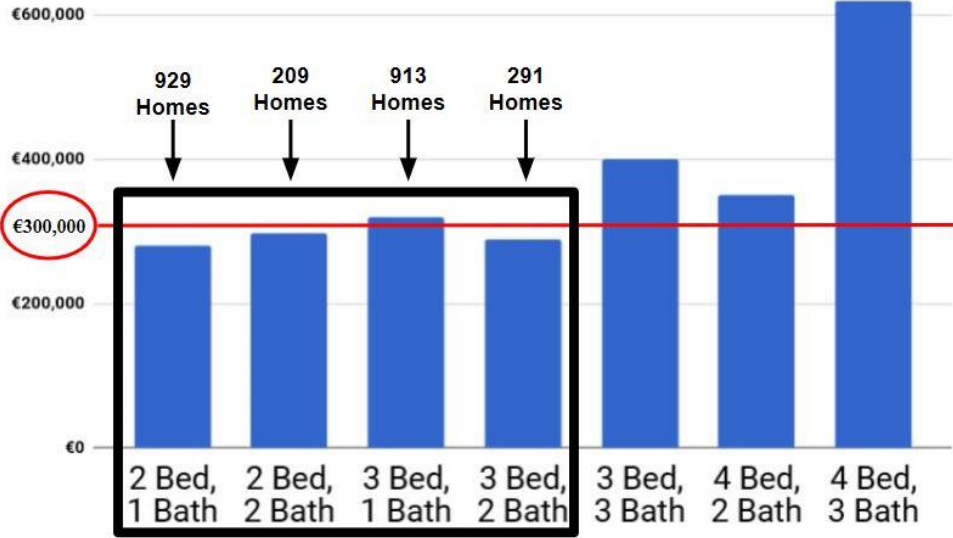


Figure 10: Ideal Homes for a Venetian Couple

This would enable the buyer to find a large selection of optimal homes. These housing types would be comfortable, spacious, and allow the Venetian couple to expand their family.

While analyzing the resident housing market through NUMBEO, we concurrently analyzed rental prices for apartments in both the historic city and Mestre. In Venice, the average rental price for a one bedroom apartment is between €600 and €900, and the average rental rate for a three bedroom home is between €1,200 and €1,600. In Mestre, the average rental rate for a one bedroom place is between €400 and €550, and €800 and €1,100 for a three bedroom. If an average couple is looking to live in a three bedroom home, they can only afford to live in Mestre. However, since the goal is to live in the historic city, a max monthly mortgage payment of €1,100 makes living in the historic city comparable to Mestre.

### 4.2 Leverage Tourists to pay Venetians' Mortgages

The concept behind Casa Peota is to help Venetians become homeowners. This goal raises many problems such as acquiring housing as well as obtaining capital needed to run a business in an expensive real estate market. Casa Peota will utilize mortgage plans needed to make housing affordable in the historic city of Venice.

In Venice, we recommend that residents look for properties around the median housing price of €300,000. Ordinarily, a down-payment of 20% of the purchase price of the home must be provided. The other 80% of the cost of the home will be provided by the bank as a mortgage

loan. A breakdown of a 15 year mortgage structure at the current average interest rate of 4.5% can be seen below.

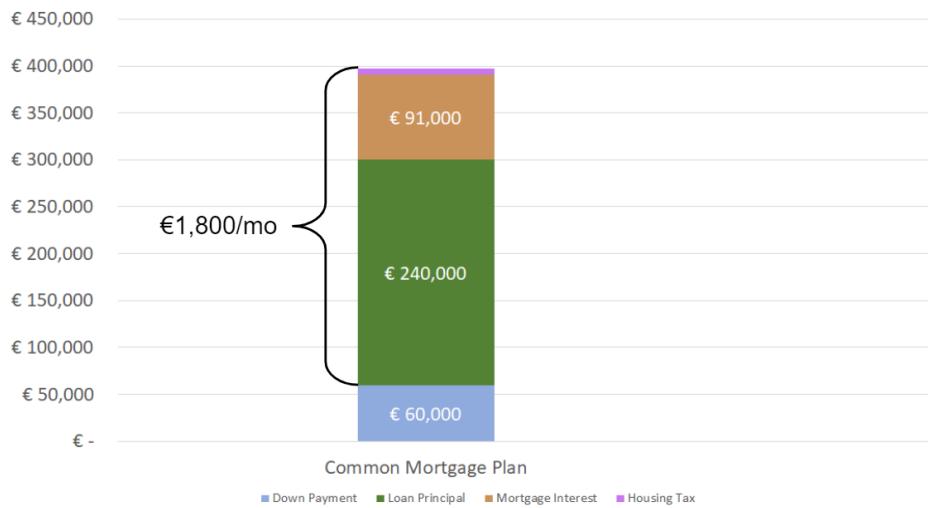


Figure 11: 15 Year Mortgage Loan Breakdown

With the added costs of the down-payment, loan principal, interest, and housing taxes associated with purchasing a property, the resident must accumulate about €400,000 within 15 years. Due to the interest rate and cost of the home, it will cost the resident €1,800 per month. In the below figure is a comparison between this monthly payment and an average Venetian income. An average Venetian’s income is about €22,000 per year, €1,850 per month, which means they would have to spend almost their entire income in order to afford this property.

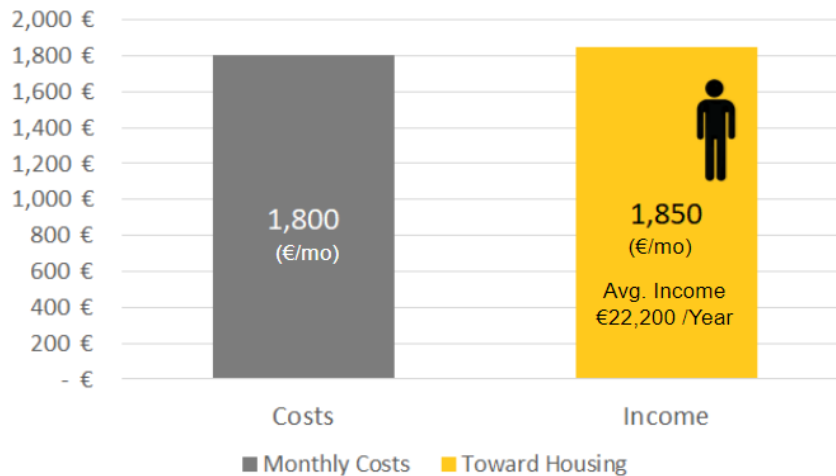


Figure 12: Monthly Mortgage Payment vs. Average Venetian Income

Rather than needing the resident to spend a lot of their income on housing, the goal of this project is to determine a structure which allows Venetians to spend just 30% of their income while being able to afford housing. Shown below is the income toward housing in which a couple would pay per month. This value, shown in yellow, does not amount to the total monthly

cost which creates a gap between how much they have to pay and how much they are paying. The gap that results is shown in red and this amount can be filled by using tourist vacation rentals.

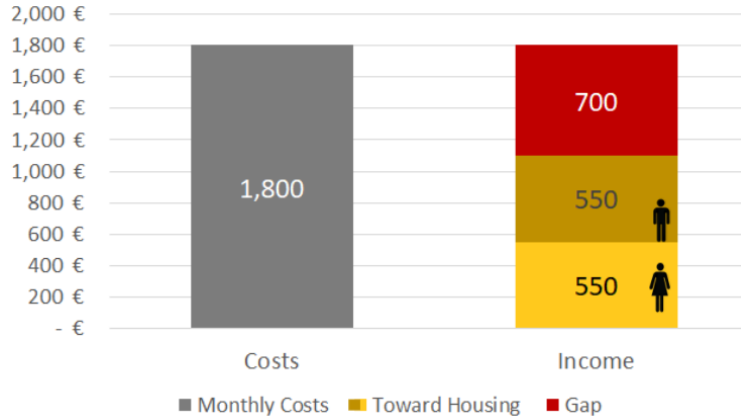


Figure 13: Gap Between Monthly Mortgage Payment and Income Toward Housing

The above monthly payment structure allows residents to afford €1,800 per month. This mortgage structure assumes that the resident can afford the down-payment up front. For residents who cannot pay the down-payment, they must get another loan. This loan must come from someone other than the bank, as the bank will only give a loan up to 80% of the cost of the home. Casa Peota will help with this loan allowing the resident to borrow 100% of the cost of the home.

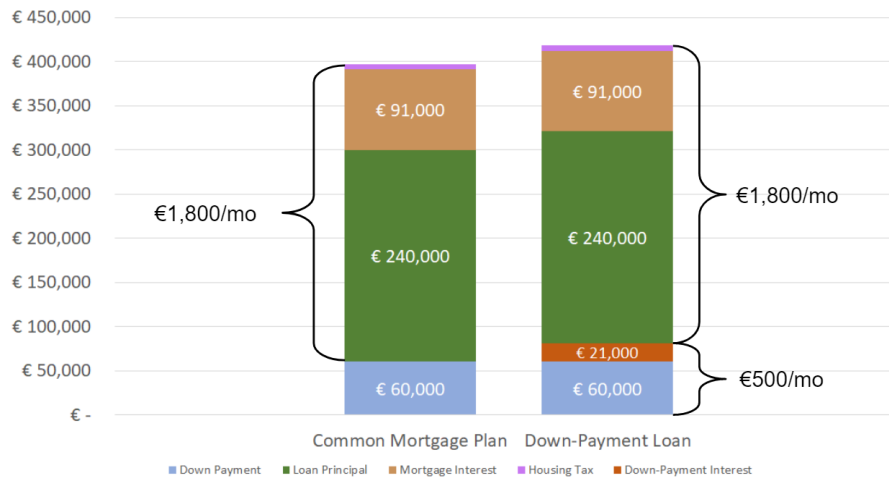


Figure 14: Mortgage Structure with/without Down-Payment Loan

Due to interest associated with this loan, the total cost over the length of the mortgage will increase to over €400,000. Also, with a greater amount of money loaned, the monthly payment has also increased to cover the Casa Peota loan payment. The above figure compares mortgage structures with or without the down-payment loan. Monthly payments now include the mortgage payment which remains the same at €1,800 per month but will now include the Casa

Peota loan payment, which is €500 per month. This creates a monthly payment of €2,300 per month and is evaluated in the figure below.

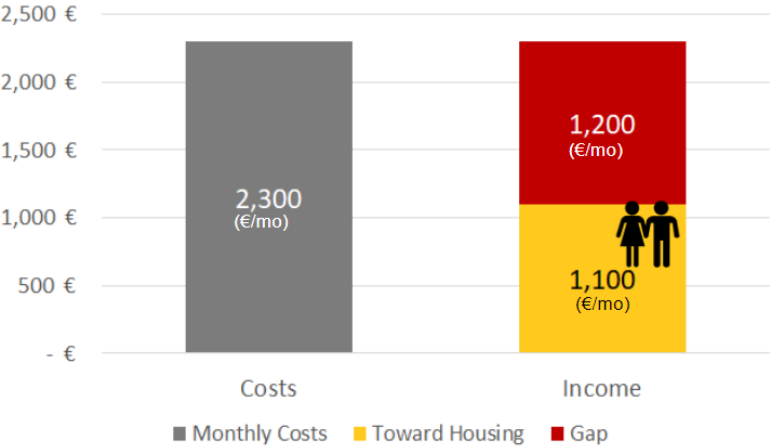


Figure 15: Down-Payment Monthly Mortgage Payment Breakdown

When paying this increased monthly payment, the residents continue to pay just 30% of their monthly income. Since the monthly cost increases, the gap that must be filled with tourist vacation rentals rises to €1,200 per month. In order to fill this gap with short term vacation rentals we must analyze the rental market.



## 5.0 Short-Term Tourist Rentals in Venice

Short-term rentals will fill the gap between what a resident can pay and what is required. Airbnb is one of the largest short-term rental platforms, and we analyzed its listings to determine the average price per night and occupancy rates of short-term rental listings in Venice. The internal listings of Airbnb are available through a community-based resource, Inside Airbnb. Short-term rental platforms offer Venetians the opportunity to purchase a home, but this model can also be modified to benefit the community in which it operates. One such platform is Fairbnb, which will donate half of its commission to local community projects.

### 5.1 Inside Airbnb

Inside Airbnb uses an automated program to scrape data listed online in Airbnb. The information provided by this data scrape includes, but is not limited to, the listing ID number, date of the data scrape, price of the listing, room type, location in latitude and longitude, number of reviews, and minimum nights the host requires someone to stay. This information was used to determine if price and occupancy rate depend on location on the historical island of Venice, as well as the average price and occupancy rate on the island. Occupancy rate is not included in the data, so it must be calculated using the following formula:

$$\frac{\frac{\text{MAX}(\text{Minimum Stay, Average Length of Stay in Venice}) * \# \text{ of Reviews per Month}}{0.5}}{365} * 12 = \text{Occupancy Rate}$$

In order to get a better estimate of the occupancy rate, the minimum stay required by the host will be compared to the average length of stay in Venice (3 days). The larger number is used as the length of stay in the formula. According to Murray Cox, the creator of Inside Airbnb, people only leave reviews about 50% of the time, so the number of reviews per month is divided by 0.5 to calculate a more accurate rate. For the purposes of this project, only data about Private Rooms will be analyzed.

### 5.2 Price of Private Room Listings in Venice

In order to find the average cost per night for a private room listing in Venice, the Inside Airbnb data was first organized by sestiere. Each section of the city was evaluated to determine the average cost per night in that area by averaging the price of all the listings. The results of this process is shown in the graph below. The average price per night of all of the sestieri in the historic city is around €100, indicating that the listing can be anywhere in the historic city. The average cost per night across the entire city is €100.

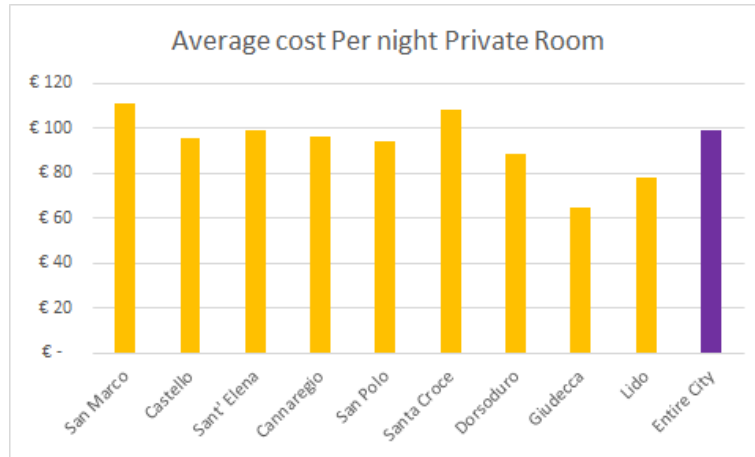


Figure 16: Average Price per Night of a Private Room in Venice

As shown in Chapter 5, the required revenue from short-term rentals is €1,200 to pay the monthly mortgage payment. If the price per night of the room being rented out is €100, then the resident must rent a room 12 nights per month, or 40% of the year.

### 5.3 Analysis of Required Occupancy Rate

In order to determine the occupancy rate of each month, the number of reviews left in a specific month was determined by comparing a listing from, for example, June to the same listing from July. The difference in total number of reviews will be the number of reviews left in that month, and the occupancy rate was calculated using the formula shown earlier.

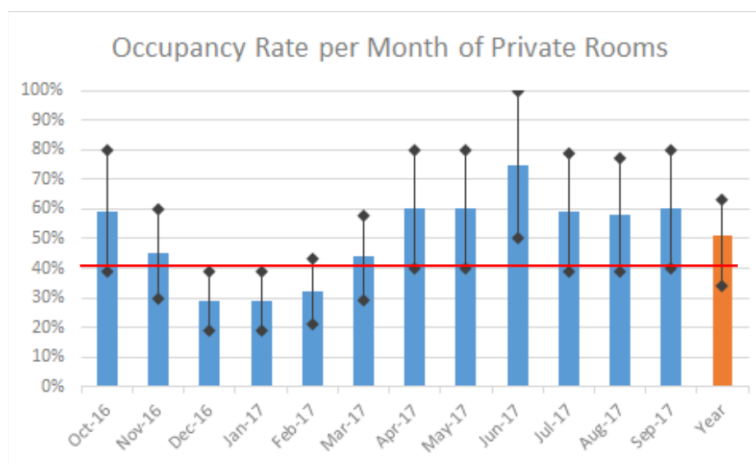


Figure 17: Occupancy rate per month of Private Rooms

The max occupancy rate is calculated using the assumption that people only leave reviews 50% of the time, while the minimum assumes that people always leave a review. Using the data from each month over an entire year, the average occupancy rate is 51%, 11% greater than the occupancy rate required to pay the mortgage.

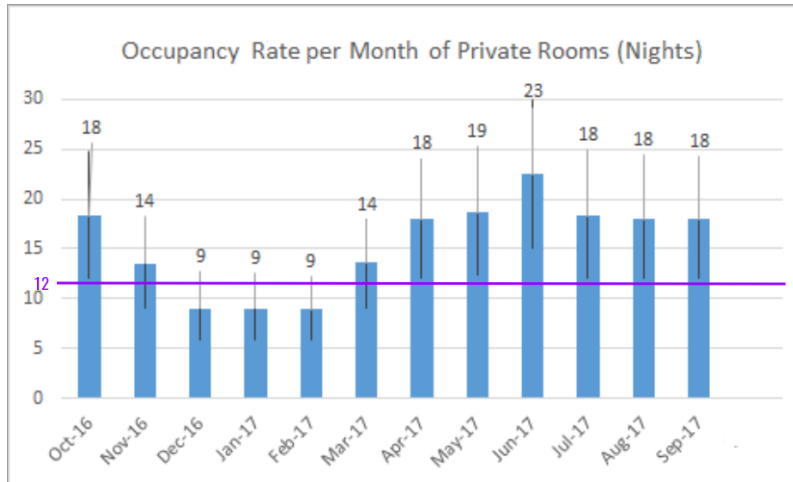


Figure 18: Average Occupancy Rate by Number of Nights

The figure above compares the required number of nights (12) to the number of nights per month someone can reasonably rent out a room. Every month, rooms can be rented for the required 12 nights per month, except for December through February, where the host can only be expected to rent out 9 nights per month. By renting out at the average occupancy rate the rest of the year, however, the profit required to pay the mortgage payment can still be met. Furthermore, if the room is rented out at the average occupancy rate from March through October, the resident can live tourist-free November through December.

The figure below pictures occupancy rate and price on a map of Venice. Each point is a Private Room listing on Airbnb, of which there are about 750. This shows that there is no one place on the island where the price or occupancy rate is higher, meaning that anywhere on the island has an equal chance of being profitable.

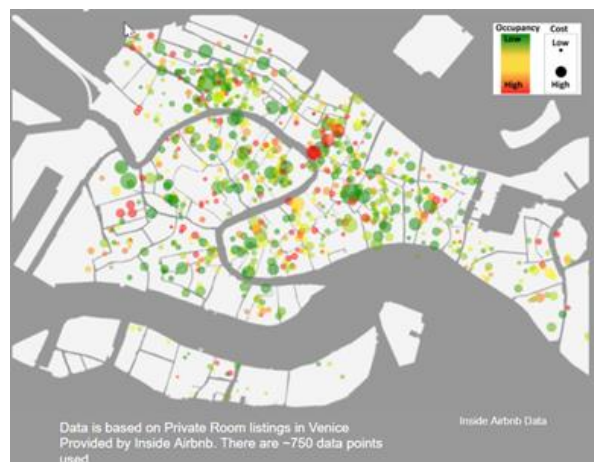


Figure 19: Price and Occupancy Rate in Venice Based on Location

### 5.3 Fairbnb Concept and Website

Any online rental platform could potentially provide income from short-term rentals to pay the mortgage. Airbnb charges a 15% commission on the cost of rentals. We developed a prototype for an equitable and sustainable vacation rental platform, Fairbnb (see Appendix B - Fairbnb Concept). Fairbnb is similar to Airbnb, but reinvests at least half of the commissions from online rentals in local projects to support and revitalize the local community. Additionally, Fairbnb would have restrictions on what and who could list properties, including: the host must be the resident of the home being listed, the listing must be a private room, and the host can only list one home at a time.



		
Short term rental service	✓	✓
50% of the fee is invested in local projects	✗	✓
Restrictions on listing	✗	✓

Figure 20: Airbnb vs. Fairbnb

#### 5.3.1 Fairbnb Mockup

The mockup currently consists of a home page, login page, signup page, listings result page, and listing page. Each page has its own CSS file, even though most of the styling is the same. The two navigation bars and footer have their own HTML file that is loaded dynamically into the main displaying document. The javascript file, slideshow.js, manages the slideshow controls in the home page. Falso.js handles page switching, keeps track of query strings to see which navigation bar it should display, and handles the changing of elements in the listings result page.

The navigation bar at the header changes according to what query string is in the URL. For the purpose of the mockup, if the URL is appended by “logged=true” the navigation bar will change to a preset user navigation bar. This can be achieved by going to the login page and clicking the login button. Until the logout button is clicked, every page will show the preset user navigation bar.

The home page consists of three main sections that should catch the user's eye once they scroll through the page once: the home page banner, featured listings, and featured projects. The home page banner briefly explains what Fairbnb is about, in addition to a button that should lead the user to a more in-depth "About" page. The featured listings section shows some placeholder listings. Finally, the featured projects section contains a slideshow with placeholder images where the images of local projects should be. Below the slideshow is a button that should take the user to a page that shows all of the projects to which Fairbnb contributes.

The listings result page has a sidebar that contains date pickers for Check-in and Check-out, drop-down menus for number of guests, and some checkboxes to filter through different types of projects. The apply button on this page sets the display of all the listings to "none" except for Ca' Tintoretto. Only the links in Ca' Tintoretto lead to the listing page. The listing page shows the details of a single listing which in this case is Ca' Tintoretto. The main thing to note on this page is that the guest is able to choose, with radio buttons, what project the listing will contribute to once the guest books the listing.

Fairbnb reinvests at least half of the profits to local projects to support and revitalize the local community. The listings should contain the name of the project that they sponsor. So, if a guest were to rent out a room, they would be contributing to the project their host chose to sponsor. The user/guest, in addition to being able to look for listings like they would in Airbnb, should be able to filter listings by types of projects. Therefore, the main features the mockup will showcase, non-functionally, are the filtering of listings through the projects they support and the host choosing what project their listing sponsors.

## **6.0 Casa Peota Plan Variations**

Casa Peota uses short term vacation rentals in order to fill the gap between the monthly payment amount and how much the residents can pay. This payment structure can be used in many different mortgage plan variations. Which variation works best depends on the goals and preferences of the residents who use them. There are a few different possibilities to choose from which allow the residents to afford a property which they could not before.

### **6.1 Mortgage Plans**

There are many possible mortgage structures that can be utilized in order to make housing affordable. These plans must maintain the goal that residents will only pay 30% of their income while accomplishing the shortest term possible. In order to keep resident payments within that range, tourist rentals will be utilized to pay the remaining amount of money needed to pay the mortgage payment. Occupancy rates of tourist rentals needed may vary between mortgage plans, but they can also be manipulated by changing a few factors such as the length of the mortgage and how much the tourist rental will make per night.

#### **6.1.1 Common Mortgage Plan**

One possible mortgage structure that Casa Peota may use is a common mortgage plan which is supplemented by income accumulated from tourist vacation rentals. There are two similar possibilities for this mortgage plan: when the resident holds the mortgage and the other when Casa Peota holds the mortgage. Depending on the entity who holds the mortgage, the size of the down-payment required as well as possible tax exemptions vary. When the mortgage is in the resident's name they will be able to get 80% of the value needed as well as being exempt from some taxes (Busetto). First home owners in Italy only pay 2% for taxes rather than 9% as long as they list the home as their primary residence (Understanding Property Taxes). On the other hand, if Casa Peota holds the mortgage, they would receive just 60% of the needed amount as well as being required to pay higher housing tax. The resulting 15-year mortgage structure breakdown can be seen in Figure 21.

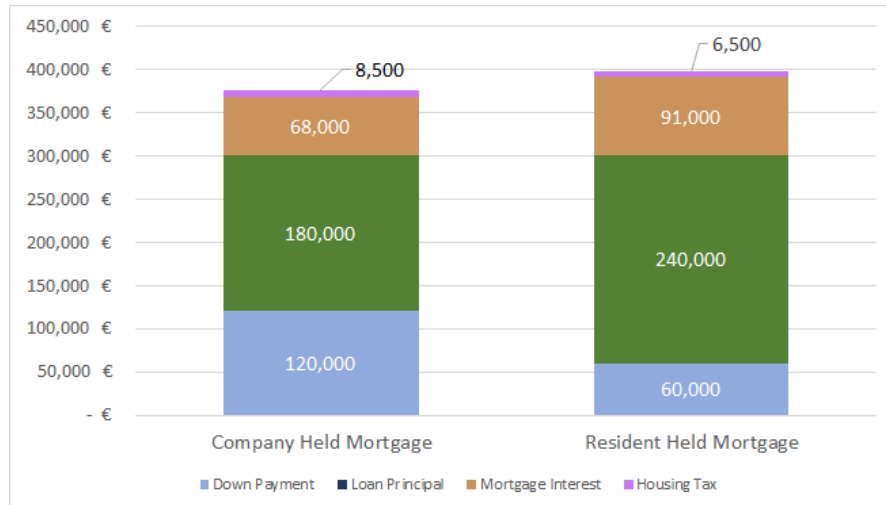


Figure 21: Mortgage Structure Comparison

Figure 21 shows two possible structures which both look to accumulate about €375,000-€400,000. This total includes the value of the home as well as the total amount of interest and taxes associated with registering a house. A mortgage held by Casa Peota requires slightly less money due to the smaller amount borrowed through the mortgage. To own the home, the resident must pay back the loan which they receive from the bank. The monthly payment structure is shown below in Figure 22.

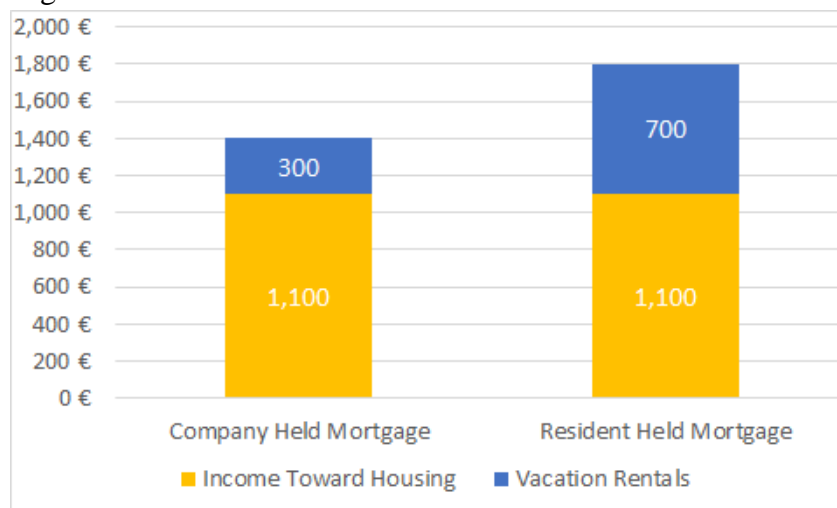


Figure 22: Monthly Mortgage Payment Structure

This figure portrays what would occur monthly when utilizing this mortgage plan. The housing payment in Figure 22 shows the portion of the payment coming from vacation rentals. This takes a burden off the resident when trying to pay the loans which they previously could barely afford. The resident's monthly payment and money acquired through renting the second private room are used to pay the total amount of the mortgage. In order to raise enough money to pay the mortgage, the private room under the company mortgage plan must be rented for 36

nights of the year (10%) when compared to the resident mortgage plan which requires 96 nights (26%). The occupancy which is calculated could change depending on the amount of money borrowed as well as a difference in the resident's income. One way that the loaned amount may increase is if the residents cannot afford the down-payment on the property.

### 6.1.2 Borrowing Entire Cost of the House

In the event that the resident looking to buy a property cannot supply the down payment, Casa Peota will loan them the down-payment. This results in interest over the entire cost of the house, making the company and resident structure cost the same amount. Differences between the two structures then become the differences in how much money is going to either the bank or Casa Peota when fulfilling monthly payments. The payment breakdown over the course of the 15-year plan is shown below in Figure 23.

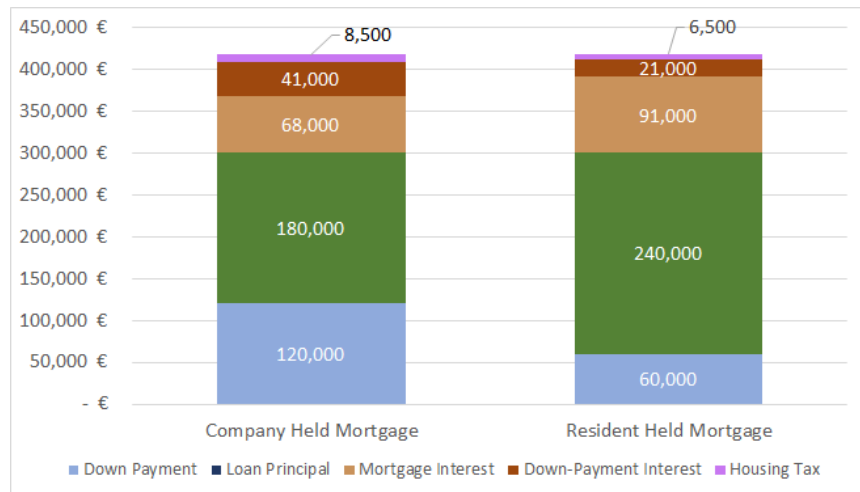


Figure 23: Down-Payment Mortgage Structure Comparison

Both available structures require an accumulation of almost exactly the same amount of money from both the bank and Casa Peota loans. However, the company structure relies on a loan from Casa Peota which is double that of the resident structure. This allows Casa Peota to acquire more income if they hold the mortgage while the resident remains unaffected. The monthly payment plan for these mortgage structures is shown in Figure 24.



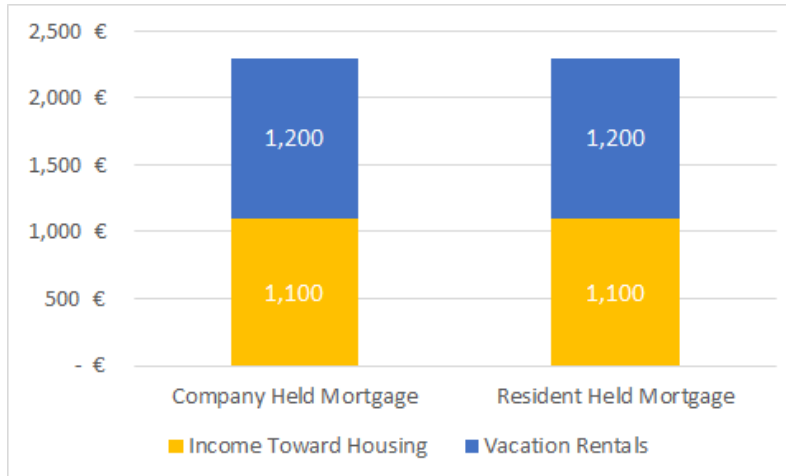


Figure 24: Monthly Down-Payment Mortgage Payment Structure

Due to the similar cost of the two mortgage plans, the payment per month is also similar. With a total required monthly payment of about €2,300, the amount which must be accumulated through tourist rentals is just over half the monthly payment at €1,200. This amount is produced through the rental of the extra private room for 12 nights each month or 156 nights out of the year (40%).

### 6.1.3 Down-Payment Mortgage Plan

The down payment mortgage plan gives another option to a resident looking to obtain a property. In this plan Casa Peota produces a contract with the resident which states that Casa Peota will supply the down-payment and the resident will rent out their extra room in order to make money and pay back the loan. This contract will have a short term of 5 years out of a 20-year mortgage which will limit the amount of years where the resident is required to rent an extra room to tourist.

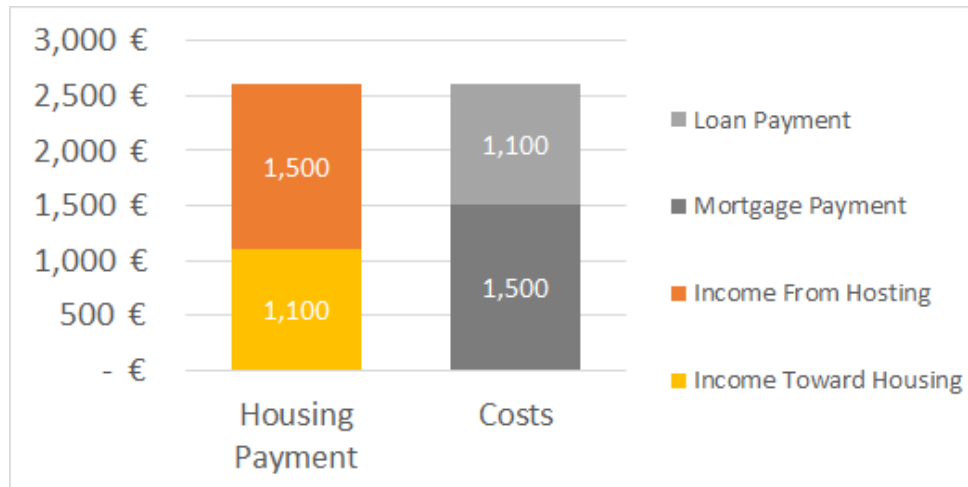


Figure 25: Paying by Month: Down-Payment Loan

Monthly payments for the 5-year plan are represented in Figure 25. This shows high monthly payments for 5 years due to the combination of the mortgage and loan payments. During this length of time the resident has to acquire €1,500 per month through tourist rentals which can be done through renting 15 nights each month or 180 nights out of the year (52%). This is a high occupancy rate, which must be obtained to fully pay loans, however it still remains possible. An occupancy rate of 52% is just above the yearly average shown in Figure 17. In order to ensure that the required occupancy rate is met, the host must consistently get high review scores.

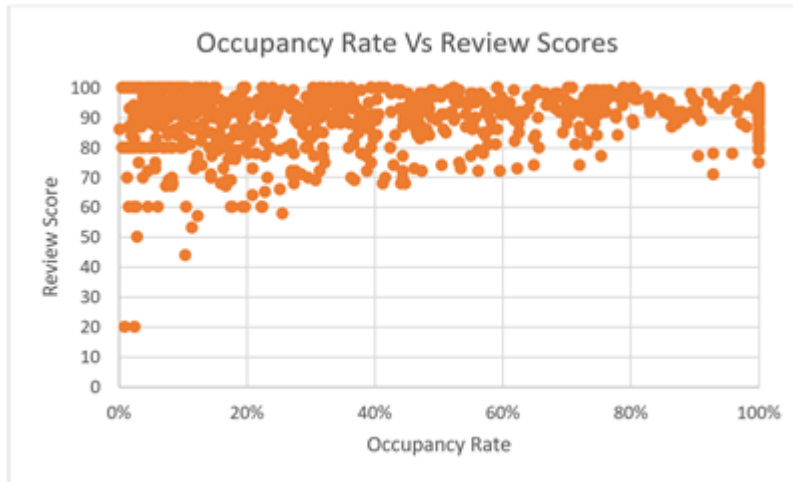


Figure 26: Occupancy Rate vs. Review Scores

As shown in Figure 26, high occupancy rates can only be achieved with high review scores. With the completion of loan payments comes the second part of the mortgage plan which brings much cheaper monthly payments.

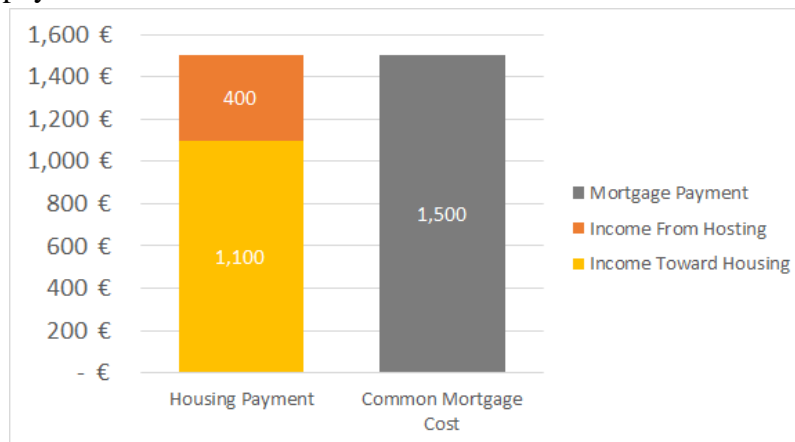


Figure 27: After Loan Payment (Monthly)

Once the loan is paid off the resident has to accumulate half of the previous amount needed during the loan. With the small amount of money needed through vacation rentals, the room must be rented for a minimal 48 nights of the year (14%). With a rate this low it gives the

resident much more freedom and will have less tourists in their home for the remaining length of the mortgage. Gathering this money is now up to the resident since the contract with Casa Peota has ended.

### 6.1.4 Options to Modify Mortgage Structure

Variables which make the mortgage plan difficult for residents is the price and the amount of time they will need to have tourists in their home. There are some options which allow the resident to change tourist occupancy by a change in the length of the mortgage as well as leveraging yearly vacation time.

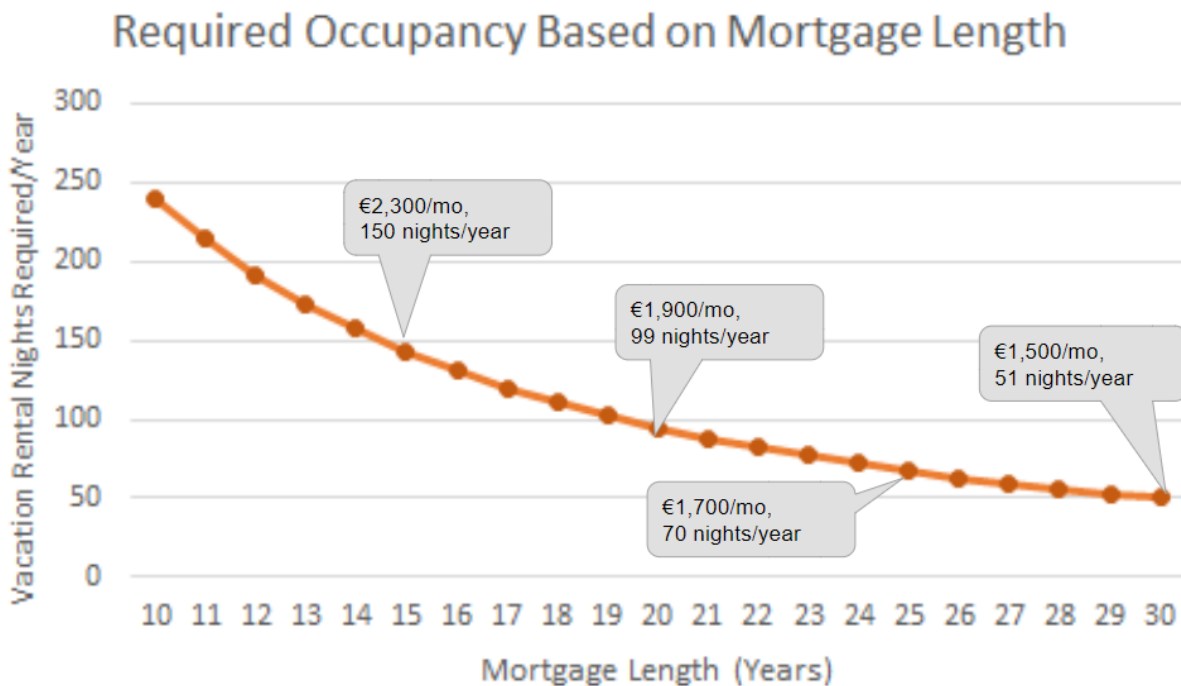


Figure 28: Required Occupancy Based on Mortgage Length

Figure 28 displays the change in required tourist occupancy depending on the length of the mortgage. The resident will be able to decide the amount of tourist required to stay in their extra room by choosing how long they want the mortgage. With a shorter mortgage plan it allows residents to become homeowners quickly but comes with a high tourist occupancy rate. Extending the mortgage plan will in turn lessen the amount of tourist in their home per year, but will also extend the amount of years needed to become a homeowner.

Another way to lessen the amount of tourist is to leverage the yearly month-long vacation of Italians. By renting the entire apartment over the month vacation time, the tenant will bring in a large portion of money, which greatly decreases the remaining income needed. This decrease in needed income lowers the required tourist occupancy rate.

	One Private Room	Two Private Rooms	Entire Apartment (3 Room)	Entire Apartment (2 Room)
Income Per Night	100	200	195	135
Total Income	2328	4656	4540	3143
Amount Left to Raise	15343	13015	13131	14528
Nights Left Renting 1 Room	159	135	136	150
Total Days Rented (1 Room)	183	159	160	174
Percent of Year Rented (1 Room)	50%	44%	44%	48%

Figure 29: Full Property Rentals Effect on Tourist Occupancy

The figure above shows the change in yearly tourist occupancies depending on what room type is rented over a month in the high tourist season which can yield an occupancy of 24 nights out of the month (80%). Renting the entire apartment as two separate private rooms proves to be the most profitable option by decreasing the amount of the year hosting tourist rentals. Based on income per night, renting the apartment as a set of private rooms is much more profitable and produces a difference of about 6% of the year hosting tourists.

This model produces about a 6% decrease for every extra room which is rented and for every month another private room is rented out. The amount of nights needed to rent out a room could continue to decrease if this structure is used for more than one month, more than 80% of the month is rented, or the property has more than 2 rooms which can be rented over the course of the month.

## 7.0 Conclusions and Recommendations

The goal of our project was to establish a balance between visitors and residents in Venice so that both can stay in Venice sustainably and affordably. The availability and cost of housing and short-term tourist rentals was assessed in order to develop a sustainable and equitable model for Venetians to buy their own home by leveraging income from short-term tourist rentals. The average Venetian couple could finance 100% of the purchase price of a €300,000 home in Venice by renting a room at least 12 nights per month at €100 per night.

Fairbnb, a new short-term rental platform, provides the functionality required to rent properties and Casa Peota provides the resources required to pay the down-payment on their mortgage. In addition to the local causes supported by small contributions via a percentage of Fairbnb's fees, these two startups will make significant social contributions to the community in Venice.

### Recommendations for Casa Peota

For the purposes of Casa Peota, a home at the median price of €300,000 was determined to be the most available, desirable, and affordable, and was therefore used in the analysis of the mortgage plan. The home can be purchased anywhere on the island since the success as a short-term rental does not depend on location.

Casa Peota could offer multiple plans or options for residents. The traditional mortgage structure with a down-payment is highly recommended. Choosing to finance the entire purchase or lengthening the term of the mortgage will depend on the priorities of the resident and other factors. A shorter mortgage will require having more tourists in their home. Many different factors such as the resident's income and the cost of the home may make the mortgage plan more difficult than explained in above chapters, which is based on the assumptions outlined in the earlier chapters.

The common mortgage structure makes it possible to purchase a home over 15-30 years. Depending on whether the resident can afford the down payment or not will determine the target for tourist rentals. A couple with two average incomes, as defined in Chapter 4, need tourist rentals for at least 144 nights (40%) of the year to afford to finance 100% of the purchase compared to 96 nights (26%) of the year with a traditional mortgage for 80% of the purchase price. This assumes a 15-year mortgage, the recommended option to own a home as fast as possible. Other options are described above in our analysis.

As long as the residents are well-rated as hosts, all of the financing plans are feasible. In order to insure that the residents can make their monthly payments, Casa Peota should provide a training program on how to be a good host.

Sources of funding for Casa Peota will need to be identified. The city of Venice is interested in this initiative because it has the potential to make more affordable housing in the historic city. The city also controls a number of units that are currently vacant that could be used to test this program. These residences could be used for below-cost loans as a way to raise

money for residents and Casa Peota itself. With subsequent investments, the company will be able to continue to invest and gain capital to further grow the business.

### **Recommendations for Fairbnb**

The Fairbnb website will require further development in order to be implemented fully. Additional features would include, but are not limited to: a fully functioning, mobile-friendly website as the front end and a database in the back-end that can support search queries and proper logins. The mockup is only an example of what the website could look like. The high priority features are identified in Chapter 8. Some lower priority features should include a function like Airbnb's "superhost", and communication between guest and host. A "superhost" has strict prerequisites such as having 80% of the reviews be 5-star reviews, quick response rates, and rarely cancelling confirmed trips (Airbnb). Fairbnb should also provide resources for hosts detailing how to be a good host.

### **Overall Recommendations**

Both startups, Casa Peota and Fairbnb, should be implemented. We have concluded that Fairbnb and Casa Peota are feasible options for helping Venetians acquire housing in Venice affordably. Future projects might examine research what makes a "good" host, which could lead to higher occupancy and increased revenue from short-term rentals. Through our study examining applying the concepts of Casa Peota and Fairbnb--to establish a balance between visitors and residents--specifically in Venice, the conceptual framework of this project could be applied elsewhere, and thus the scope for implementation is much wider and its potential impact is much broader.

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# Appendices

## Appendix A



## Appendix B

Fairbnb Concept - [fairbnb.coop](http://fairbnb.coop)

Fairbnb Prototype - [shareyourhome-def49.firebaseio.com](http://shareyourhome-def49.firebaseio.com)