

Avoiding Atlantis  
Sea Level Rise Is Not Affordable For Low-income Communities  
by  
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Senior project  
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## Avoiding Atlantis

Sea level rise is not affordable for low-income communities.

By Roberto Hernandez

Submitted in partial requirement for the degree of Landscape Architecture Bachelor of Science in the Department of Human Ecology at the University of California, Davis.

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# Abstract

Sea level rise has become one of the most challenging threats for cities and habitats around the globe. Most of the environmental changes have been due to the increase of in human population. From food to waste, humans are responsible for climate change. Sea level rise will flood cities, and it will change coastal lines impacting the lives of a lot of people. It will also mean the loss of habitats and the extinction of many species. However, when it comes to addressing the issues of sea level rise, low-income communities are at higher risks of the negative impacts of sea level rise. The city of Alviso is a low-income community that faces the threats of sea level rise. Can sea level rise be affordable for low income communities? To find a solution for this challenge, this project seeks to find the balance between ecological features and cultural features when responding to sea level rise. While addressing sea level rise, this project takes into consideration cultural and ecological features that have a strong identity in the city of Alviso. Additionally, the convictional strategies of sea level rise will be study with the purpose of finding a design that will incorporate the needs and wants of the city of Alviso.

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# Chapter 1

## Sea level rise



# Introduction

Driving around in the middle of San Jose, my brother and I had waited a long time for some time to enjoy together, but it started to rain. Climate change? Is it a reality? It has been a reality for a long time. Even though some of the higher ups of this country do not believe in science. We live on a planet that is host to many ecosystems and has several life cycles, several processes and an immense number of distinct species. However, to ignore the facts is irresponsible, but to prove the facts we must understand why climate change is happening. Let me introduce one variable into the equation, and perhaps the most important one. The GreenHouse Effect. Atoms are present in the atmosphere all at different ratios, this atom form bonds with each other by sharing electrons and ultimately, they form larger molecules. Molecules then follow the same behavior of sharing electrons and larger molecules or elements are formed. The greenhouse effect is a natural process composed of several molecules in the form of gas. Energy from the sun comes in the form of light and it transfers energy to the molecules of gasses that are present in the atmosphere.

After some of the energy has been absorbed, some of the radiation escapes back into the universe. Whatever is left over excites the electron and other fascinating reactions happen. One of the gases that is responsible for the greenhouse effect is CO<sub>2</sub>.

This gas has the highest ratio of particles in the atmosphere and it is a gas that helps the planet regulate its temperature. Before the 1930s, the amount of CO<sub>2</sub> particles in the atmosphere was stable, however after the 1930s, the number of carbon particles increased. With the increase in CO<sub>2</sub> in the atmosphere, more radiation is captured and therefore, the temperature of the planet increases. Increasing the temperature of the planet has caused many changes in the planet. The climate patterns change, vegetation and species shift because they need to find ways to adapt and sea levels are rising due to the melting of the ice caps and because increasing the temperature of water, it increases its mass.

The consequences of sea level are terrible. Cities are at the verge of flooding and entire islands that people used to called home have been flooded. Have we made awareness of our acts? No, because 10 percent of the entire population lives near the ocean. This implies that 10 percent of people will need to be relocated due to sea level rise. The conventional strategies for the adaptation of sea level rise are expensive and only selected places will be able to afford resilience. Low-income communities are prone to sea level rise because of many reasons. Low educational rates, low-income, poor community participation and low government funded. Alviso is consider a low-income community. It is located at the south of San Jose and it is a complex place full of rich history and exciting challenges.

# California expected Sea level Rise



Figure 1. California's Sea levels are expected to rise 3-6 feet by 2100

# Context Map



Figure 2. Bay Area map

# Chapter 2

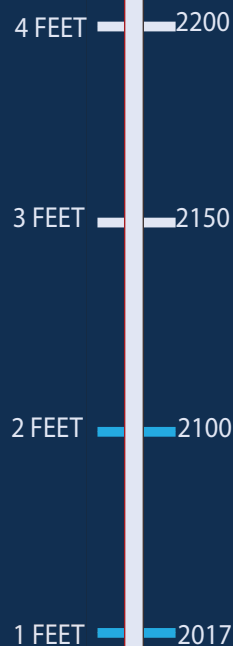
## Bay area Sea level rise

# Sea Level Rise Data

Can urban design work with sea level to produce multiple positive outcomes?

## What are the best methods to avoid atlantis?

Predictions on urban and environmental features impacts due to sea level rise.



## Research

- Research shows that sea level will rise approximately 3 feet with the next century.
  - Urban areas will be flooded affecting social, environmental and economic features.
  - It is estimated that San Francisco will take an economic impact of over 100 billion dollars without responding to SLRL.
- 
- SLR will first challenge costal design. The shorelines will shift and the patterns of tides will be changed.
  - Eventually, if action is not taken. Wetlands and other ecosystems will be cover by sea water..
  - SLR also increase the erosion risk due to the exonerating rise of the water. The erosion risk expands along the California coast.



Figure 3. Expected Sea Level Rise in the Bay Area by 2200 top imige by Cimate Central.



Figure 4. Sea Level Rise Predictions for the Bay Area Image by Yahoo

# Conventional Sea Level Rise Strategies

The following is a set of conventional strategies that serve as a blue print for addressing sea level rise. It was developed by the planning department of the city of San Francisco in their action plan for addressing sea level rise.

**Accommodate:** Accommodate means to build up with respond to sea level rise. This is one of the methods proposed to deal with sea level rise.

**Protect engineered:** Building massive walls that are engineered to stop the water from going into the city.

**Protect with nature:** Build natural levees that would support natural habitat and ecological restoration.

**Retreat:** Building away from the shorelines so that cities do not have to face catastrophes.

These strategies apply responding to sea level rise, but they don't address all of the issues that are bought along with climate change. However, they set a good base point in which better strategies can get developed

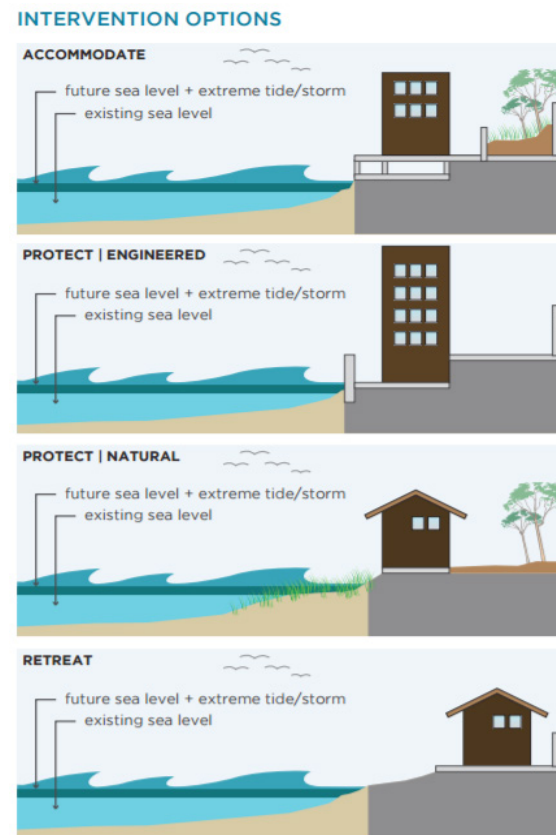


Figure 5. Sea Level Rise Strategies by the planning department of San Francisco

# Chapter 3

## The site



# History of Alviso

Alviso is a low-income community that needs to respond to the issues of sea level rise. It is in the lower part of San Jose. At the nearest south of the bay area. European settlers date back to 1777 and it got its name after a Spanish rancher called Ignacio Alviso. The city was founded in 1846 and it has had a dynamic history up until the present day. It was one of the biggest canaries in the United States at some point and it was also the main port of San Jose.

Alviso was an independent city at a point in history, but after acknowledging that its independency would not be sufficient for progress, they decided to become part of the city of San Jose. It was not an easy decision for the community because they felt that their identity was at threat. The community wanted to remain low density while maintain the historic values that were so significant for the community. Becoming a part of San Jose could change the city into a metropolitan area something that concerned the Alviso community.

Alviso is an amazing place. It is rich in history and ecology. The place is surrounded by former salt ponds that give it amazing views and big opportunities for recreational activities. The Guadalupe Creek and Coyote Creek drain water from the diablo range and Santa Clara mountains into the Alviso slough. An existing levee protects the community from flooding, however it needs some improvements because it has fail to stop the water from going into the community.

The community is considered low income and it is mainly populated by Hispanics. Minorities get pushed towards this type of communities because of cheap rent. In the majority of cases, going places that offer low-income housing is the only option people have. It creates a wave of problems that have been affecting this communities. In more detail, kids end up going to low founded schools that do not have the means to provide a good education. Students attending such schools often drop out of and begin to work instead.

# Low income communities

Low-income communities face more than an educational gap, because of the poor resources available to the community, people are often unaware of the current environmental issues social and political issues. Low-income communities are often populated with “illegal” immigration and they faced more struggles. People in the US are often unaware of all the disadvantages that these communities face and don’t understand how hard and complicated living in this situation can become. From not being able to get licensed or even a job because new immigrants aren’t allowed to get a social security. But the disadvantages continue and even for kids that manage to make it to higher education and get a degree, they will not have the opportunity to fully expand their careers because of the same problems. Combining these characteristics makes low-income communities susceptible to injustices that are disadvantages for the people who live in it and because I experienced growing up in a low-income community, I had to see firsthand what it is like to see family and friends fight against disadvantages and injustices.

- Poor community participation
- Low education rates
- Gang related activities
- Low government funding
- Restricted community services
- Perceived as negative and unsafe
- Population is typically first generation immigrants

# Map of Alviso



Figure 6. Google earth Image

Alviso is currently perceived as a negative, dirty and unsafe place. It is believed to have gang related activities. It is easy for young people to get distracted with illicit activities when they have been drop out of school. Understanding all the characteristics about low-income communities shows that responding to the needs of a community like this can be challenging in many ways.

In a positive note, community organizations are consistent throughout the entire community of Alviso . Ten different community organizations work hard to provide services for the community. Each organization focuses on different issues that concern the community and they are actively trying to better the city.



Figure 7. Historic Map of Alviso located at the entrance of the Alviso community.



Figure 8. Bird watching structures at Marica Park in Alviso



Figure 9. Alviso Marina Park Way located in San Jose California



Figure 10. Historic building

# Chapter 4

## The problem

# The problem

Alviso's current conditions are not favorable for dealing with sea level rise. The place is one of the regions that will be completely covered in water due to sea level rise and storm surge. The community has already faced severe flooding in the past. With the limitations of the levee, Alviso poses the threat to be under water again. The Alviso slough takes water from both, the Guadalupe river and the Coyote Creek. They have lost water storage capacity because of the long drought in California. It caused the subsoil to compact decreasing the storage capacity. In the other side of the levee, the city's street scape is mostly impervious surfaces and lacks green infrastructure. The current levee is about 13 feet high and when all the systems fail, the levee does not stop the water from coming into the city.

The education and income levels of low- income communities are typically below average which poses a challenge when trying to get community to participate in community workshops and design. Most of the families could find themselves worried about making sure they can earn money to be able to pay for their most basic needs. The Army Corps of Engineers, together with the Santa Clara Water management, and the State Coastal Conservancy have come up with a The Shoreline Study. The study focuses in the restoration of the bay shoreline, managing floods and the protection of communities that are prone to sea level rise and flooding. The study looks at the entire bay area and it has identified Alviso as the highest risk flooding zone.

The action plan of the Shoreline Study is to extend the levee so that the city can be protected, but it lacks the inclusion of the community. While reviewing their meeting minutes from 2015, it was brought to my attention that they sole purpose was to protect. Even though they had try to reach out to the community, they did it in a way that it did not work. Therefore, they did not get response from the community. One of their issues was that it did not seem like they had any diversity in their team. It was clear that the approaches were straight forward. It did not seem like the team was inform about the life style of Latino communities.

Over all, Landscape architecture and many other disciplines lack diversity. A lot of the decision making has an influence in the life of minorities is taken by people that do not know anything about them. Increasing diversity in design provides a wider set of skills when it comes down to the decision making and the design process.

Image By Mercury News



Figure 11. Alviso's most severe floating due to storm surge and non-functional levee design 1983



# Chapter 5

## Site Inventory

# Site inventory

- Habitat
- Alviso is not only rich in history, but also in habitat. The former salt ponds have supported many different ecosystems. As of now, the site is managed by the John Edwards National Wildlife Refuge. The refuge's goals of protecting and providing service for the conservation of endangered species. Habitat restoration has been challenged by all the current development in the bay area. One of the most current movements is to restore the bay area shoreline. The goal is to restore habitat that is crucial for the life of over 300 species
- Land use
- Most of the parcels are divided between open agricultural space, habitat and residential. The community of Alviso is not very dense with a population of only about 1000 people. Most of this people live in the high-risk flooding zones due to low rent. Commercial areas are located along the main streets that lead to the greater San Jose area and the only public space is located at the highest point in the town. It is called Alviso Marina park.



Figure 11. Habitat map managed by the Don Edwards Wild Life Refuge.



Figure 12. Land use map

# Alviso risk zone map

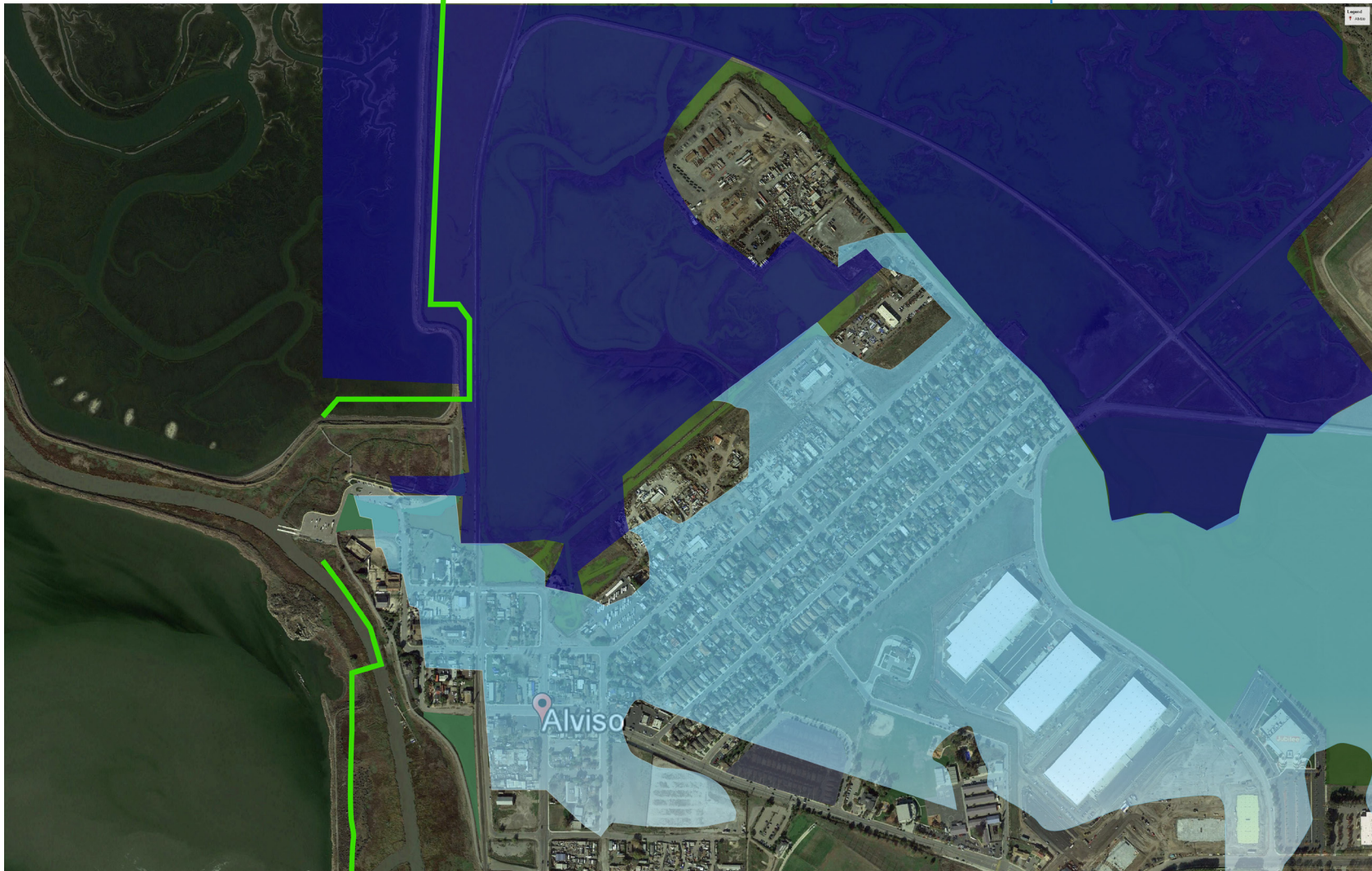


Figure 13. Sea Level Rise Predictions for Alviso Community

# Chapter 6

## Site analysis

# Site analysis

The site analysis phase has consisted of a site visit, web search and GIS research. From the visit, experiencing firsthand the features of Alviso it is easy to see the potential of the site. At the same time, it is clear why people don't take Alviso as a prominent neighborhood. The flooding risk and poor city design. Most of the neighborhood sits below sea level, most if not all the street surfaces are impervious and when it pours down, the city gets flooded. There is a good system of trails that seem to bring people into the site. Some of these people are from outside of town. The yate club and the Joan Edwards wild life refuge are some of the highlights of the city of Alviso because it brings people from out of town.

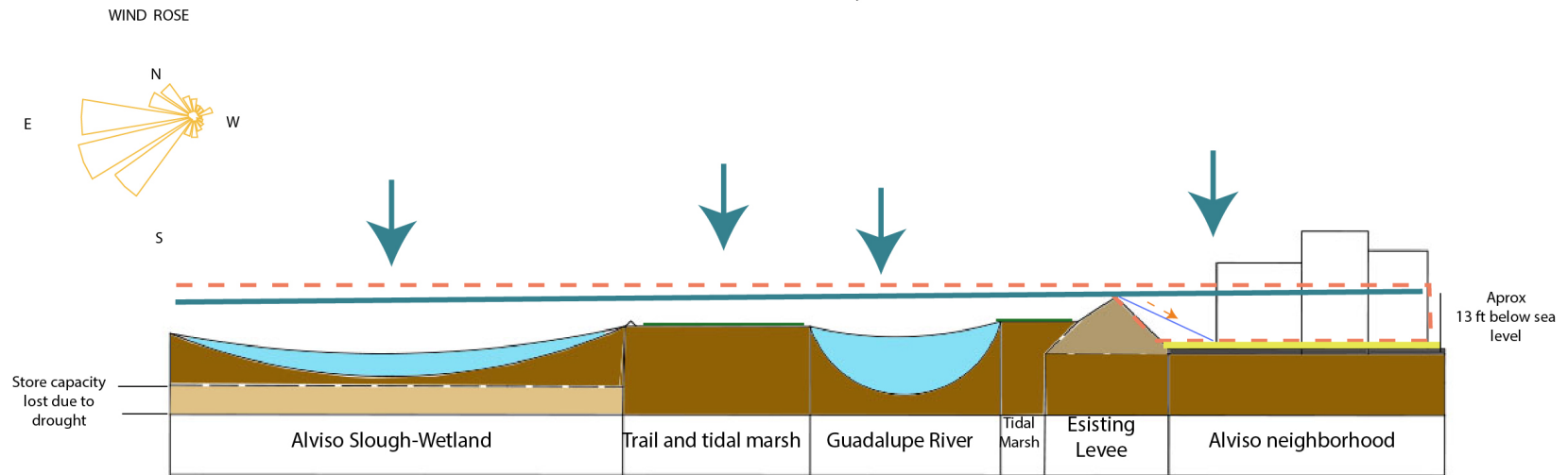
The city does not seem to dense in population and the conditions of the streets are not the best. It also looks like the streets need some work because of their lack of vegetation. Green infrastructure could make an enormous difference when dealing with flooding and reducing run off. The population is mainly Latino dominating with over a 75 percent. The other 25 percent are divided between Asian and White. It is interesting how Alviso got to be a Latino community. My number one assumption is low income housing is a big driver for minorities.

GIS data has been helpful when providing the necessary information about the site's feature and zoning density as well as land use. The site does not seem to have a lot of topography overall. Most of the places that sit below level have a flat surface. The levees that protect the entire community seem to be working fine at the moment, but one can see how they can be over taken by the water. The levees are now been reevaluated by the Army corps of engineers and Alviso has become their main priority. Alviso is one of the cities in the bay area with the highest risk of flooding due to sea level rise. The ACOE has come up with a study. The south bay shoreline study focuses on the restoring the shoreline while maintaining the habitat that is around it. The study has a lot of valuable information that will inform the design of the site better. One of the opportunities is to expand beyond the shore line and into the city because of how much work the city needs to in general. Another of the opportunities is the esthetics of the place, the place feels completely different because of its ecological surroundings. The wet lands around are the most valuable assets around this community. It brings people from outside the city and perhaps, from outside the bay area. This is also the biggest challenge because during the drought the wet lands lost store capacity and with the recent raining events, the existing levee did not stop the water from going into the city.








Figure 14. Alviso site analysis board

# Site analysis



## Legend

-  Rain water
-  Sea level rise
-  Impermeable street surface
-  General slope from highest point wich is Marina park
-  Street runoff

The combine elements that make Alviso prone to sea level rise are, storm surge. The wetlands lost their storing capacity because of the recent droughts that California experienced. Additionally, the Guadalupe and Coyote creek drain water from two separate places into the Alvios slough. This bodies of water accumulate all at once along the increases of sea levels and the community of Alviso is in a high risk of inundation.

Figure 15. Site Analysis Section

# Income

- The income in the city of Alviso is below the average from its neighboring cities. The mean salary for Alvios is about 15 percent less than San Jose and about 10 less than Santa Clara.
- Age distribution.
- The average age of the community of Alviso is fairly young. The majority of the population is 28 years old and the second largest group is about 30 years of age.



# Community needs

Focusing in a low-income community can be problematic because a lot of the people that will be affected by the climate changes most likely are not even aware of the current issues. Most of these families are occupied with family and economic problems. Low-income communities tend to have low education rate and gang related activities.

When trying to reach out to the community one can expect little or no participation at all. So, one of the solutions is to make sure that when design is being developed, a diverse team should be considered. Alviso has a respectable number of active community organizations that can help explain the needs of the community. Some of the needs and wants of the community are more open spaces for recreational opportunities. To maintain and protect habitat and reduce pollution. To improve city streets and most importantly to reduce or avoid flooding are the dominating concerns of the public.

Personally, having grown up in a low-income community, I was never aware of the issues that surrounded me. I was only preoccupied in catching up academically and culturally. This makes me completely aware of how to approach the design strategy because I grew up in Mexico, and lived in a low-income community for about 10 years.

I didn't understand that I was labeled as a low-income until I got to college. I thought, how can I be low income when rent at where I was at was expensive. It took me while to understand that low-income means more than household income. It means low founded schools, high drop-out rates, both in college and high school. Your community is perceived as unsafe because it is full of hard working that have come a new country to work towards a better future. Additionally, people see you a lower-class citizen and there is a big gap in social services.

Now, with the education that I have obtained I can see how that there is still a long way for minorities to be able to overcome all the challenges ahead.

# Community Organizations

- Star of the Sea Catholic Church
- Santa Visits Alviso Foundation
- Rotary Club of Alviso
- Alviso Community and Youth Centers
- People Acting in Community Together
- (PACT
- Trinity Park Neighborhood Association)

# Chapter 7

## Design strategy

# Design strategy

The intention of this design is to respond mainly to sea level rise and how it affects low-income communities. The purpose is to avoid gentrification. Improving the water front of Alviso poses a threat to the community. The development of a master plan for the water front could potentially bring outsiders to Alviso and eventually push people out of their homes. To avoid gentrification, the design will be developed considering Mexican American culture.

The water front, where the water meets the levee will be dealt with ecological restoration. The plan is to extend the levee horizontally and make the levee taller to stop the water from going into the community. With this levee interventions, the ecological side of the site is dealt with. By elongating the levee, the design attempts to restore habitat and increase the esthetics surrounding the area. Additionally, the ratio of the slopes allows for the natural process of wetland restoration. Native planting should be encouraged through the site. Native plants support many ecosystems and help native species maintain their habitat.

Making the levee taller will stop the water from going into the city. At the edge of the levee, on the ecological side of the site, a boardwalk will be proposed so that people can interact with nature. The boardwalk will extend all along the new levee and it will stop when reaching the Alviso Marina park. The main idea is connecting the two features to improve connectivity.

At the top of the levee, the strategy is to provide a promenade so that people can have the opportunity to walk on the levee and feel a sense of ownership. It is also the highest point in the city, so people can enjoy the ecological view. The materials of the system are expected to be biodegradable. The design seeks to incorporate new biological materials and technologies that will aid not harm the habitat.

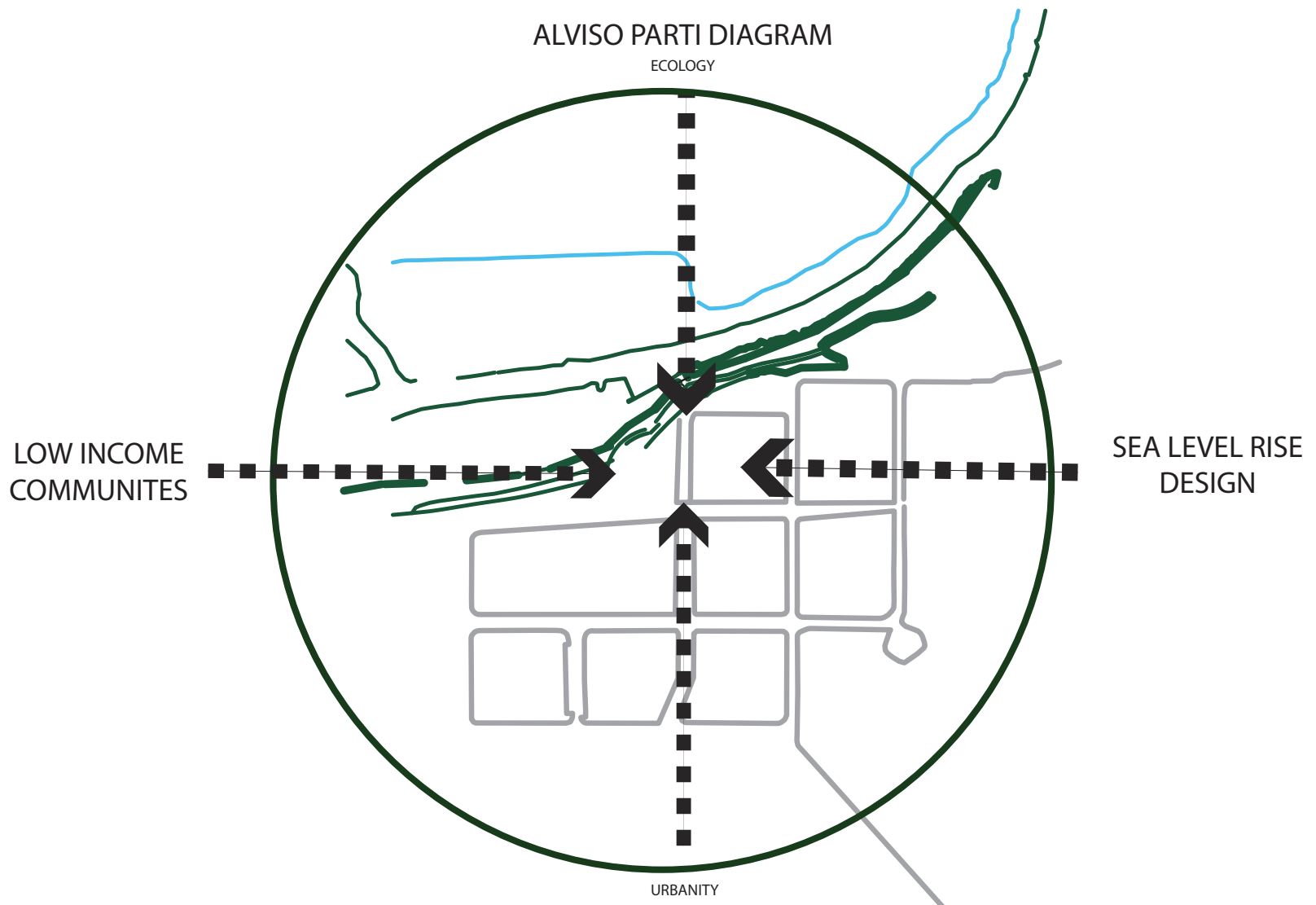


Figure 16. Ecoly, urbanity and sea level rise at Alviso



Figure 18. Alviso site plan dealing with sea level rise



Figure 18.1 Alviso site plan dealing with sea level rise

# Community Design

Based on the community analysis the design intends to provide and keep the sense of community. By designing central plazas with Latin American characteristics, but also identifying the Mexican American features like flea markets and open spaces for festivals. The design will also identify nodes where the city can increase green infrastructure. The design seeks to implement recreational activities that will provide outlets for young people.

The intention is to reduce gang related activities by providing places where people can perform sports. The implementation of an auditorium where people can have community service meetings, but it can be used for other purposes such as bailes (Dances) and concerts. The community would benefit from an auditorium and the desired building would be the Canary building. It is a historic building that could be remodel and of effective use by the community.

Some of the activates that would be programed for the spaces that the design seeks to develop are flea markets, farmers market and community celebration like Cinco de Mayo. Having an specific program that ties to the cultural background of the community will show that the design focusses on people and that the challenge of sea level rise were mean to provide creativity for the process of the design.



# Alviso Plaza

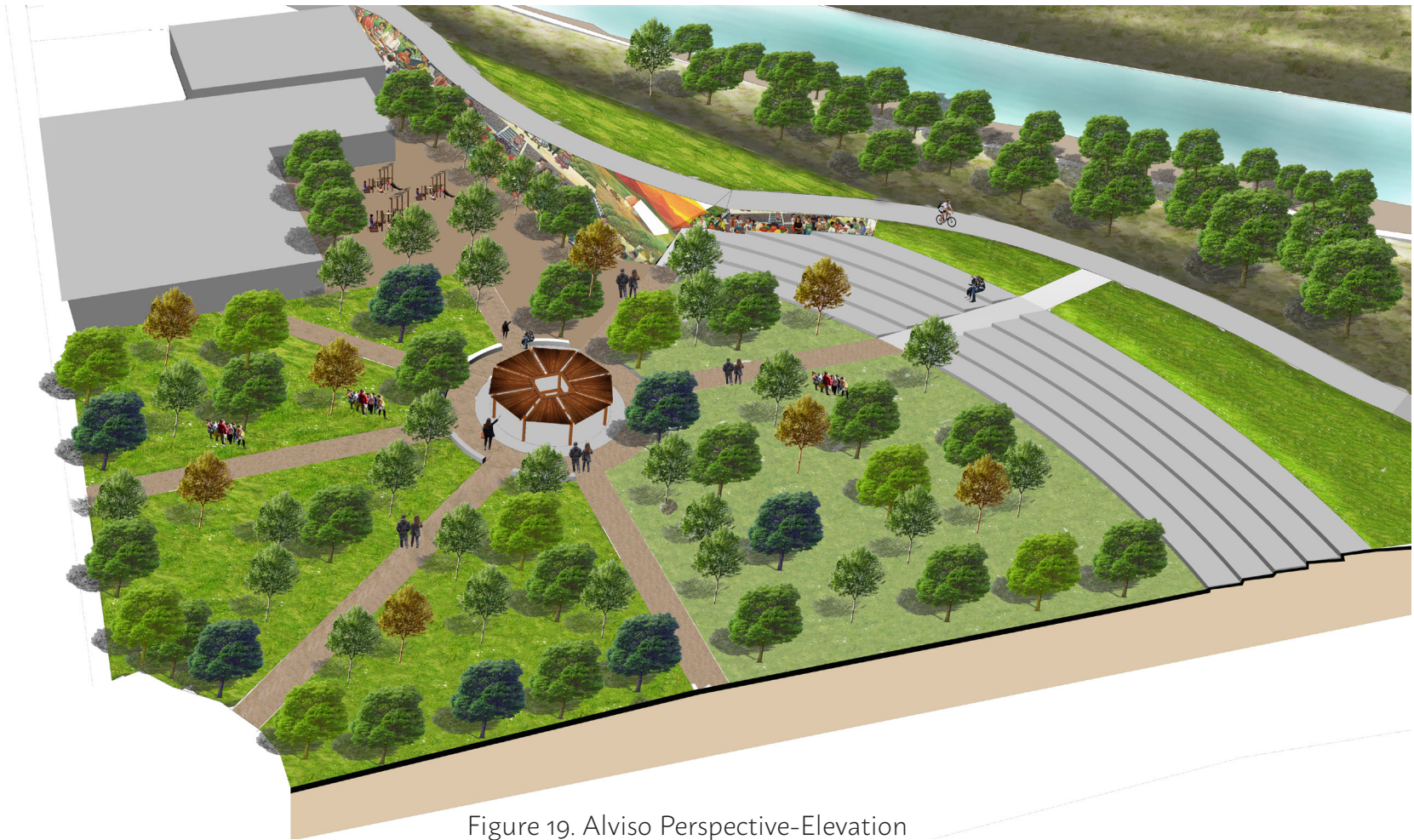


Figure 19. Alviso Perspective-Elevation

# Recreational Space



Figure 20. Perspective

## Recreational Space

The perspective called “Recreational Space” shows the intention of the design. It presents the idea of an interactive levee design in which recreational activities take place on the levee. The top of the levee is designed so that the surface is approximately fifteen feet wide and people can walk, run or even bike on it. It has a large open space that allows for recreational activities and community celebrations. The space is designated to have a more informal usage. Vegetation was strategically placed for shading and habitat restoration for the species under the management of the Don Edwards wild life refuge.

## Alviso Plaza

The Alviso Plaza has a more formal intention. It is a park with the characteristics of a typical Mexican park. Strong axial symmetry and a focal point at the center. Though the focus of the design is to simulate Mexican culture, the shade structure resembles native of American architecture. Native of American people were the first to live in Alviso at some point in history and it is important to give them recognition. Next to the park, a renovated building has been proposed. This building can have many purposes. They can vary from community meeting to more formal celebrations such as quinceaneras or bailes (dances). The intention is for the design of the park to correlate with the programming and function of the space.

# Section A-A'



Figure 21. Section showing ecological features



Figure 22. Section showing community features

# Section B-B'



Figure 23. Green infrastructure street prototype

# Sections

Section A-A shows the proposed features and it shows in more detail what is happening on the other side of the levee. It also shows a boardwalk that travels parallel to the levee. The objective is to engage people with the natural environment and provides an outlet for mental health. People living adjacent to and in big cities tend to have higher levels of stress.

Section B-B' Shows the green infrastructure street prototype. Storm water management encourages sustainability and provides many benefits. Aside from reducing runoff, green infrastructure can reduce flooding and improve ground water as well as restore habitat. Additionally, it improves soil texture and reduces negative stimuli.

# Chapter 8

## Conclusion



# Conclusion

The study of sea level rise and low-income communities has brought many challenges, and it has been an eye opener to the significant issues of climate change. It has shown that people have been big contributors of the negative impacts of climate change. Our practices and life styles have done some severe and irreversible damage that have let scientist to believe that humans can be the nemesis of our own species. As the studies have shown, many cities will be under water, and there are some places where the opportunities to relocated or come up with strategies are at hand. Some cities around the world have the means to deal with sea level rise and other climate change issues.

However, there are places that are not even aware of what is happening around the world, but it is not their fault. The social systems that are set up the United States have made some people more prone the fatality that issues like sea level rise have a consequence. With this project, the purpose was to, not only find resilient design for sea level rise, but also to expose the faulty system in which we live in. Now the real question is, how can we move forward as a country in the verge of climate change, when the chief commander of the nation has pulled out of the Paris agreement?

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