

# Housing in Ixtapaluca

*Problems of the mega city and how affordable housing affects happiness.*

*Part 1*

# Cover

Titel:

**Housing in Ixtapaluca -**

Problems of the mega city and how affordable housing affects happiness.

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# Readers guide

The long master thesis report works with the problems of the mega city and how affordable housing affects happiness. Focusing particularly on the city of Ixtapaluca in Mexico, the main approach is to see how happiness and wellbeing are influenced by the housing situation created by the growing mega city and how changes in housing can improve it. The report is split in two papers; the first paper is theoretical and aims to conclude in a list of architectural design principles. The second paper will be more practical, aiming to use these principles to make an architectural project that deal with the housing crisis in Mexico, and the housing needs in Ixtapaluca. This theoretical paper is divided into four parts which will analyze the problems in Ixtapaluca by researching it in various ways.

In the first part the reader will be introduced to both existing problems of the cities of Mexico City and Ixtapaluca and also briefly describe how the problems were created. The second part will analyze research done in other areas of Mexico and other counties and then relate it to the context of Ixtapaluca. The research presents some elements that are similar to the situation in Ixtapaluca while other elements will work as inspiration to create change. The section will both give a greater perspective and understanding on the situation in Mexico and in Ixtapaluca.

The third part will relate the analyses made in part two to more concrete and real situations. This is done by making case studies of affordable housing projects from other areas of Latin America and compare them to some of the key elements from part two. A questionnaire will then relate the conclusions of the research to people living in Ixtapaluca. The fourth part evaluates on the key elements of part two and three. In this evaluation a series of architectural design principals will be formulated, creating the foundation for the second paper.

# Abstract

Housing problems presents significant issues all around the world especially in mega cities. Often bringing about problems to infrastructure, lack of drainage and more. The mega cities of third world countries are especially troubled by these problems. Mexico City is a mega city where the problems are big and they are many. This paper focus on the city Ixtapaluca, a suburb of Mexico City that has been affected by the city's growth. The suburb itself has grown from a small city of approximately 80,000 people to one of 350,000 in around 30 years. ([http://seduv.edomexico.gob.mx/planes\\_municipales/ixtapaluca/pmdu%20julio%2009.pdf](http://seduv.edomexico.gob.mx/planes_municipales/ixtapaluca/pmdu%20julio%2009.pdf) ). This growth has created many issues and if the approach of the housing industry does not change the problems could become even bigger. The paper describes both the existing problems and how new approaches to housing could help the city react to the growth of Mexico City. The main focus of the paper is on how happiness and wellbeing is affected by affordable housing in the low middle-class city Ixtapaluca.



### III 1 Map; Mexico





III 2 Picture; San Buenaventura

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## Preface

Before I started university, I traveled and worked in South Africa, in poor areas with a high crime rate. This experience inspired me greatly. So, when I had a chance to take a semester abroad during my bachelor, I went to Mexico, where there were many problems just like in South Africa, such as high crime and poverty rates. During both studies and later travels, I experienced how living conditions had a great effect on the people, with buildings being a significant part of the division between classes in society. While studying in Mexico I met the person that later became my wife. Traveling with her gave me a different perspective on life in Mexico; meeting the people that live in the affordable housing areas and try to understand how the world looks through their eyes. After finishing my bachelor, I moved to Mexico to work in an architectural firm in Cancun. In the office, we mostly did work for rich Americans, making hotels and luxury mansions. We also made an affordable housing project, but these projects didn't mean anything to the firm, it was just for the money. I understand that money is important, but I know and care about the people that lives in the affordable housing areas. I hope that with this project I can create a new focus on the problem and, hopefully, also ideas that can improve life in these areas. After reading "Elemental: Incremental Housing Participatory Design Manual" by Alejandro Aravena, I got inspired to make a new kind of housing that could free the poor and middle class from loans and bad living conditions. When reading "Happy City: Transforming Our Lives Through Urban Design" by Charles Montgomery, it occurred to me that the financial aspect of people's lives only played a small part. But by combining the ideas of a new kind of affordable housing from Aravena and the focus on happiness from Montgomery, a new approach could be created. This master thesis is inspired by my readings and my many first-hand experiences on people in low income areas, and my wish to improve their conditions, and hopefully their happiness.

# Introduction

Housing options and needs is growing in Ixtapaluca, this happens both due to the natural growth of Mexico City but also due to certain policies that have promoted growth in the suburbs. During the last 30 years the municipality have grown from being a rural farming area with around 100 thousand people into an urban suburbia with 400 thousand people causing a building boom. ([http://seduv.edomexico.gob.mx/planes\\_municipales/ixtapaluca/pmdm%20julio%2009.pdf](http://seduv.edomexico.gob.mx/planes_municipales/ixtapaluca/pmdm%20julio%2009.pdf)). Sadly, most of the buildings have both a low architectural and contractual quality. Most of the houses are single-family row houses or two-story apartment buildings resulting in a fast-growing low height city, with a lot of infrastructural problems. At the same time a part of the inhabitants are trapped in substandard loans and low paying jobs. The crime rate is high and many feel unsafe. The better paying jobs are in Mexico City which are a long drive away.

This paper will approach the problems of Ixtapaluca and how to improve their lives by making the inhabitants happier through urban design and architecture. This will be done both by understanding what is could be done and what have already been done. New ways of living through flexible solutions or shared living, case studies, and a questionnaire to the people in Ixtapaluca, will be some of the elements that create the knowledge and inspiration that will become the foundation for creating a better affordable housing project.



## State of the art

There are many different approaches to housing in the suburbs of Mexico, although few researchers have tried working with the increasing problems of Ixtapaluca, therefore parallels to other cases has been made as means to solve the problems of the suburb.

One of the approaches is to look at the city planning of Mexico City in general, here Diane E. Davis have made many studies and written several books, one of which is called “Urban Leviathan – Mexico City in the twentieth century”. The book gives an understanding of the many changes Mexico City has undergone in the last 100 years in an urban planning perspective. Diane E. Davis is the Charles Dyer Norton Professor of Regional Development and Urbanism and Chair of the Department of Urban Planning and Design at Harvard’s Graduate School of Design (<http://www.gsd.harvard.edu/person/diane-davis/>). She has also studied sociology, so her studies her an interesting perspective on the understanding of the mega city and its suburbs.

Alejandro Aravena is an architect from Chile, he is partner in the “Do Tank” named Elemental that focus on projects of public interest and social impact, including housing, public space, infrastructure and transportation (<http://www.elementalchile.cl/en/about/>). Together with the co-founder of Elemental Andres Lacobelli, Aravena wrote several books one called “Incremental housing and participatory design manual” the book explains their process and follows up on their projects at a later stage. Both his research and project give an interesting take on a more hands-on approach to the housing problems.

Looking only at the geographical understanding of the area of Ixtapaluca and Mexico City, George Pomeroy provides a clear picture of the situation. He has a master in geography and a PhD in urban studies (<http://www.ship.edu/Geo-ESS/Faculty/Faculty-Pomeroy/>), in his book “Global perspectives on urbanization” he describes some of the challenges Mexico City and Ixtapaluca have with infrastructure and how they are creating “dormitory cities”.

Looking at happiness, Charles Montgomery, a journalist, provides a good example on how to combine happiness with architectural understanding in his well referenced book “Happy City: Transforming Our Lives Through Urban Design”. The books give both examples of modern problems and ideas for solutions. It focuses on how people spent their time in cars instead of together with others.

Another author focusing on happiness is Carroll D. Ryff. She has a Ph.D in psychology and has made many publications about wellbeing, most known is her “Scales of Psychological Well-Being” where she studies how to determine a person’s wellbeing. (<http://www.liberalarts.wabash.edu/ryff-scales/>, <http://aging.wisc.edu/research/affil.php?Ident=55>)

# Research problems

The mega city, Mexico City is growing and the municipality of Ixtapaluca have merger challenges in the housing industry because of this growth. How can more socially oriented housing and expandable houses prevent the housing problems and make the inhabitants happier?

1. What is the climatic, infrastructural, financial, and social situation in Ixtapaluca?
2. What can be done financially to avoid forcing new homeowners into massive housing debt and what effect does loans have on the people?
3. What impact does it have on the happiness of the user if they own their house instead of renting it?
4. How can architectural passive strategies be applied in Mexican affordable housing projects, and what effect will it have on the challenges created by the climate?
5. By applying the Ryff Scales of psychological wellbeing, how can affordable housing architecture increase happiness in low income areas?
6. What can be done architecturally to make affordable housing more social?

# Methodology

As the projects title indicates is this paper is about housing in Ixtapaluca, with a focus on problems of the mega city and how affordable housing affects happiness. To investigate and create a good research a good methodology important. Each area of the research needs a relevant method that fit the kind of information needed.

The initial research is a historical research of Ixtapaluca and Mexico City by looking into how it has changed through time to its present day. This will lay the foundation to understand the problems of the area. After the initial research, an investigation will be made about Ixtapaluca one of Mexico City's suburbs, focusing on creating a basic understanding of the problems of Ixtapaluca. This will partly be done by looking at statistics on housing, poverty and the job situation. Information about climate, building traditions and social structures will help to get an even deeper understanding of the situation. The statistics will be compared with rest of the information found on the subject and this will be complied to create a coherent explanation of the current situation in Ixtapaluca. A short research on happiness and wellbeing will then create the framework for the next analysis, focusing on Ryff Scales of psychological wellbeing and how it relates to other kinds of theories on happiness.

A big part of understanding affordable housing is to understand the financial aspect of it. Before trying to give any result or solutions a research will clarify the financial situation of the Mexican building industry. Next part of the process will then be to find new solutions which will be done by relating the financial aspect to the research on happiness and affordable housing.

When building housing projects, it is important to understand the building traditions and how they fit the climate, but knowing that they do is not enough, so in this section a series of examples of improvements will be found and related to the context. So, by using the frame of affordable housing and happiness the information will be directed in a way so the it will be clear which elements can be used in the case of housing in Ixtapaluca.

To understand what could be done in the future, it is important to investigate what have been done before. Analyzing past attempts to improve the housing situation will provide an understanding of which parts worked and which did not. This knowledge will be used together with all the other research to start creating new ideas. This will be done by using examples and by defining the pros and cons to define the best possible directions for new solutions.

The knowledge will be theoretical, so to relate it to existing situations series of case studies and a questionnaire will be made. Both case studies and questionnaire will draw from all parts of the past research that have been done.

A long series of conclusions will be made, and the research will result in a series of architectural design principals. They will be an exemplification of the results gained through the collected research. These will be the key stones in the next processes, where a practical solution to the housing problem will be made. These processes will be made in the second paper. Besides the architectural design principals, the collective knowledge will form a foundation and inform the ideas and decisions made in the second paper.



# Part 1 Mexico City, Ixtapaluca

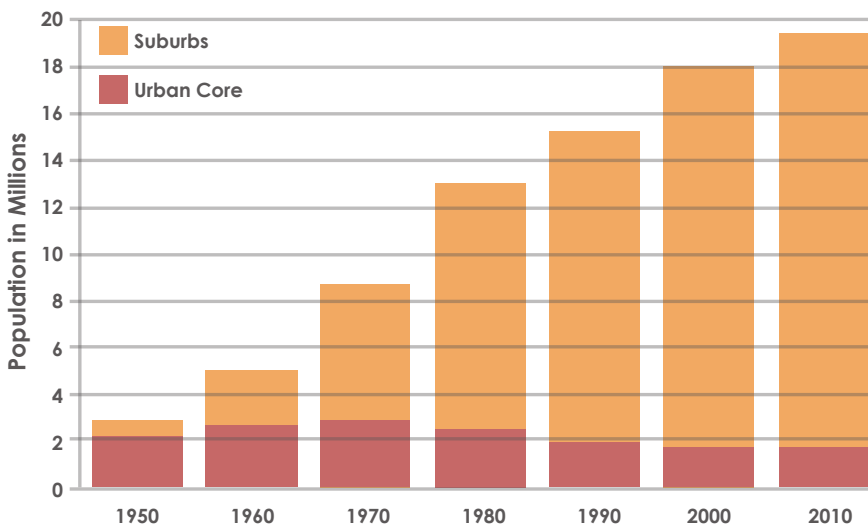
# Mexico City / Ixtapaluca

To gain a basic understanding of the situation of how the life in Mexico City and Ixtapaluca is, this section of the paper will examine different aspects of the life of the people living there. The section will give a peak in to the problems and the situation, but it won't look for answers or try to present solutions. It will create the groundwork for later chapters and give the reader a look in to the lives of people in Ixtapaluca.

The housing situation in Mexico is complicated like it is in most countries. Conditions are defined by many factors, geographic parameters and income. It is therefore important to define a specific area that can exemplify the problems that are dominating in Mexico concerning social housing. But before becoming more specific a general understand of the urban housing situation is needed.

For a long period, people from the country have been moving towards the city to get jobs, but the cities haven't been able to keep up with the growth of the population. (<https://ageconsearch.umn.edu/bitstream/8082/1/fo07me01.pdf>) This has caused a lot of challenges concerning infrastructure, housing, sanitation and drainage to sewers, just to mention a few of the many challenges most Mexican cities have to deal with. The city that has the biggest problems is Mexico City, a city with a population of around 8 million in the inner city, while Greater Mexico City counts around 22 million. It is an extremely large mega city (Baltimore: Johns Hopkins University 1981), but it would have been even bigger if there hadn't been a really big earthquake in the 1980s that changed the way they build in the inner city. They changed their focus from building high and unsafe housing, to building low buildings over a larger area. This had an effect on the suburbs which has been growing instead. This has made the inner city even more expensive and forced the poor and middle class to move further away from the center.(Ward 1998)

## Valley of Mexico Urban Area: 1950 -2010



III 3 Diagram, Valley of Mexico Urban Area

## Climate

There are many different kinds of climates in Mexico, it is a big country separated over several climate zones. Geographical elements such as mountains, volcanos and oceans also influence the local weather. Mexico City is located 2240 m above sea level which in many ways is the main factor in determining the climate of the city. (<https://www.mexicocity.com/v/geography/>) It has quite hot summer and mild winters. The seasonal changes are small, January is the coldest and May the warmest. The main rainfall occurs between June and October. The rainfall in Mexico City is in many ways more extreme than in countries such as Denmark, where the downpour is spread evenly through the year, in Mexico City and surrounding areas the rainfall occurs over some few months. Even when the rain falls in different ways the amount of rain is nearly the same. (<https://en.climate-data.org/location/873136/> , <https://en.climate-data.org/location/764739/>)

### Aalborg climate table / Historical weather data

	Januray	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	-0.7	-0.7	1.9	5.9	10.8	14.3	15.9	15.6	12.6	8.8	3.8	2.3
Min. Temperature (°C)	-3.5	-3.8	-1.3	2.4	6.9	10.2	12.1	11.6	9.1	5.9	0.7	0.9
Max. Temperature (°C)	2.1	2.4	5.2	9.4	14.8	18.5	19.8	19.7	16.1	11.7	6.9	3.8
Rainfall (mm)	49	32	40	37	47	54	62	65	71	71	69	55

III 4 Table; Climate Aalborg

### Ixtapaluca climate table / Historical weather data

	Januray	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	12.3	13.4	15.7	17.3	17.8	17.7	16.8	16.9	16.7	15.4	13.8	12.7
Min. Temperature (°C)	2.1	3	5.3	7.4	8.8	10.4	9.9	9.8	9.9	7.4	4.5	3
Max. Temperature (°C)	22.5	23.9	26.2	27.2	26.9	25.1	23.8	24.1	23.5	23.5	23.1	22.4
Rainfall (mm)	10	6	11	30	57	110	130	113	91	44	8	6

III 5 Table; Climate Ixtapaluca



III 6 Picture; House Denmark

III 7 Picture; House Ixtapaluca

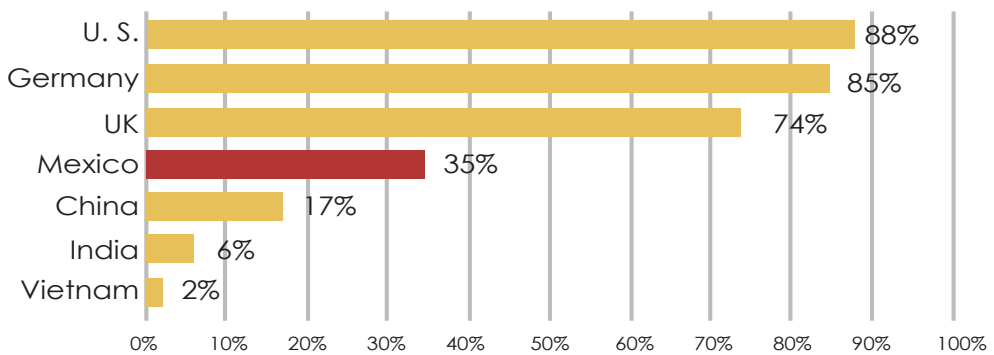
The traditional Mexican Aztec house looks quite similar to the older Danish houses in many ways with pitched thatched roof, clay walls and wood inner construction. (<http://www.aztec-history.com/aztec-houses.html>) But, when looking at more temporary houses from the last 100 years there is a big change, the modern Danish houses look similar to the older houses, but the Mexican does not. One of the reasons is the introduction of building traditions from Spain. A second reason is traditions coming from the drier and warmer desert areas in the north of Mexico have spread down to the more humid and colder areas in the middle and southern part of the country.

The problems with the architecture from the north is that it fits the climate of the northern areas but not in all of Mexico. One of the challenges of the flat roof is drainages, the flat roof provides less protection to the house, where the pitched roofs eaves protects the walls and repel the water. The flat roof is not all bad and there are many good reasons why the Mexicans mainly have chosen this kind of roofs; it is cheap to install and easy to use as a terrace or roof garden, it even makes it easier to extend the house upward (<http://homeguides.sfgate.com/pros-cons-flat-vs-pitched-roofing-6931.html>). It also keeps the home cooler, where the pitched roof traditionally would trap warm air and make the houses warmer (<http://www.roof-repairs-uk.co.uk/how-to/flat-roofs-history.html>). A pitched roof can in models be good at keeping the home cool and flat roofs can be built with good drainages, but this only happen if the roofs are well built. Which is rarely the case in Mexico City.

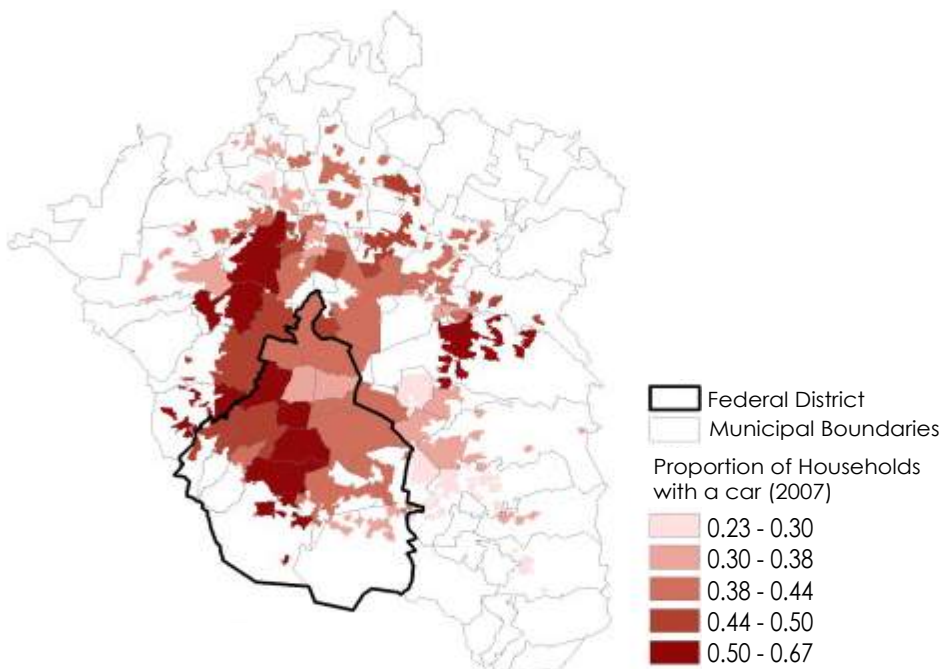
## The infrastructure

Mexico have a big highway system, but it is being poorly maintained. The Greater Mexico City is one of the biggest cities in the world measured in square kilometers, so even with a huge road system, the city has many traffic problems. (<https://www.inverse.com/article/7541-the-future-of-mexico-city-a-design-town-with-an-infrastructure-problem>). The city has huge traffic jams, so many use the metro, but it is getting more and more expensive and doesn't get you everywhere, and it also is really packed in rush-hour. The traffic jams happen often, it would therefore be natural to assume that most had cars, but the percent of the populations that have a car is small, this is specially the case in the poorer areas of the city.

Percentage of households owning a car in selected countries in 2014



III 8 Diagram; Percentage of households owning a car in selected countries

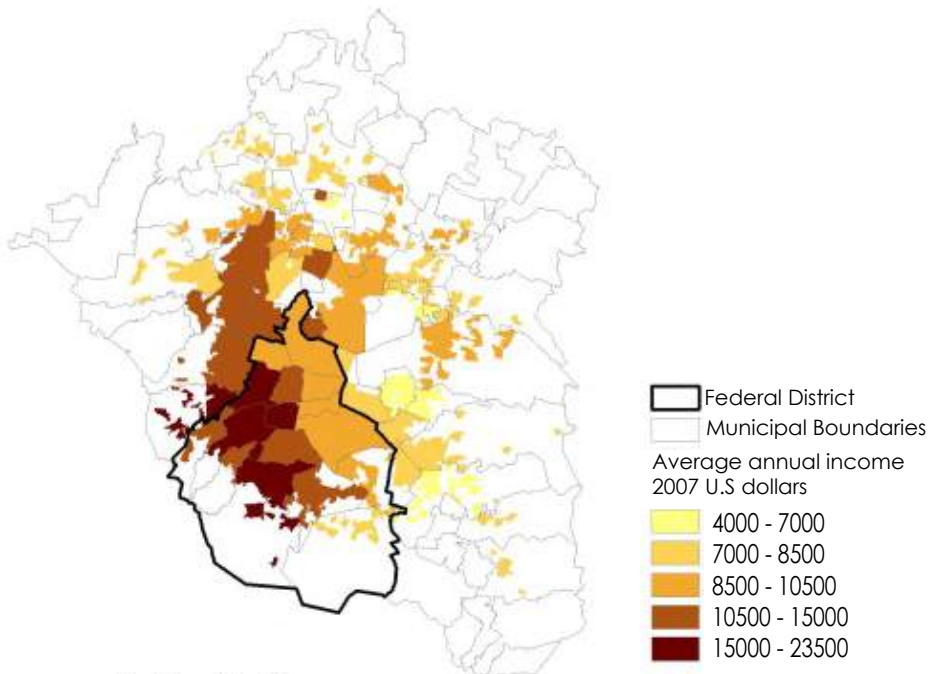


III 9 Diagram; Percentage of households owning a car in Mexico City

## Financial

Even when most don't consider Mexico City a wealthy city, according to the World Bank it has the 8 biggest GDP (Gross domestic product) in the world for cities at 390 billion US dollars, compared has all of Denmark a GDP around 300 billion US dollars. (<http://pwc.blogs.com/files/global-city-gdp-rankings-2008-2025.pdf>, <https://tradingeconomics.com/denmark/gdp>) For most Mexicans, a job in Mexico City would mean better salaries and more status, but even with better salaries it is often not enough to pay a rent in the inner city so people settle in the suburbs. Where the housing prices are much lower, but so is the salaries so many commutes.

47% of the households in Mexico are middle class, and they earning between 15000 dollars and 45000 dollars per year. (<http://mexiconewsdaily.com/news/mexicos-middle-class-47-of-households/>) The middle class of Mexico is growing, but most households are still low-income class. In most of the suburbs the households are either low or low middle class, that makes the areas financially unstable and weak. According to one of the biggest developers in Mexico most the houses they build for low and medium-income homes have a size between 40 and 70 square meters and are built on lots of a size between 60 and 120 square meters. The prices on these homes range between \$20,000 and \$35,000 dollars. (<http://industrytoday.com/article/building-concrete-dreams/>) Even the prices are low, get many people stuck in the process of paying of the interest, instead of becoming closer to owning the houses, and the unstable job market doesn't make it easier.



III 10 Diagram; Average annual income in Mexico City

## Social situation

There are many ways to look the social situation in Mexico, one way is through the family. Family is really important to most Mexican, it is the core of the social structure. The family is in Mexico main source of trustworthy relationships, of solidarity to take care of the daily needs as well as the extraordinary problems that occur in the lifetime. Even the idea of openly criticizing the family and its importance is highly unlikely. Even when the family is so important it is not the same way as it was before. Since the 1960 the number of unmarried couples are getting higher and the just since the 1980 the percent of divorce have gone from 4.4 % to in 2010 15.1 %. ([http://www.familiam.org/pcpf/allegati/1397/Summary\\_Mexican\\_Research.pdf](http://www.familiam.org/pcpf/allegati/1397/Summary_Mexican_Research.pdf)) Even the size of the family household is decreasing from 4.1 persons in 2000 to 3.85 persons in 2010. These numbers all point toward a change in the family structure but compared to many other countries the family structure is still really strong and conservative. For example, have Denmark an average household size in 2010 on 2.16 persons, USA have on 2.63 persons. (<https://www.nakono.com/tekcarta/databank/households-average-household-size/>) The Mexican family is also much bigger than many families outside of Mexico, one reason for this is the extended family is considered really important. Often the children live at their parents long and sometime they stay even after they found a husband or wife for short or long periods. (<http://countrystudies.us/mexico/59.htm>) There are many different kinds of living arrangements, some live just one nuclear family, other two or with a grandparent. Sometimes they share the kitchen other times there are more than one. Even when the family is really important, they still spent less time with them than they do at work. One other function of the family is as a safety net, if one of the family members becomes sick or loses their job, the rest of the steps in and help. (Ward 1998) Mexicans trust is not extended to people outside their family, most feel that they have a greater honor and higher moral codes than people outside the family. But as the family patterns are changing so is the openness to other, more of the younger and better educated population is supporting a more open society with cultural differences and tolerance. (<http://countrystudies.us/mexico/59.htm>)



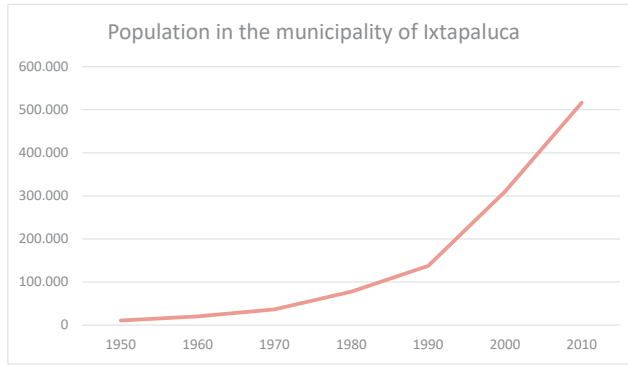
# Ixtapaluca



III 11 Map; Ixtapaluca

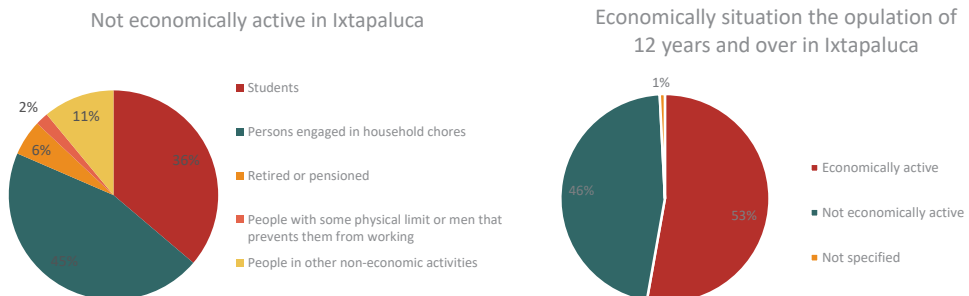
To exemplify the problems of the mega city a specific suburb has been chosen to work with. Ixtapaluca is a suburb on the east side of Mexico City, the municipality is around 315 square kilometers and have a population of around 500,000 people. Ixtapaluca is a Náhuatl (old local language) word meaning “Place where salt gets wet”. (<https://ixtapaluca.gob.mx/tu-municipio>) The area represents many typical problems such as, infrastructural problems, water and sewer problems, financial and social problems. ([http://internet.contenidos.inegi.org.mx/contenidos/Productos/prod\\_serv/contenidos/espanol/bvinegi/productos/nueva\\_estruc/inter\\_censal/panorama/702825082246.pdf](http://internet.contenidos.inegi.org.mx/contenidos/Productos/prod_serv/contenidos/espanol/bvinegi/productos/nueva_estruc/inter_censal/panorama/702825082246.pdf)). The area is in great changes it is growing, many new project, buildings and roads are being made. Still with all these things happening the outskirts for the main city is still quite rural. Where the part closest to Mexico City, seems like it's a part of the main city. This is the same kind of growth most of the suburbs closer to Mexico City experienced before they became totally urban. (Ward 1998) It is an area that can become both better or worse, if the constant growth Ixtapaluca have faced in the last many years continues unaltered, the problem associated with city growth would become even greater. The area would be considered middle class in Mexican standard, with areas of low middle class and poor, but compared to a northern European standard it would be considered below poor. (<https://ixtapaluca.gob.mx/wp-content/uploads/2016/09/Plan-de-Desarrollo-Municipal-de-Ixtapaluca-2016-2018.pdf>)



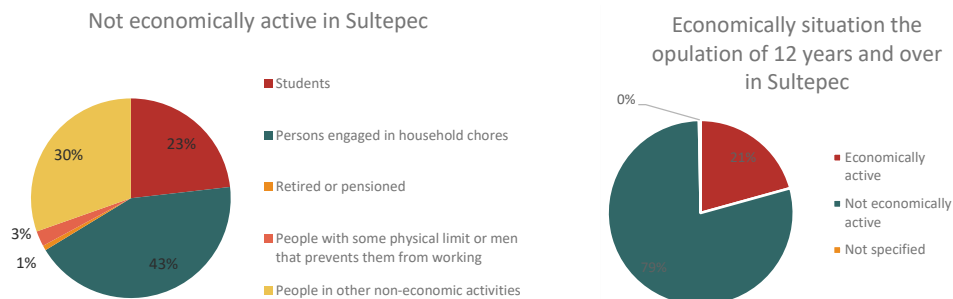


III 12 Diagram; Population in the municipality of Ixtapaluca

The unemployment rate in Ixtapaluca is at 46%, in the group of unemployed is included both retirees, students and housewife's. Compared to some of the other municipalities around in the State of Mexico it is quite average. Most of the other municipalities further away from Mexico City have much higher unemployment rates, some have one close to 80%. ([http://internet.contenidos.inegi.org.mx/contenidos/Productos/prod\\_serv/contenidos/espanol/bvinegi/productos/nueva\\_estruc/inter\\_censal/panorama/702825082246.pdf](http://internet.contenidos.inegi.org.mx/contenidos/Productos/prod_serv/contenidos/espanol/bvinegi/productos/nueva_estruc/inter_censal/panorama/702825082246.pdf)). The municipality Sultepec is (see ill 14) is in a rural area, it stand as a contrast to Ixtapaluca. By comparing the different unemployment rates, it is clear that the municipalities further from big cities have the highest rates, this is due to many factors. Most of the industries are close to the cities, it is harder to get to good schools in the rural areas and the infrastructure is not well maintained. There are many reasons to the high unemployment, and there is not a simple answer to why, but it is clear that many moves from these areas and closer to the city, and one of the areas they move to is Ixtapaluca. This make Ixtapaluca grow even faster. (Ward 1998)



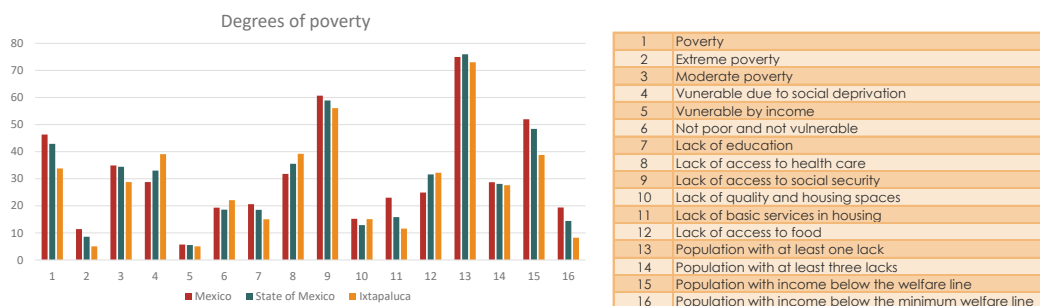
III 13 Diagrams; People in Ixtapaluca



### III 14 Diagrams; People in Sultepec

The crime rate is high and the jobs in the area are low paying. Ixtapaluca was before a farm city but doing the last 30 years it has become more and more joined with Mexico City. This have change the lifestyle of the inhabitants.

The people that dreams of a well-paying job these are located closer to the city main, but the housing prices are also higher there, so most commute between the main city and the suburbs. Because of the fast-growing city, the infrastructure hasn't followed the growth that rest of the city have. The transport prices have risen, but the salaries haven't.



### III 15 Diagrams; Degrees of poverty in Ixtapaluca

Another symptom of the fast-growing city is the city planning. The kind of housing project that dominate the area are affordable housing project, normally consisting of 1 - 2 levels row houses, either with one unit in two levels or with a family on each level. The areas often consist of one street with houses on both side and a gate on the end of the street, leading to a street that are connected to other projects, this street is then connected to a main avenue. Each house has the same size and price.

## Conclusion of Part 1

It is clear that both Mexico City and Ixtapaluca have many challenges, many because of the growth of the cities. But, it is clear that the growth is not the only reason to the problems. The climatic situation also effects the houses and there have to be made changes to the way the contractors build in the area. There are many infrastructural challenges some a resolve of the growth other just of bad building habits. This project is not aiming to create new infrastructure, but by working with the building traditions and build different kinds housing projects it will maybe be possible to ensure that the infrastructural problems will not become bigger in the future. One of the merger problems is the financial situation of the people and how buying houses effect the people. If the people get stuck in loans, it will be nearly impossible change their lives. One of the strong elements of Mexican culture is the family, it is clear that if the goal is to make a real change in people's lives it have to be made including the strength of the family and the communities in the solutions.



III 16 Picture; Ixtapaluca

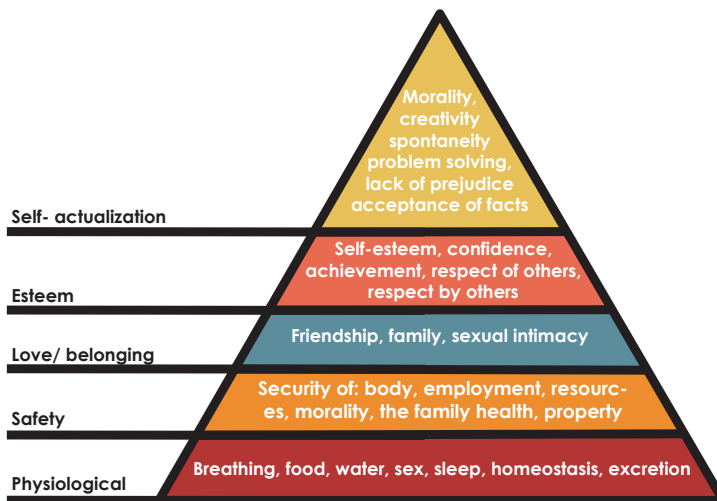
## **Part 2 -Happiness through Affordable housing**

# Happiness

One of the main goal of this paper is to understand how to improve lives in the neighborhoods of Ixtapaluca. To do that, it is not enough to understand the problems of Ixtapaluca and Mexico City, but it is a good knowledge to build on. To really to make a change, a goal has to be set up, in this chase the goal is to improve people's lives, to do so life improvements have to be specified.

There are many ways to classify life improvements, some ways are by income, new cars, physical health, or many others. Aristotle's Nicomachean Ethics states that the highest of all goods achievable by human action is happiness. (Carol D. Ryff 1989) In many ways the concept of happiness is an umbrella description of many human emotions. So, assuming that happiness is the clearest form life improvement, the new challenge is then to define what happiness is. Mainly there is considered to be two main kinds of happiness, a short term and a long term. The short term is affected by things like rollercoaster, sport and games. Where the long term is more are associated with things like loving relationships and general wellbeing. (Ryff 1989) To make big changes to people's lives, the focus of this project will be on long term happiness. By studying the brain is it possible to see the level of certain hormones which indicate our happiness level. Other studies have showed that the answers people gives in happiness questionnaires correlate with the levels of the hormones from the brain. (Montgomery 2013) It is not new to try to describe what happiness is, but throughout time people have defined it different. One of the most dominant ways have been by financial flexibility. One of the key speakers of the financial importance was Adam Smith, but even when he warned that money and comfort can't lead to happiness by itself. People and governments wanted ways to measure life improvements and using Adam Smith's economic health became the main way. (Montgomery 2013) Another way of looking at wellbeing is by using the theories of Abraham Maslow, his "Hierarchy of Needs" a theory that try to explaining how to achieve wellbeing.

The "Hierarchy of Needs" is a theory that stats 5 stages of needs. Humans first need some basic needs, then safety, belonging, esteem, finally self-actualization. In the basic each person has to fulfill each step of needs before searching for the next step. In reality



each person is different, in some cases, people only partly fulfill each step before starting the next, a fact Maslow recognized. Maslow saw the hierarchy as a general description of a person's general needs. In some cases, people for example need to pursue the belonging before creating a safe environment. ( <http://www.pursuit-of-happiness.org/history-of-happiness/abraham-maslow/>)

To understand this theory, a little experiment with two fictional scenarios have been made.

#### Scenario 1

A low middle-class family living in Ixtapaluca. They live five people in one home of 50 square meters. One grandparent, two parents and two teenage kids. The parents have low paying jobs in Ixtapaluca. The grandparent has a part time job to help to pay the expenses, and also take care of the kids. The kids go to school and have to take the bus to the school by themselves, because the parents don't have time.

#### Scenario 2

A rich family living in southern part of Mexico City. They live three people in a big house of 200 square meters. Two parents and a teenage kid. The parents work in the north of the city and their jobs are both high paying. The kid gets driven to school by a private driver. They also have a maid that helps with the cleaning.

By looking at the different theories it is possible to argue which family would be happiest. If the theory of financial freedom is the most important factor of happiness, then the people in case 2 would be the happiest. Furthermore, they would be even more happy if they had more money. But if it is looked at with the eyes of Maslow, the picture is not that clear. Money can help people in deep poverty, to get food, housing and security, in other words it can insure the basic needs, which is necessary to be happy according to Maslow. But in both cases the people have a place to live, some one that look out for the children and they have a family. So, the only thing that is left is the upper part of the hierarchy. In the upper part of the hierarchy money have a much smaller effect, so as soon the basic needs are met money becomes more insignificant. When looking at the upper part of the hierarchy of needs Carol Ryff's study in wellbeing gives a more detail perspective. Her checklist for wellbeing that looks like follows:

#### *Self-acceptance*

*High scorer:* Possesses a positive attitude toward the self; acknowledges and accepts multiple aspects of self, including good and bad qualities; feels positive about past life.

*Low scorer:* Feels dissatisfied with self; is disappointed with what has occurred with past life; is troubled about certain personal qualities; wishes to be different than what he or she is.

#### *Positive relations with others*

*High scorer:* Has warm, satisfying, trusting relationships with others; is concerned about the welfare of others; capable of strong empathy, affection, and intimacy; understands give and take of human relationships.

*Low scorer:* Has few close, trusting relationships with others; finds it difficult to be warm, open, and concerned about others; is isolated and frustrated in interpersonal relationships; not willing to make compromises to sustain important ties with others.

#### *Autonomy*

*High scorer:* Is self-determining and independent; able to resist social pressures to think and act in certain ways; regulates behavior from within; evaluates self by personal standards.

*Low scorer:* Is concerned about the expectations and evaluations of others; relies on judgments of others to make important decisions; conforms to social pressures to think and act in certain ways.

#### *Environmental mastery*

*High scorer:* Has a sense of mastery and competence in managing the environment; controls complex array of external activities; makes effective use of surrounding opportunities; able to choose or create contexts suitable to personal needs and values.

*Low scorer:* Has difficulty managing everyday affairs; feels unable to change or improve surrounding context; is unaware of surrounding opportunities; lacks sense of control over external world.

#### *Purpose in life*

*High scorer:* Has goals in life and a sense of directedness; feels there is meaning to present and past life; holds beliefs that give life purpose; has aims and objectives for living.

*Low scorer:* Lacks a sense of meaning in life; has few goals or aims, lacks sense of direction; does not see purpose of past life; has no outlook or beliefs that give life meaning.

#### *Personal growth*

*High scorer:* Has a feeling of continued development; sees self as growing and expanding; is open to new experiences; has sense of realizing his or her potential; sees improvement in self and behavior over time; is changing in ways that reflect more self-knowledge and effectiveness.

*Low scorer:* Has a sense of personal stagnation; lacks sense of improvement or expansion over time; feels bored and uninterested with life; feels unable to develop new attitudes or behaviors.

*Taken from Journal of personality and social psychology 1989, vol 57, No 6, 1072 and written by Carol Ryff*



The checklist is not the only way to approach happiness, but it shows that there are other ways to look at it. It is less measurable than peoples' financial situation, but it addresses that happiness is a psychological state and not a physical state. When that is said genuine wellbeing have a big effect on the physical body and physical feelings have effect on the mind. In Carol Ryff's study, the people that rated themselves high according to the checklist, they were also the people that had the best health. (Montgomery 2013)

Looking at the two scenarios using the checklist, the perspective is now changed. All 5 points could be really low or high in both scenarios. In the first case, both parents have jobs and are able to provide for their kids and grandparent. Most people in the area are in the same income class, so there is a good change that they don't see themselves as low middle class or any class for that matter. They could easy be proud of their jobs and their family. They live a work in the same area, so they have good changes to have good social relations. But this is just speculations, to know the family then they have to be interviewed and understood on a greater level. But it is sure that their financial situation is not purely controlling their happiness. In the other case the parents have good jobs, but far from the area they live in, it is not given that means they don't have good relations, but studies show that long commutes are bad for families and social live (Montgomery 2013). But like in the first case this have to be determent by further studies. The point with this is to clear that life improvement, do not follow the income. So, how else can changes be made if the main goal is not financial improvements? Journalist Charles Montgomery have an idea, by looking at more than only one study he proposes a basic recipe for urban happiness, using ideas and research from, philosophers, psychologists, brain scientists and happiness economists. This is his idea of what a city should aim to accomplish, beside meting the inhabitants' basic needs.

The city should strive to maximize joy and minimize hardship.

It should lead us towards health rather than sickness.

It should offer us real freedom to live, move and build our lives as we wish.

It should build resilience against economic or environmental shocks.

It should be fair in the way it apportions space, services, mobility, joys, hardship and costs.

Most of all, it should enable us to build and strengthen the bonds between friends, families and strangers that give life meaning, bonds that represent the city's greatest achievement and opportunity.

The city that acknowledges and celebrates our common fate, that opens doors to empathy and cooperation, will help us to tackle the great challenges of this century.



This list is not all revolutionary, many of the things is already been done in many cities, but it is not normal to have them as main focuses. Architects and Urban designers can use this to create a new kind of city where happiness is the main goal of the design. Then the question is how to translate this in to real design and not only abstract concepts. In the following sections Carol Ryff's checklist will be explored in different architectural approaches. This will be done in a context of Ixtapaluca and Mexico in general, it is therefore important that the ideas are affordable for the people in the area.



III 18 Diagram; The Ryff Scales of Psychological Well-Being

## Social and affordable housing

Social /public housing or affordable housing is just some of many names for the housing options for the poor or middle income. Even when both terms relate to cheap houses, it doesn't mean they are the same. Social housing means houses that in some way are supported by state or municipality or private companies, where affordable housing can be all kinds of housing that are being built to accommodate poor or lower middle class. This means that social housing is a kind of affordable housing, but not all affordable housing is social housing. ([http://england.shelter.org.uk/campaigns\\_/why\\_we\\_campaign/Improving\\_social\\_housing/what\\_is\\_social\\_housing](http://england.shelter.org.uk/campaigns_/why_we_campaign/Improving_social_housing/what_is_social_housing), <http://lotzar.com/difference-public-housing-vs-affordable-housing/>) In many ways social housing are preferable, because it often is followed by policy that can help the inhabitants, to change their unstable situation. The houses or apartments are also often better because parts of the building will be paid by either state, municipality or organizations that help poor people. Just as it is an advantage to get funding from outside it can also become the problem, policy could change or the organization could change goal, this would then make the building unpayable for the users. (<http://homeguides.sfgate.com/problems-public-housing-1907.html>) This could have different outcomes, the building would stand unfinished, or stand empty after completion or the buildings target user group would be changed to people that could pay higher prices. Other problems with social housing is that the state could become too powerful, they can control how moves there, for example they can say at most housing units will be filled with people on state benefits, or if they want the opposite, to give the apartment to people working for the state or as a gift to people to ensure their votes. (Ward 1998)

In relation to Mexico and Ixtapaluca is corruption by the state quite possible. Therefore, would social housing not always be the right solution, so what about affordable housing? Affordable housing is often really similar to social housing, but the budget is just a bit more limited. Often that result in worse locations, this is done to keep the prize down and the keep the quality up on the building. Another way is build smaller housing units or lower quality. (Aravena 2016) There are many ways to get to the goal, but all have pro and cons. Another way that for example have been used a lot in USA is Building a normal home far from the cities, but in really good quality, and then make it really easy to loan money for the dream house. This was one of the main reasons for the financial crisis of 2008. When people lost their jobs and suddenly couldn't pay their loans, they lost their houses and the bank didn't get their money. In the end it results in a housing bubble. It has made both banks and lenders more nervous about making big loans. (Montgomery 2013)

It is clear that it is difficult to make affordable housing, and even more if it has to make the users happy.

## Own or rent

People mostly prefer to own because they feel it is a good investment. Sometimes it is, but not always. Some of the advantages and disadvantages of renting are:

Pro	Cons
It allows a flexible lifestyle where people move more around.	The monthly payment doesn't become an investment.
Less responsible for maintain the building.	The owners can set the prize high.
Allows people to make other investments	Can get evicted easy.
Make it possible to move to good places with small credit history.	Harder to make loans when you don't have a house make the loan in.
It is not necessary to take a long-term mortgage.	Hard to make house changes or additions
Rent can at times be smaller than mortgage and mortgage interest payments.	

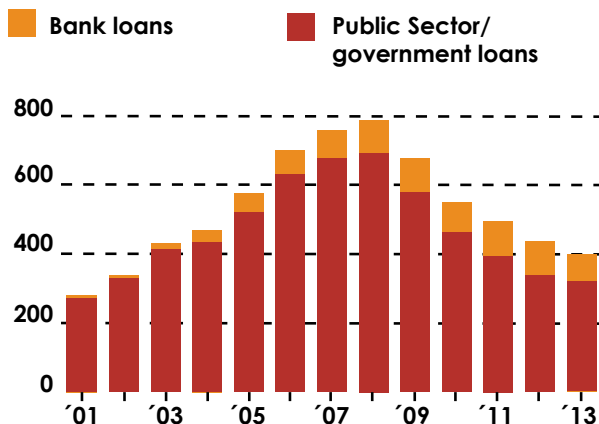
III 19 Table; Pros and cons of Renting

Beside the more practical pros and cons, is there also some social status and psychology aspect of the decision of buying or renting a place to live. For many renting is a more young and flexible decision, because it is a smaller commitment. Where buying is a big commitment and an investment, it creates an image to the world that the people are strong and stable. This image is often not the reality. Before people had to have a stable job with a steady income, to get a bank loan. This is not the reality today. Some banks have made it so easy that nearly everyone could get a loan. (Montgomery 2013)

The last 15 years have been quite extreme in the Mexican housing sector. Former president Vicente Fox declared that: "My presidency will be remembered as the era of public housing." He said that there should be a home for everyone, and in his 6 years as president from 2000 to 2006 more than 2 million affordable houses were made. (<http://www.mascontext.com/issues/21-repetition-spring-14/two-million-homes-for-mexico/>) Even after his presidency his policies was continued by the next presidents, which resulted in even more houses. One of problems was that just because they were build, doesn't mean that that the areas around them were finished or that the houses were in good conditions. The building boom was created with especially one concept. Easy loans for everyone, INFONAVIT, the National Workers' Housing Fund Institute, Mexico's federal housing finance agency, was directed to ramp up its mortgage lending dramatically. Other kinds of loans for the poor section of the people was also created to make it easy for everyone to get the dreams. To supplement the government's work, the World Bank and the Inter-American Development Bank invested \$2.8 billion in Mexico's housing sector. (<http://www.latimes.com/projects/la-me-mexico-housing/>)

### Total mortgage loans granted to Mexicans from 2001 - 2013

(In thousands)



Ill 20 Diagram; Total mortgage loans granted to Mexicans

The boom in the loans also created a boom in contractors, many companies tried to get a piece of the pie. Most of these companies was controlled by foreign money. Many of these companies took big changes and made risky business models. They build extremely cheap housing project that promised a lot, they aimed their houses at poor first time home owners. This was a group that never before had been able to buy houses and take loans. This made them easy targets for the companies, people that had low income and big dreams. In a short period between 2001 and 2012, an estimated 20 million people moved from inner cities, shantytowns and rural areas to the suburbs. (<http://www.latimes.com/projects/la-me-mexico-housing/>) They dreamed of better live owning their own place, but the reality was another. Because of the speed and volume of the people moving, the infrastructure couldn't keep up. Many of the new owners, wasn't able to pay the mortgage and was ether evicted over time or pushed in to criminal behavior. The people left in the area, that was able to pay wasn't in a much better situation, lack of water, bad roads, insufficient drainage system, bad sewers and fear of the neighbors, created unhealthy environments. (<http://www.latimes.com/projects/la-me-mexico-housing/>) Is happened allover Mexico and also in Ixtapaluca, this is not an evidence that buying is bad, but it shows some of the main concerns of buying. If the people had been renting they wouldn't had been stuck in bad deals. It also shows that buying is not for all, people need to be able to a back a mortgage and the interest and understand the complicated contracts before becoming a home owner. This makes it really difficult for the poor part of the population to become home owners.

The question is then, if they shouldn't or they should search for ways to make it possible for them to pay and understand. For some it surely wouldn't be possible, but for other it could be. In Mexico most people don't trust big companies or the government because of the corruption and the many bad deals there have been made to keep the population poor. (Ward 1998) So, changes have to come in a way where the trust have to be placed on people closer to their own situation. One way to make it possible for people to pay the rent, would be to make the house units bigger so more members of the family can live together and share the rent. This will be discussed later in the New ways of living section.

Taking happiness in to the equation, there comes some new reasons to buy or rents. Lot for the aspect that relate buying or renting to happiness are about the social status that are connected to the two different kinds of life they symbolize.

#### 1 Self -acceptance, or how well you know and regard yourself.

This will be really individual. Most buyers will first feel that they finally did it, they are a stronger and stable and will feel proud. Is feeling will for some stay on, but the ones that made bad deals feel trapped and ashamed for their bad decision.

The renters will not be as affected because their decision wasn't as big, they haven't so much to lose or win. Even when it's not as big it can still have an effect, the location is really important, if people rent in the inner city close to high paying jobs, it can bring lots of pride. Oppositely a house in an area where everybody else own, it can feel more like a loss. (Montgomery 2013) Age and stage in live also have to be considered, and mature family will be less proud of renting compared to a young single person.

#### 2 Environmental mastery – your ability to navigate and thrive in the world.

Both renting and buying can be positive and negative in this aspect. It is again really important where they buy or rent, and how well your place look compared to others.

#### 3 Positive relations with others.

By buying a place people starts to settle down, starts to relate more to the neighbors and try to increase the social status, by becoming part of the group. (<http://www.nytimes.com/2013/08/29/business/economy/as-renters-move-in-and-neighborhoods-change-homeowners-grumble.html>) This is mainly about houses and not apartment, people buying apartment often end up behaving like they rent the place, it is often harder to personalize apartment buildings. Where houses can easier be adjusted to make them feel more like they are personal. When a place feels and look personal, people invest more time in it and the neighborhood, thereby making them more social. (Montgomery 2013).

#### 4 Personal growth and purpose.

Location is again important, but also so where and in what the people live in before, former renters in cities close to good jobs and good infrastructure, will in many cases think that to move to the suburbs and buy a house will make them happy, but in many cases, it will do the opposite. Longer commutes and worse infrastructure will make them feel bad. Even after that is said it will in many cases still make them feel that they grew, but the happiness gained from growth will be less than the sadness they feel from the bad conditions. Where a move to a better rented apartment or house in the good area, will make them feel a smaller growth, but there wouldn't be any sadness. (Montgomery 2013).

## 5 Feelings of autonomy and independence.

Renters will often feel really independent which will be helping them to be happier. They are not bound to a place or a kind of living.

Where buyers will feel lucked to a place and a mortgage, but they will be freer according to making the place there own.

By the comparison there is not only one good way to live, for some renting will be best or for others buying will be. In Ixtapaluca most live in suburbs conditions, some in areas where the infrastructure is working and other people in places where city expansion have been to fast so the infrastructure haven't been able to follow the growth. People in suburbs would mostly benefit from owning according to achieving happiness, but in areas where the living conditions are bad it will not make them happy, renting there wouldn't make them happy either, but they wouldn't feel as trapped, which will give them energy to improve. It would make them more likely to try to move to a better place before they get trapped. There are areas in Ixtapaluca that seems more like a down town city, where life is busier and there are more jobs, in these areas renting would be a good solution for many, they would feel like they were trying to improve their financial situation. There are many examples where city renting become more appealing than buying, even in areas where it is less clean, noisier and life can seem difficult. This is because of the happiness the achievements can bring. (Montgomery 2013).

In conclusion the project that could help to improve the happiness of the people in Ixtapaluca would be a combination of renting and buying, some for the young new renters and some for the more mature buyers. It also becomes even clearer that renting or buying isn't the only challenge people meets, because of the bad conditions of areas and houses, people end up in situations where happiness is impossible.

## Technical approach

To create better houses and areas have many factors are in play, one of the factors are the technical approach of the architects, contractors and builders. There are many technical elements in the building industry, some are general and other are more specific to the housing situation in Ixtapaluca. This section will focus on the ones that are specific to Ixtapaluca, mainly climatic solutions and reusable material.

### Climate

One of the main ways that builders can determine their technical approach is by understanding the climatic factors. Without thinking about the climate, the houses built will not withstand the challenges. Mexico is a big country where many areas have different climates, so solutions have to be made specifically to the area. In this case it is the area of Ixtapaluca, which lays in the valley of Mexico. An area 2240 meters above sea level. With few months of rain and storms. The temperatures are both low and high, from monthly average of 3 degrees up to one of 27 degrees. (<https://en.climate-data.org/location/873136/>)

In earlier sections of the paper the flat roof has already been described, but there are many other ways to approach the climate challenges of Ixtapaluca.

As when the flat roof was described rain is one of the main challenges of the climate. It affects the houses in Ixtapaluca in many ways. In the rainy months of the summer the rain falls in so high amounts that buildings and houses doesn't dry up and get matter damaged. The drainages and sewers get overflowed, and streets become rivers. Even when there is high amount of rain many people don't have enough water. By for example installing a rain harvesting system and a greywater recycling system, the need for extra water would be greatly smaller. The rain harvesting works as the name indicate by collecting the water a collecting it and filter it and then use it for washing machines and toilets, even showers but only with special filters. (<https://www.theguardian.com/lifeandstyle/2014/jul/22/rainwater-harvesting-using-the-weather-to-pay-your-bills>) The grey recycling system is a system that collect the used water from the house and re use it to washing machines and toilets. The two systems are possible to combine to create a system that are even better. Another reason to combine is that the rain harvesting system only works when it rain, where the greywater system is always working. The systems will help the home owners but also help the genal sewers because of the smaller water use and drainage from the roofs. (<http://www.sustainablebuildingsolutions.co.uk/solution-data-sheets/grey-water-recycling-and-rainwater-harvesting>)

One of the problems with these solutions are the price, poor and low middle-income families would not have the means to install the solutions. But, concepts they use work and if simpler solution is chosen it would be possible to implement it in to affordable housing projects.

Another solution that work well on roofs with low inclination are roof gardens of green roofs. This is a solution that are mainly used in climates where rain is quite constant yearly. But research have shown that by choosing the right roof, earth and plants it is possible in nearly all climates. (<https://www.sciencedirect.com/science/article/pii/S0925857412002960>) By making roof gardens the drainage become smaller. Furthermore, will it also create a protection against warm and cool temperature. (<http://www.roof-repairs-uk.co.uk/how-to/flat-roofs-history.html>) The green roof works as an insulator, in well insulated homes it will only have a small effect, but in the non-insulated or poorly insulated homes of Ixtapaluca it would have a great effect. ([https://www.researchgate.net/publication/260862666\\_GREEN\\_ROOFS\\_AS\\_PASSIVE\\_COOLING\\_STRATEGIES\\_UNDER\\_TEMPERATE\\_CLIMATES](https://www.researchgate.net/publication/260862666_GREEN_ROOFS_AS_PASSIVE_COOLING_STRATEGIES_UNDER_TEMPERATE_CLIMATES))

As mentioned the temperature in Ixtapaluca are warm in the summer and quite cool in summer (see ill 5 on page 15 for temperature table), it is therefore important to have well working passive strategies to create a good indoor environment specially when most people don't have a heating or cooling system. ([http://internet.contenidos.inegi.org.mx/contenidos/Productos/prod\\_serv/contenidos/espanol/bvinegi/productos/nueva\\_estruc/inter\\_censal/panorama/702825082246.pdf](http://internet.contenidos.inegi.org.mx/contenidos/Productos/prod_serv/contenidos/espanol/bvinegi/productos/nueva_estruc/inter_censal/panorama/702825082246.pdf))

Beside the green roof there are many other passive strategies that would be beneficial to houses in Ixtapaluca. First by just adding a small amount of insulation in the walls the indoor climate would become much better, colder in the warm days and warmer in the cold days. (<https://www.beconstructiveltd.com/does-insulation-work-in-summer/>) One other ways is to work with thermal gain strategies, with a sun-space or a trombe wall. Both solutions are similar and work with the concept of protecting the rooms with a wall that absorbs the heat doing the day with vents for natural ventilation in top and bottom of the wall to keep the rooms behind it fresh. In the night the vents could be closed to heat up the rooms behind. If the weather is hot, an outside shaping devise could stop the sun from heating up the wall and thereby keeping the rooms cold at all time. In areas with big difference in season temperatures, the sun would be high on the sky in the summer and low in the winter, but in Ixtapaluca the suns placement is nearly the same year around.

In areas with hot climates ventilation is another way of making the indoor areas more pleasant. One way is by making the floor plan so cross ventilation is possible. This will both cool-down the rooms and make the air circulation better. In taller building is it also possible to take advances of the stack effect to ventilate using the thermal buoyancy. This can be done by having a roof vent and windows in the side lower on the building, the vent in the roof will let out the warm air that entering from the lower windows. This will



increase the air change rate in the rooms. The concept can also be used in lower buildings by having a window in the top and bottom of the room. But the effect will be larger, the bigger the height difference between the two openings are. (<https://www.sciencedirect.com/science/article/pii/S036013230300132X>)

It is clear that there are many ways to improve the affordable houses with passive strategies, some would be cheap and part of the design where other would be nearly impossible to implement in a cheap way. But if the houses have to have a good indoor environment it is certain that some passive strategies have to be used.

## Material

The materials of the buildings have a big effect on the finished building. They are one of main aesthetic elements, but why also have technical properties. The materials mainly used in affordable housing and in housing in generally in Mexico is concrete. Mainly in the form of reinforced concrete frames. It has many advantages, but also some disadvantages.

Pros	Cons
High compressive strength	Tensile strength to compressive strength ratio
Adequate tensile strength	Uncertainty of final strength
Durability	High form cost
Economy as a construction material	Larger column section
Less deflection	Shrinkage
Use as precast structural components	
Less skilled labor	

III 21 Table; Pros and cons of concrete

### Reused material for housing:

In a few years will many of the badly build houses need to be rebuild or simply removed. In a country where the materials are a much bigger percent of the hole budget than in counties with expensive labor. Building new often means to get new materials, but it doesn't have to. In building with bricks and wood it is possible to reuse them in new construction. In Mexico the most common building material is concrete, a material that normally doesn't get reused, but by new processes has made it possible to use old concrete waste. This concrete waste would normally end in a landfill. The concrete can be made in to tiny pieces and then be used in new mixes of concrete instead of use of natural aggregates, by doing that the amount of natural aggregate is highly decreased. (<https://www.omicsonline.org/open-access/an-innovative-study-on-reuse-of-demolished-concrete-waste-2165-784X-1000185.php?aid=61010>) It is still a new process that are not fully developed, but it is an interesting concept that would make big changes in

the building industry in Mexico, if it was made easier for the normal contractor. Another interesting material is bricks made out of compressed plastic. The plastic is reused and after it is made in to bricks it is still light weight and easy to work with. It is cheap and also fire and earthquake safe, the company that make it, clam that it will be around 30% cheaper than most alternative materials on the market. (<https://www.forbes.com/sites/lauriewinkless/2016/07/21/these-houses-are-built-with-blocks-made-from-waste-plastic/#4118e7a17894>)

It is clear that if a nation has to build houses for up to 9 million homes over a short period, they need to consider which kind of materials they will be using. Even more when a big part of the houses that is already built is in bad conditions and need changes. To build new houses in the cores of the cities, it is also clear that many houses have to be taken down. In most countries this would be a hard decision, but in a country, that have so many floods, fires and earthquakes it often become a natural process. The homes with the worst constructions normally are the first to breakdown. (<http://time.com/4954580/mexico-city-earthquake-collapse-building-codes-block/>)

## City plan

Ixtapaluca is both a city, a municipality and suburb to Mexico City. In some way it can be considered a city by itself, but the structure of the city is really like suburbia, far spread and most houses are low and with only one family.

It is clear that the way cities have been spreading in Mexico have been out of control, new building complexes goes up everywhere and they are build fast and bad. (<http://www.latimes.com/projects/la-me-mexico-housing-chapter-2/>) In the 1970/80 administrators in Mexico City made some extensive master plans, that explained how the city should expand, even with these made the city still just grew without control. Parts of the plan was to let the inner city spread from the inner city by having 11 smaller city cores around the inner city, this should lower the traffic. Furthermore, the smaller cores should create higher density areas with more jobs and bigger building structures. (Ward 1998) The ideas where fine, and could maybe had worked if it were followed, but it weren't. The main problem was and is corruption in the politician system. It is not the only problem, but the main problem, many of the good ideas that was put in the master plan was never communicated to the municipalizes. The master plan was made by a planning agency, it was at the time new and underfunded, and every time a new president was elected the agency was changed so their ideas fit the changing public opinion. It became a propaganda tool more than an actual policy. It was not only the president that used the city planning as propaganda it was also the local politicians, if they needed votes from a certain group, they were promised a new road in their area or some extra land to build on even if it was protected by law. Often new building areas rose up, in spaces that was supposed to be limited to farm land, this happened with help from local politicians. After it was build it got dispensation from the law and it became legal housing. Another problem is that the inner city of Mexico City (Federal district) have a special political structure, so rules made for the inner-city dose not ably to the suburbs outside the Federal district. This have made it difficult to deal with the growth of the city, now when the urban core has spread far beyond the Federal district. (Ward 1998) This is just some of many political problems of city planning in Mexico, so what if the politicians isn't involved, if the solution has to be private?

Sadly, are private developers just as bad, they have been using the poorly regulated system to exploited the poor and middle-class population. Right now, there is a lot of problems, both the government and the private sector doesn't have a good record. It is not all bad, new ideas have been coming forward. Mexico City have sine 2000 had a participatory agenda, where different questions have been brought to the public by telephone questionnaires, the investigation have given an understanding of the publics views on the subject. Later even more relevant citizen involvement has been started, several small citizens councils were made to make small project. The involvement of the population haven't big and there is still an immense distrust of the local authorities and for a good reason many of the decisions made by the citizens councils have been stopped or slowed be the authorities. (Yasminah Beebeejaun 2016) In most cities this would not be considered good, but in Mexico it is new that the politicians even try to give little power back to the people. It is clearly only a start, and even if none of the ideas will be used, making citizens councils bring people together and make them care more about their area. This

could be more important than the actual changes.

Assuming it was possible to make a change with either with governmental or private help, what should then be done to improve Ixtapaluca?

To give a little bit of credit to the current president, Enrique Peña Nieto has acknowledged that tiny one-bedroom, low quality houses carries big problems with them. His administration has made it harder to get loan for the tiny houses and promoted INFONAVIT make it harder to get loans for single-story buildings far from the existing urban areas. In contrast it has been made easier to build and to get loans to make new building in the already urbanized zones, to avoid the cities to spread too much. Against his credit, it was also his own administration that partly creating the problem in the state of Mexico, where he was governor while the building boom happened. (<http://www.latimes.com/projects/la-me-mexico-housing/>)

At the moment is there a lot of new buildings all over the country and in the state of Mexico and in Ixtapaluca, sadly is the quality not high and they are not build to stay long. In some cases, are the houses so bad that fires start because of faulty wiring or water gets through the roof. This happens in buildings that are in many cases not more than 5 or 10 years old. In some areas houses stand empty because former owners were evicted or the contractors haven't been able to sell them, this often resolve in houses degrading faster than they normally would. Even when there is a lot of empty houses there is also still a big need of houses, and it is estimated in 2015 that there still is needed more houses to closes the housing cap of 9.7 million houses. Beside the problems with badly build houses is there also other problems. The infrastructure often terrible, many places don't have water, electricity, drainage and sewer systems. Many of the contractors went bankrupt, other just build the houses and started other housing project. Most of people living there, don't have money and education to fight the companies and the few that does meets strong corporations or corrupt governments. (<http://www.latimes.com/projects/la-me-mexico-housing-chapter-3/>)

Some of the places could maybe still be fixed and made in to good places to live, but some are so bad that they probably will be abandoned, destroyed or say a slum with no improvements. (<https://www.facebook.com/latimes/videos/10156099862583010/>) So not to do the same mistakes different kinds of projects have to be made.

## **Main problems of housing project:**

### **Too far from existing building project infrastructure and installations.**

The money the contractors safe by buying cheap land, end up becoming disappearing when they have to build a lot for infrastructure and installations. In most countries the infrastructure is mainly public build or at least subsidized by the government, but in a corrupt country as Mexico this is not always to be expected. If the contractor decides not to build the installations and infrastructure, the results become as described earlier, with project that are unfinished. If the locations where closer to existing project, the cost of the land would be higher, but the prices of infrastructure and installations would be smaller. Even more important it would be much cheaper for the average citizen. An

example of this is the research done in Canada where they compared the prize of living in the city to living in suburban areas. To create all the new functions needed for making a suburban area livable will it become more expensive than building in the city even with the higher land prices. (David Thompson 2013) The numbers will not be the same in Ixtapaluca, but the main point would be the same.

Beside the financial problems, the projects locations also have a big effect on happiness. The people have to spend more time on commuting to and back from work and spends less time on social activities in the neighborhood and with their families. In short, long commutes create worse social life and less happy people. (Montgomery 2013) By spreading the city of Ixtapaluca, the core of the city becomes less important. With weakened city core the feeling of being part of a city, and less activities will be made in the inner city. By spreading the city, more shopping malls areas only accessible by car get build, this kind of shopping area decrease social interactions. It also makes it harder for a part of the inhabitants that don't have cars. (Montgomery 2013)

### **Too small house units.**

The small houses are built for first time buyers, they think that it will become a good start. Sadly, most times it becomes a trap where the mortgage forces them to stay there. An American study conclude that, living in small spaces is linked to social withdrawal, stress and aggression. It will even have an effect on children growing up under the conditions, the children need a private space. Another American study shows that children that lived in houses with less rooms than people, were less likely to graduate high school and complete college by the age of 25. (<https://undark.org/2016/05/31/psychology-living-small-spaces/>) It have to said, that if both studies is not about Mexican people, and different cultures have different ways of defining living in a small space. Furthermore, is it difficult to prove that is a direct effect of the small living and not the surrounding living conditions the family members are exposed to.

Living in small spaces will also make the people less likely to have many guest and will make them less proud of their places, which both will have a negative effect on their happiness.

### **House plots are too big.**

The space each house takes is quite big compared to the how small the houses are. The plots are inspired by the American suburban house, where each house have a small back garden and front garden. The Mexican plots are small compared to the suburban plots in USA, but compared to the plots of the inner-city houses, are they really big. The problem is that the less efficient plot sizes, forces the city to spread.

Many people would like to have big plots for their houses, but the way it is in Mexico, people will not just let it stay empty space, they expand their house unto the unused space. Most plots in the inner-city have more than one house unit on, often is the building in two or three floors and a front house and one or two other houses behind the first one. The extra housing units are either being rented out to strangers or to other parts of

the family. In this way will a plot made for one unit often become for 3 or 4 units. The way the new project is made makes this expansion difficult, and it will therefore become a less dense area.

Analyzing the traditional city house unit in Mexico, it is possible to find information that can help create many ideas for how to make the city plans better. The old city houses of Mexico City were in 3 – 5 plans, with a shared courtyard in the middle, with apartments surrounding the center courtyard. This kind of building was introduced by the Spanish and dominate the older Mexican cities. They create a more compact city with a strong relationship to the culture. (Ward 1998) After the earthquake in 85 the government gave an agency the task to build new houses to some of the survivors, these houses were inspired by the old town houses and painted in strong colors. The houses were in high quality. The problem was that they were only made for a small part of the people that lost their houses, in some way as publicity to show that the government was helping. This differentiated the group of survivors that previously had lived in the same areas, people that before had felt that they were the same. The house was built well and were cheap, because that they got big subsidizing from the world bank and the government, this made it possible to sell them to half the market prize. Other people got so inspired that they demanded similar housing. They wanted to own houses that was finish by contractors in high quality and with many colors. (Ward 1998) This was a big change in the way the people were thinking about new houses. The rehousing was on the old sites where the peoples' houses had been before, so the houses had to be able to contain the same amount of people as lived there before. Before this happened most new areas of housing was uncontrolled self-build, where governments and municipalities added the installations when the areas became big enough. (Ward 1998)

It is not clear if the self-build was better or worse for the people, they had chances to build in their own speed and in the size needed, which was good for them, but they didn't know when and if the installations would be made. Another idea was that people should self-build in a controlled project where the government created infrastructure and installations, this would make the area safer to move to. (Ward 1998)

The colorful high-quality house was difficult to rebuild for the other poor people that dreamed it, because of the big subsidizing the original project got. One of the solutions was a standardized finish houses, looking like it was from an assembly line. But where the original project had high publicity quality, the many houses that came after didn't and it was up to the contractors to make good houses.

Some of the elements from the 1986 earthquake rehousing project could be used in strengthen the city core of the city Ixtapaluca.

### **High quality construction.**

The high quality is important for many reasons. First the houses with good construction will prevent firer in electric installations leakage from roof and walls. Second is it really important when building in earthquake zones to have a good construction and even more if the building is in several levels.

### **Many colors to relate to the culture of the country.**

There are many reasons to make the buildings relate to culture. One is that it can strengthen the relation to the country and make the people feel prouder of where they live and come from, and if people are proud they become happier.

Another reason to have strong colors is that it is an easy way to customize the houses and make them feel more personal. As mentioned earlier if the people can personalize their places they are more likely to relate to the people in the area and be more socially involved in the area.

Last is the materials used in most buildings in Mexico is concrete, which can look sad and cheap, but by painting it, it can become expensive and interesting looking.

### **Being able to contain the same amount of people as the city houses.**

By building a place that can contain many people the price of building goes down calculated per unit, this allows each unit to be in higher quality, compared to how they would have been if they were built as unmerged houses. It also makes it easier to make a denser city structure, which again makes the core of the city stronger and the inhabitants happier, because of the many reason listed earlier.

### **As cheap as self-build of the same size.**

A good price is as always one of the main elements that attracts people, in this case people got something that could give them all their dreams to a good price. Even when self-build often is as cheap as buying something build, does self-build give a lot of stress and hard work. If the buildings made by contractors are made well, will it also remove some of the challenge of designing a house and the fears about doing it wrong.

### **Central location in inner city.**

One of the things that made the rehousing really popular was that it didn't forced people to move, some people dreams of a more suburban life, sadly have studies showed that it for most wouldn't make them happier, less social life, either long commutes or lower paying jobs are just some of the reasons that suburban live for many isn't making them



happy. (Montgomery 2013) To make the inner city more appealing the architects have to give the central located homes some of the things that people dream of when thinking about a suburban life. Things like allowing the homes to changes to personalities, give them the chance to own and give them a feeling of private life. Again, the reason for having the central location is to strengthen the city core.

When listed it is clear that it will be hard to make anything that comes closes to be as good as the rehousing project, that is properly why it wasn't just build for all people. So, the challenge is to make new architecture, where the houses have most of the good element from the rehousing project and also make buildings that will increase the happiness of the people. This challenge will be the main theme of the next section of the paper, but to conclude on this section another element has to be looked at. The future master plans of Ixtapaluca and who to make them. It has become clear that even the government have good ideas to improve the city, they don't have the ability to do it for all the people that need it. They are more focused on the next election. So, the ideas they make should be used more like concepts that contractors and private people can use as guides for how to build. This will allow people to make better decisions about how to live and where to live. The main idea presented in the old master plan about many smaller city centers, instead of one single core with many rings around it, is good. The ring idea is that normally happens when a city grows without a strong masterplan, it creates really long travel time and it often create many areas where no one lives were factories split the city. By having many cores each area gets live, it will therefor create jobs in many different areas, at the same time will the travel time will also become shorter. There will of cause still be transport between each area, but by having many cores, will the traffic be spread over many roads, instead of only going in one direction. On a smaller scale the city cores will need areas with buildings with around 3-5 levels, this will centralize the people and will still create a center in human scale. The city cores closet to Mexico City core will need to have even higher building, but by having building of 3-5 levels, it will be less necessary to build high rise building with 10 or more levels. This way will create many small city centers.

## House plan - New ways of living

New architecture can help create houses and buildings that will increase the happiness of the people living in them and around them. It can be done in many ways, sadly is most of the ways architects often use expensive, in this section of the paper different approaches will be investigated.

### Shared living:

Most Mexicans lived before close to their family and often in the same building, in the last years the families' houses become more separated. Each person wants to have something that is just theirs, and the way the new buildings are made, make it difficult to live many people together and still have privacy. Most of the new homes are made from an American model of a single-family unit, this have made the units less flexible. The way that the older houses were built made them easy to share, because they give a chance for all still to have a private space. By locating the living units around a small court area, it is possible to have living units on more levels and still feel like they are part of a bigger building. By living so close allow each living unit to be different, one unit with a bigger dining area, but no tv area. Were another unit have a big tv area, but only a small practical eating space. This is what naturally will occur when people with strong social relations live close. The people that live in the same size space, but far from relatives or good friends, will have to have all the functions in the same space. This will normally make them feel that they need more space and they move to a place where they can have more space for a low price. This get them in to new houses that are bigger, but further from the center and often in bad quality. Even when the Mexican family is strong and often bigger than most European and American families, some people don't have a family that they want to live with. So, how can architecture help create relations to strangers and make friends become good friends? This is a question that are being asked and tried solved around the world. Most Mega cities have the challenge to house many people in a small space but keep high living standard. One way is to work with the problem is shared living, but there is many different levels of shared living or co-living as it also is called.

One approach is to give every unit, all the essential rooms, such as bed rooms, toilet, kitchen and living room. Less call this option 1, here all rooms have to be small to make it affordable. In this option the shared spaces function as places only for bigger meetings. Where small gatherings will happen in the private unit. This makes it good for the feeling of independence, and it lets people have life without being forced to include other, but it gives people a chance to be social and it still encourage the inhabitants to be social in the other rooms. An example of this is seen on ill 22 on page 46.

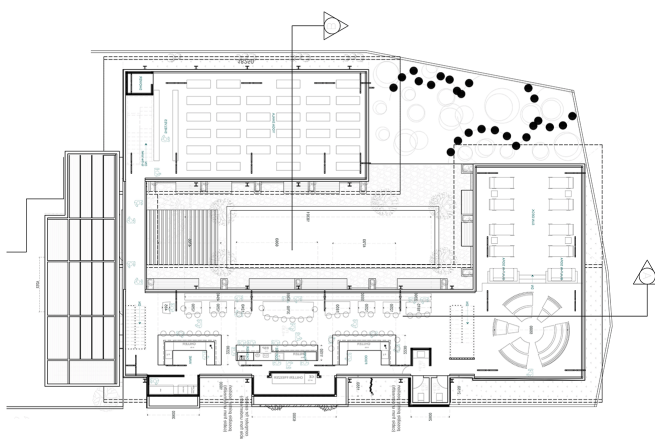
Option 2 is where each unit still have own rooms, toilets and a little living space that also functions as entrance. Assuming that the size of the apartment will be the same as in option 1. This option gives a possibility to have bigger rooms and each room will be in a higher quality than in option 1, but it will of cause still be small compared to American standards. In this option there will be shared kitchens and living spaces, theses spaces will be bigger and more central for the people, because they will be forced to use them. Their own units will more be a sleep and maybe relax unit, where the shared space will



Ill 22 Picture and plan; New Ground / PTE

be where most activities will happen. This will be an option that will make the social life stronger and force people to mix and become part of a community, but still have some space that will be called their own.

An example of this is seen on ill 23.



Ill 23 Picture and plan; roam Bali / Alexis Dornier

Option 3 is the extreme co-living here the units will consist of a room, the rest will be shared. The main entrance will most often be shared. This option will allow big rooms and high quality both in the shared space and in the private space. The challenge will be the lack of privacy, every action will be in the shared spaces, which will force strong social live and limited private life.

An example of this is seen on ill 24.



Ill 24 Pictures; LT Josai/ Naruse Inokuma Architects



There are many other ways of co-living, but most of the other ways falls under one of the three options. The relevance of different kinds of shared living is big in Mexico, mostly because it is already how many of the people live in the houses they self-build years ago. Houses where one part live in the main house, one part in an extra house build in the back of the plot and one part in a 1th floor apartment or in other similar arrangements. (Ward 1998) This way of living has become more difficult in the newer tract houses where it is more difficult to expand the houses. Co-living is not new, it is the more traditional way of living, but most modern houses makes it hard, because it had low status to live many generations together. Most people in Ixtapaluca that lives with their family, do it because it is practical and necessary for survival. But if the ways of living together could be more optimal, would people then do it for more than practical reasons? This question was asked in USA more and more would say yes, because suddenly by living together it was possible to get bigger and better houses, and they could get more time in the daily life when chores are shared. (<http://www.bbc.co.uk/news/magazine-36396217>) Beside living with the extended family, more and more young people also decide to move in together again, this is something that the housing market in Mexico have to adapt to, if it want to make houses that actually are good for the people.

It is difficult to determent which way would be best for Ixtapaluca. There is not only one way, option 1 is often the one chosen when more families of the same generations live together. But when it is a family of two generations, sharing a plot would often be more like option 3. So, each option has its good elements, therefor, if new building project would make a mix of the 3 options, it would be possible to get a more mixed catalog of people. Lastly how does shared living effect peoples' happiness. Before it had low status to live together, and it would thereby make people less proud. It still would be really good for their close social life, but the social status would be low. The point is, shared living is good for the people, but only if the status of co-living is good and the physical contusion is fitting the lifestyle. So, if people are proud of the building and the type of co-living, it could make them happy.

## Self-build and the half house

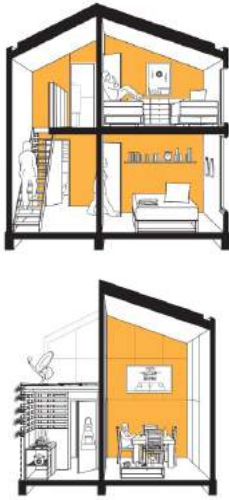
The traditional way that Mexican cities grew was by self-build. Self-build does not mean the same as DIY (do it yourself), it is more that people hire the workers themselves, it is possible that they do some DIY, but most work will often be done by professionals. It allows people to build the houses they what, and do it over a longer period, this let them build when they have money and wait when they don't. This allow people to build new houses without building up mortgages and let them a home that are specialized to them. It sounds really good and it is, but not for all because there are some disadvantages to it.

Pros	Cons
Personal house that are made for the user's needs.	Price is often higher per square meter compared to houses build by big contractors.
Easier to adapt to changing needs.	Even when it is done by professionals, the building can easy be made with a weak construction to save money
Have long time to get money for the final house.	Floorplans and design is often not made by professionals, and it can make the house less functional.
	It is a difficult and demanding task to be a contractor.
	Takes longer to finish.

III 25 Table; Pros and cons of Self-build homes

The housing problems and the lack of affordable housing in Mexico, demands fast solutions and solutions that can be made for many people. It would therefore seem like self-build wouldn't be the best option, because of its longer building process. This is partly true; the classic self-build will not solve the bigger problems. Some people would of course still do it, but for solving the bigger scale problems would it be too slow and not cheap enough. There are more ways to make self-build. One way is to buy ready made modules that just have to be put together and thereby save time at the building side. This option is quite popular in northern Europe, where workers are really expensive because of the high salaries. In Mexico the salaries are low in most areas where affordable housing is needed, there is also a need of jobs. So, to remove most of the hard labor makes little sense, actually because of the cheap labor, it is possible to make cheap houses that are customized. (<https://www.archdaily.com/office/tatiana-bilbao>)

Other ways of self-build that are faster is to buy a model home, where all drawings are made and the people just have to decide which of the different model homes they want. Then the company hire the contractors. It is often a more expensive way to build, the company often takes a lot of money for the help. The Mexican architect Tatiana Bilbao want to change this approach, her company have made projects and ideas where it is possible to choose which of many options they want and all cheap and in the right size for the family. The design consists of two materials a strong concrete and a cheap wood. The main house is in concrete, and areas that the family want later to have included in the house will be in wood, this make the house look finished, but still gives a chance to extend in to a bigger house.



III 26 Diagram and Picture; Tatiana Bilbao social housing

The look finish and in many ways, solve many of the problems of the housing problems. But the efficiency of this solution is not perfect, the plots are better used than most newer houses, but still only one family on the site and only in two levels. It will therefore still make the city spread and create some of the same problems that other affordable homes give. This way of thinking is similar to another kind of building.

There are mixed solutions where bigger companies build a smaller house and then the inhabitants are supposed to extend the house until it has the desired size. This option has gained more focus, because it has the speed of the many standard house project, but it allows the people to extend the home slowly. There are many ways to make this, one good example of this kind of project are made by Alejandro Aravena. He is an architect from Chile, he won the Pritzker Prize in 2016, a big part of the reason for his win was his and his companies approach to affordable housing. They promote the idea of incremental housing, an add on housing. The houses give the users the change to buy a house that only have the absolute essential rooms and installations. Building the people buy also include an extra space, where they can build more when they have the money. One of the special things that makes their design stand out is that it is not normal row houses, but one family on each floor, this makes the solution more relevant for the inner city. The houses give many opportunities, the way that they are build makes it easy for the owners to extend, this is done by creating the structure for the whole building from the start even the part that haven't been build. (A. Aravena 2016)





III 27 Pictures; Villa Verde Housing and Quinta Monroy / ELEMENTAL

This kind of buildings doesn't look like finished building, they are more a good skeleton to build the body on, the base house gives a place that people can live in, but not much more. The base house doesn't make people proud, but it gives them a change to become proud.

There many reasons to look at self-build as both part of the past and the future, it gives people the changes to make homes just for them, and in a time frame, that fit them. But as a solution to the urgent problem with lack of affordable homes, it is not the right solution. Except if it is in a different form, where it can be faster and more controlled. There is need of homes that are more personal and houses fitting the specific user, the idea of incremental housing could therefore be an option.

## Conclusion

A good way to approach architecture is to look at the history of a country, to see what work and what does not work. In Mexico the government is not trusted, but family and close friends are. So, architecture should encourage shared living instead of working against it. It should make buildings that strengthen the city cores and create more natural live, as the old cities naturally does. By building in more plans and in with focus on letting the people be part of the building, loans will be smaller and care for the buildings will go up. By encouraging people to build parts of their homes they will naturally be more interested in the neighborhood. By using reused materials, it will be cheaper and the new technologies will make it easier for self-builders to make good houses.



III 28 Pictures; Villa Verde Housing and Quinta Monroy / ELEMENTAL

## Part 3 - Case studies and questionnaire



## Case studies

Most of the research in this paper is related to architectural cases, to make this connection stronger three affordable housing projects will be analyzed. There will be a focus on most of the elements from the research. The analyses will be made from a collected material on each case, none of the places have been visited or seen in person.

The approach of each case study will be done in the same way. First focusing on the location, then the master plan, floor plan of the project and if expansions is possible. It will be analyzed if it is possible to expand and how. Next, materials and finally with happiness.

Every kind of housing project will have an impact on the user's happiness, but affordable housing is maybe the kind of housing that have the biggest. The people would in many cases not have a home if there wasn't an option to get a cheap house. In other cases, they would live in houses that both are small and in really bad conditions. In the "Happiness" section the cases will be compared to Ryff Scales of psychological wellbeing. Each criterion for personal wellbeing will be looked at in perspective to the projects effect on the users.



III 29 Picture; San Buenaventura



III 30 Picture; San Buenaventura

## San Ignacio Houses / IX2 Arquitectura



III 31 Picture; San Ignacio Houses / IX2 Arquitectura

The San Ignacio House project contain 10 houses on an area of 925 square meters. In the area there are 450 plots they are planned in horizontal subdivision. The houses were built in 2016 and drawn by IX2 Arquitectura. The manufactures were Rotoplas, LOBA and Novidesa. (<https://www.archdaily.com/796047/san-ignacio-houses-ix2-arquitectura>)

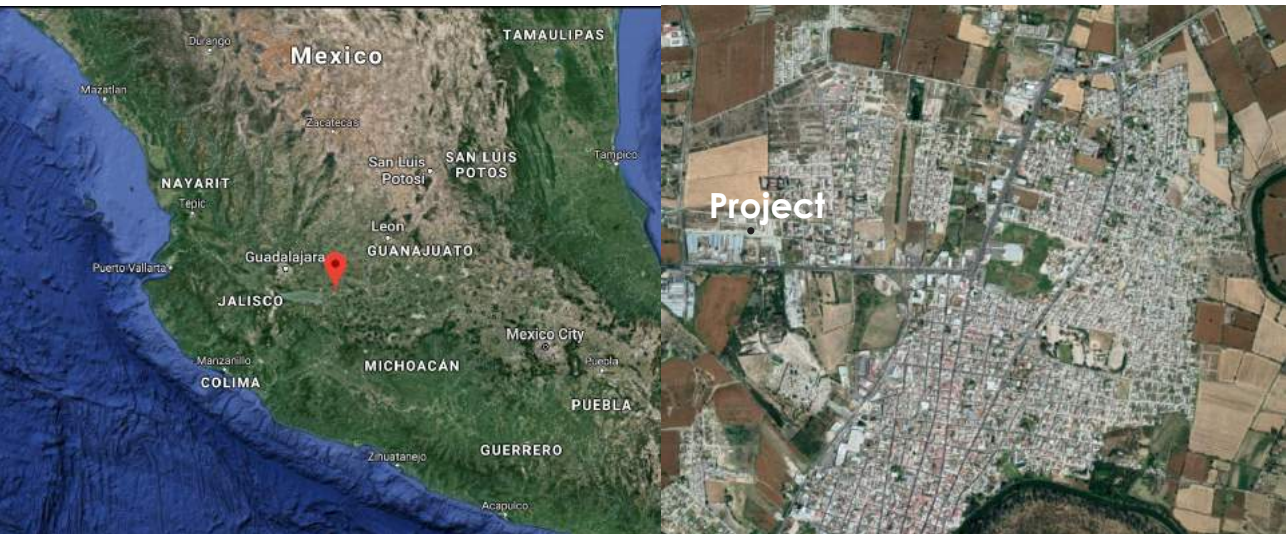


III 32 Picture; San Ignacio Houses / IX2 Arquitectura









III 34 Maps; La Barca

## Location

Location is an important part of architecture. When describing the location, it is also important to describe the context. This affordable housing project is located in the state of Jalisco, it is located in the mid-western part of the Mexico, the capital of Jalisco is Guadalajara which is the second biggest city in Mexico. The project is located in the city of La Barca, a smaller city of 60 thousand people. ([https://en.wikipedia.org/wiki/La\\_Barca\\_Municipality](https://en.wikipedia.org/wiki/La_Barca_Municipality)) It lay around 450 km west from Mexico City. The project is located around 3 km from the city center of La Barca.

The area of the project is in development, it both have big industry buildings, a hospital, other services and more housing project. Most of the houses in the area are self-build, but the area stands quite empty. It is on the edge of the city and just 100 meters from the project is it only fields.

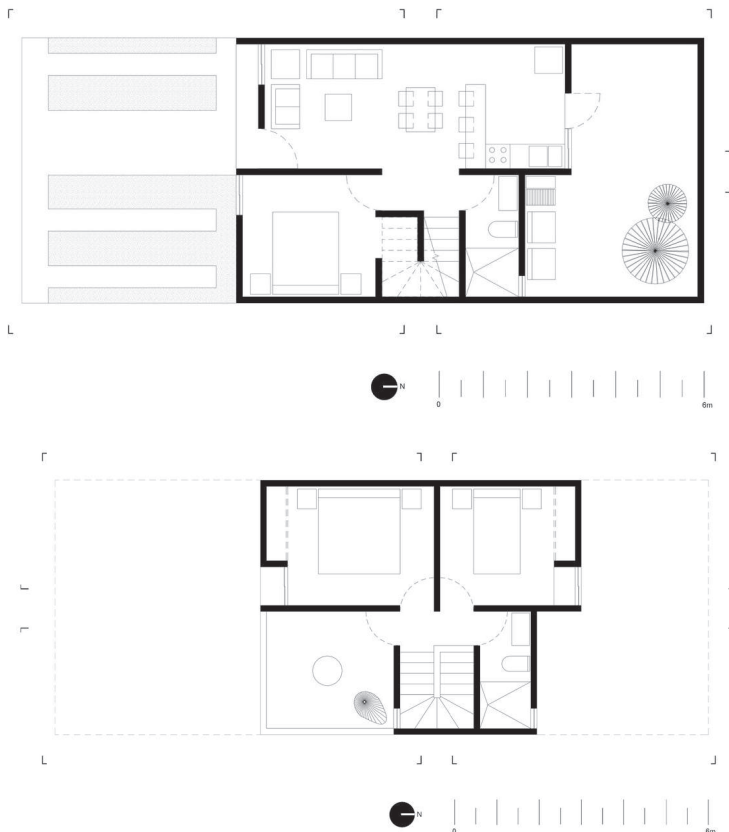
It is clear that more houses are coming in the area, but not in a high speed, this is seen by comparing the Google earth from 2018 pictures with the street view picture from 2014. There are coming more buildings, but they are spread over a big area so the growth doesn't look fast or big.

The location it an example on placing the project far from the center of the city. It is still part of the city and not like a satellite city far from the real city. It is still close enough for people to get to the city in short time. The dose not invite to strong activity and the location is clearly a cheaper option compared to the more central locations. It also gives a change to build bigger project without having to tear down existing buildings.

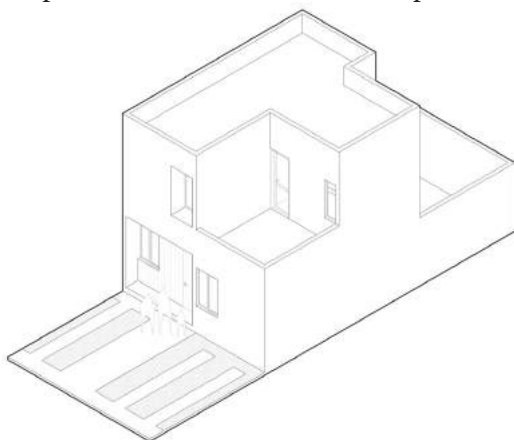
## Master and floor plan

The master plan is really simple, the built part of the project only containing 10 buildings and they lay linear along a big road. The architects say this is according to the cities bigger plan for the area. (<https://www.archdaily.com/796047/san-ignacio-houses-ix2-arquitectura>) The plan doesn't create any interactions between the inhabitants, it is an area where people just pass through without creating connections.

The layout of the plan is simple and practical. There are no indoor entrance area and people go directly in to the living space. There are three bedrooms and a little back garden, a front garden that work as a parking lot and as an outdoor entrance. The back garden has a sink and an area to wash.



The architect describes that the “holes” in the structure is made both for the function they have now and for the possibility of expanding the house. The architect furthermore describe that the idea is inspired by the architectural do-tank Elemental, that have a similar concept in many of their houses. (<https://www.archdaily.com/796047/san-ignacio-houses-ix2-arquitectura>) In the top square is it easy to add an extra room. Here three of the walls is already made and it would thereby make it easier to expand. On the ground floor is it possible to expand the kitchen in to the garden. This would make sense, because of the quite small kitchen. The floor plan makes a lot of flow through the living space, and it is difficult to get to the kitchen and the garden. Rest of the plan is quite functional. Expansions could give some few new options, but the flow in the living space would still be a challenge. In some other houses with the same kind of front entrance, they change it to be more a part of the house. Some even expand in that direction.



III 36 Visualization; San Ignacio Houses / IX2 Arquitectura

## Material

There are used different materials in the project, both for practical reasons and for aesthetic reasons. The façade material is mainly flatted sand-cement, which give a smoother surface than the traditional material used in affordable housing in Mexico. The door and the area around the door is made from Okume wood which have mainly been done to make the design stand out from other cheap housing. (<https://www.archdaily.com/796047/san-ignacio-houses-ix2-arquitectura>)

The main structural system is made by a module called m16 NOVIDESA, the main material in the module is made of rigid expanded polystyrene foam with high density. It is structured with two galvanized steel profiles. The material will make the building insulated in a cheap way. ([http://www.novidesa.com.mx/detalle\\_producto.php?idproducto=m16](http://www.novidesa.com.mx/detalle_producto.php?idproducto=m16)) Compared to homes in north Europa the insulation is not good, but most homes in Mexico are not insulated, so insulation of 15 cm will have a big impact on the people living in the homes. The temperature is higher than in northern Europa. But with 5 degrees winter it would still be a cold without insulation. (<https://www.worldweather-online.com/la-barca-weather-averages/jalisco/mx.aspx>)

## Happiness

### 1 Self -acceptance, or how well you know and regard yourself.

The houses have a luxurious look compared to other affordable houses, the architect have put focus and care to the materials and the finish of the outside of the house. Even the inside looks nothing like most affordable houses. It has to be mentioned that the architect has properly use more expensive furniture than users would have money for and used professional photographers to make the house look much better than it would when the intended users would move in. Even when the house would look different on the pictures compared to when the users live there, it would still be a place that make them proud. In many aspects it looks like most affordable housing just done with a better finish and materials. It would still not make people feel like living in a big self-build house, so this would affect their self-acceptance.

### 2 Positive relations with others.

There are no areas for bigger social events, no area playground or common room, and even when the house is bigger than most affordable houses, it uses most of the space for the bedrooms. Therefore, is it possible to say that the project does not help with social relations to other outside the household. Furthermore, the project is located in an isolated area of the city.

### 3 Autonomy

The houses are not build to the uses wishes, they are not in any way personalized. But, the homes are easy to make some changes and adjust to make more personal. Both with colors and with expansions, and thereby make it personal. Is would have a great effect on the feeling of autonomy. The distances to most things are quite big, this makes having a car more important, which for many wouldn't be a possibility. If it had been in another country, where it was normal and safe to use bikes, the distance wouldn't have been a problem.

### 4 Environmental mastery – your ability to navigate and thrive in the world.

The homes are bigger than many other newer affordable houses, some homes are not bigger than 30 square meters . (<http://www.latimes.com/projects/la-me-mexico-housing-chapter-5/>) The houses in this unit are around 90 square meters on plots of 100 square meters. Living in a house this big, would create great chances to have a family live and make them live there comfortably. Furthermore, will the insulated walls also have a great impact on the users. People living there would have a good home, but the location is far from many things and the area are not controlled or secured. So, there are both pros and cons in relation to environmental mastery.

## 5 Purpose in life

The location could end up isolating them from connections to other and this could resolve in lost chances in relation to job, friends and other family. Again, the project would both give a good and bad effects on the inhabitants.

## 6 Personal growth

The home would for many be a step up in quality and space, which as a beginning would make the users feel like they were improving the life. There is a big chance that the feeling of growth is connected to how well the area develop, either it becomes more active or stays isolated and dead. An active area will make help the people to feel personal growth.

In all is it clear that there are both pros and cons for this project according to how it would impact the user's happiness. The main con is the location and the master plan, both affects the people in many ways. The main pros must be the quality and size. The chance to expand would be great for some families, but even without the expansion the house has a size that can accommodate most Mexican families.

## Conclusion

The architects have in many ways created a project, with many good elements, the materials are and quality is far above the state of other affordable housing project. But the master plan and the location are troublesome. The project is located at the edge of the city in an area where the buildings are spread and in few levels. For the project to be positive for users the city has to grow around it, else the people will be isolated. The project is a clear example of the kind of affordable housing project build all over the Mexican country, it looks good, it is big and interesting architecture. But it is far from the central city, it is part of a grand unfinished project. In many other cases these project forces people in to loans and the infrastructure around them never get finish, people buy a dream instead of a home.





## Quinta Monroy / ELEMENTAL



III 38 Picture; Quinta Monroy / ELEMENTAL

The project is an experimental affordable housing project made by the firm Elemental. The firm has a focus on making minimal incremental housing, where the user only gets a half house and a space to expand the house into. The idea is to make houses that people can buy cheap and not have to make big loans to afford. Over time the owners can extend the house when they have saved enough money. The design process was made with great participatory effort from the people living on the site. (Aravena 2016)



III 39 Maps; Chile, Iquique

## Location

The project is located in the north of Chile, in a city called Iquique. In the city lives around 220,000 people, it is one of the most important harbor cities in Chile. (<https://en.wikipedia.org/wiki/Iquique>) The project is located south east of the central city, but still inside the inner city. The area is full of other houses, some new and other older. The location was chosen to give better houses to people already living on the side, the people living there was relocated outside the city center while the project was being built, and then after it finished they moved back to the same site. The people could have gotten bigger houses outside the city but they rather wanted smaller and more central houses. Many of the people living there was able to walk to their jobs from their homes, this would not have been possible if they had moved outside the city. (Aravena 2016)



III 40 Pictures; Quinta Monroy / ELEMENTAL





## Master and floor plan

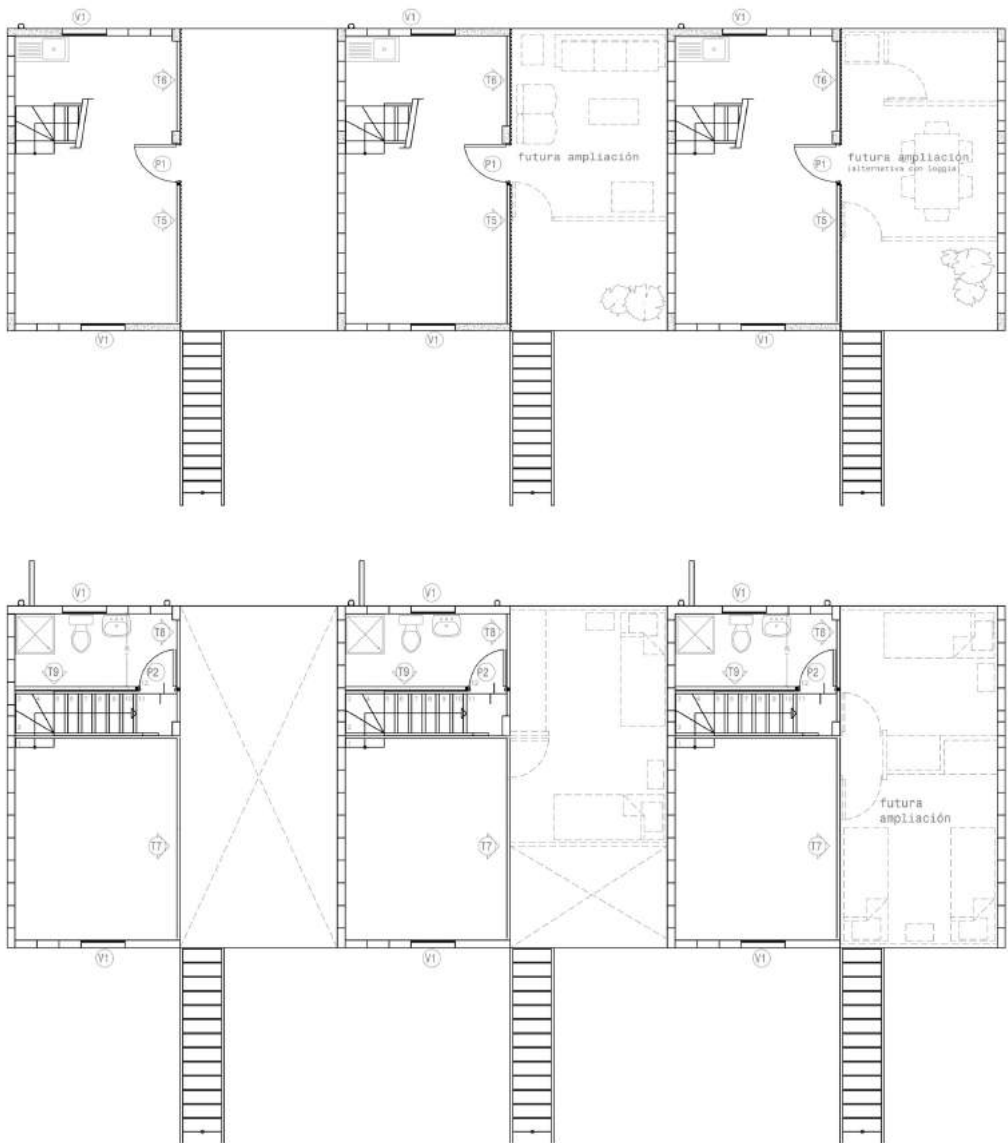
The masters plan has been made in corporation with the people living on the site. The residents told the architect that the site already was divided in groups with people of different backgrounds. The architect could use this to information when making the master plan. They could make a plan that helped the people in the groups keeping a feeling of connection to each other. So, instead of making long lines of houses, four areas were made. This should strengthen the connection and neighborhood feeling. (Aravena 2016)

Another aspect that was decided with help from the users, was the height of the buildings. The people demanded that they wouldn't live in apartment blocks. The architect explained the users that if they all wanted to stay living in the same area they had to live on more levels. Elemental came with a new idea, where they all could have their own entrance and still live on more levels. They expected a big fight with the people, but the idea they presented was for many people familiar. The houses they lived in before was often in two or three plans with different people living on each level. This kind of living had started by itself by people building an extra level and then renting it out to people. So, in some whey the buildings Elemental offered was just a more controlled and well build edition of the former buildings. (Aravena 2016)



III 42 Master plan; Quinta Monroy / ELEMENTAL

The floor plans are in many ways simple and still well thought out. The part of the house that are build is the part that are hardest for private people to build themselves, a kitchen and a bathroom with plumbing and installations. Beside this the walls are made in a way so the loadbearing structures are in the outer walls and a column, which insure easy expansion. The ground floor apartment expands to the side. Where the first-floor apartment is in two levels and also expand to the side. The way the construction is made insures that the expansions are made in a more controlled way than normally is seen in poor and low middle-income areas.



III 43 Plans; Quinta Monroy / ELEMENTAL





III 44 Pictures; Quinta Monroy / ELEMENTAL

## Material

The materials used in the construction is simple and cheap, concrete blocks as loadbearing and facade material. Wood beams and wood boards for the inner construction. This is done both for making the building as cheap as possible and for making expansion easier. There is no inner finish or “beauty finishes”, just the essential.

## Happiness

### 1 Self -acceptance

The houses stand more like a base to build from, more than a finished house. People will not feel as proud as if they had a finished house, but it gives them a change to create something by themselves. But for many of the people living there it is an upgrade, they had even worse conditions before the new houses was build. So, it will make them prouder, but if the building would have appeared finished they would have been even more proud.

### 2 Positive relations with others

By making a master plan that collect the people in groups and join them together, will help them to have greater relations. Furthermore, will the future work on each house create a lot activity in the area and by personalizing each house the people will get a strong relationship to the area and the people in it. There are no shared rooms or buildings and the site don't have a defined outdoor social area. But, the way the master plan is made create small outdoor areas that by time could work as social areas. Furthermore, is the area so central that there are many places to meet in the surrounding area.

### 3 Autonomy

By giving each family a change to create something for themselves, the project helps each person to feel more independent. By looking at the many different ways each house has been expanded it is clear that each family has a chance to create something unique and personal.

### 4 Environmental mastery

The location gives the people a big opportunity to the people to have interesting lives, with small distances to sounding jobs and activities. Also, by creating cheap housing the people will be more flexible to do activities and more time to explore the city.

### 5 Purpose in life

The project does not insure that people will have purpose in life, but by forcing the inhabitants to build, they are forced in to action. And by taking action there is a great chance that peoples feeling of purpose will increase. ( [https://www.huffingtonpost.com/shannon-kaiser/3-unexpected-ways-to-find\\_b\\_5176511.html](https://www.huffingtonpost.com/shannon-kaiser/3-unexpected-ways-to-find_b_5176511.html))

### 6 Personal growth

By locating the project in a central area with many jobs and still making the houses cheap, the people have great opportunities. The expandable buildings also will give the people a feeling of growth, when they create their own home.

There are many aspects of the project that would make the users happy, the location, opportunity for the user to make their own home, the price and the independence it brings and the enclosing master plan. It is not all perfect, the houses look unfinished and the high demands on the users, will for some be too much. For them will it not be possible to find money to expand, and then the houses are far too small to be a good living space. But for the people that have the money and energy, the houses can become much better than anything else they could have bought from the same amount of money. The location also makes it easier for good earning jobs and this will make the project a good base.

## Conclusion

The project is not a typical architectural project, the building does not look finished, even the inside look like the building process is only half way. In some way that is the case, it is buildings and the new owners will by themselves make it in to homes. The project demands a lot from the people buying the buildings, but this kind of affordable housing doesn't force people to take loans or to live far from the center. The buildings even have the potential to become good looking homes. The way it is made also make the area quite dense and at the same time spacious, with shared areas in front of the homes. All the good elements only comes to live if the people have jobs and expand the base home, this is why the location is so important. If the people are not up for the challenge the buildings are too small and the living spaces are unfinished and not good for living.

## ITI 68 / C Arquitectos



III 45 Picture; ITI 68 / C Arquitectos

This affordable housing building is made by “C Arquitectos”. It is designed in a way so it relates to its context, which is a high speed big road. The simple façade is made with colored panels that relate to the billboards, but it also gives the building a unique expression. The project is also an example of trying to build high instead of spreading the city with low constructions. (<https://www.archdaily.com/442004/iti-68-c-arquitectos>)



III 46 Pictures; ITI 68 / C Arquitectos









III 48 Map; Mexico City

### Location

The building is located in the inner city of Mexico City, it is located around 4 kilometers west from the center. Even when it is 4 kilometers from the central square, the area is still considered central. It is located next to big roads, but the road is split in a faster road in the middle and a smaller slower one toward the building. It isn't easy to build new affordable housing projects in the inner city, but because of the buildings thin shape it was possible to build it so central.



III 49 Pictures; ITI 68 / C Arquitectos

## Master and floor plan

The project is challenged by the shape of the site, where is force the design to be narrow. To let light and air in to the smaller apartments, the building is split in to three volumes with gabs between each volume. The apartments are simple and around 40- 60 square meters. The façade panels are put in a way so it is harder for the people in one apartment to look in to another apartment, and it also give each unit its own expression.

The floor plan is quite simple, the ground floor has a long corridor that lead to two staircases which give access to the apartments. All the apartments are with two bedrooms except one on the ground floor. All the apartments have entrance through the living area, some divides from the living area in to the other rooms, where other goes in to a corridor which then divides in to the bedrooms and toilet. There is parking in the basement.

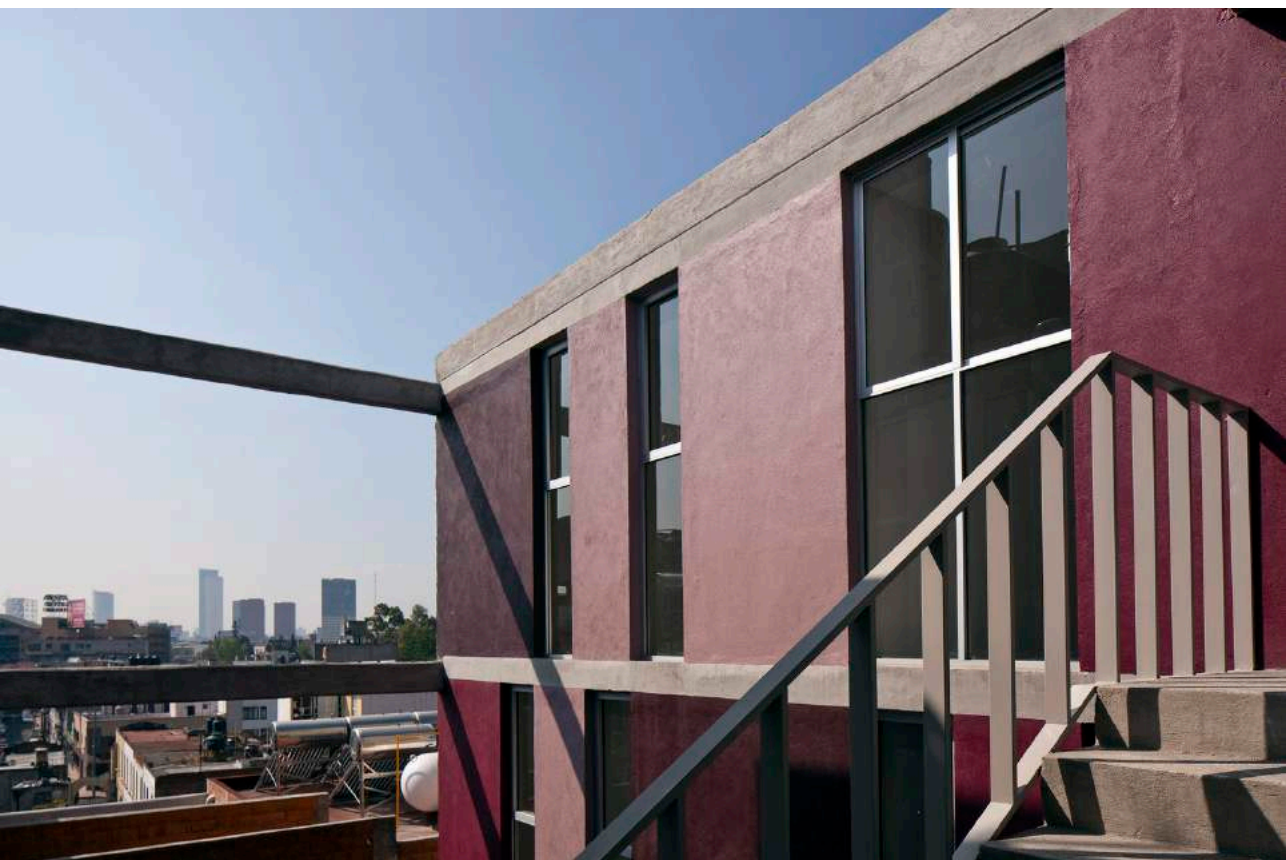




III 51 Pictures; ITI 68 / C Arquitectos

## Material

The building is constructed mainly in reinforced concrete with aluminum windows and steel handrails. The panel effect is achieved by using colors on the façade between the windows. The building is projected by iron gates that can be opened or closed, this is instead of a wall, this allows the space between the gates and the building to be used for parking or other things.



III 52 Picture; ITI 68 / C Arquitectos



## Happiness

### 1 Self -acceptance

The building is made simple and with aesthetic finish. Comparing to many of the buildings in the area the façade would be something the user would be proud of. But beside the façades is the building not creating pride. It is in many ways a neutral building, it is made for just being enough.

### 2 Positive relations with others

When the architects from Elemental did research in tall buildings they discovered that stairs shared by many became objects of fear and problems. It became spaces that no one took care of and it often became the places of neglect or crimes. (Aravena 2016) In this project the stairs could become quite dark and unprotected. Even the building is protected by a gate, it does not protect from the other people living there. There are no good shared spaces and the ones there are, they are in the bottom in dark holes between the volumes. The location is a clear positive element, and it could create some relationships.

### 3 Autonomy

The little differences in the apartments could create some feeling of being difference or independents. But the apartments floor plans are locked and there is no way expand or make big changes. In general, the building does not inspire to autonomy.

### 4 Environmental mastery

Location is one of the main pros in the project it gives the people a big opportunity. And by putting so many people in a small space there is even a chance that the area will get even more active. Sadly, will most of the activity not be around the front of the building because of the road. The small distances to sounding jobs and activities will be helpful for the users.

### 5 Purpose in life

The building can work as a cheap base for people, where they can start exploring the city form. The location can help people to find jobs or connections. But it is not strengthened by the architecture, but mainly from the fact that the location is good.

### 6 Personal growth

The building will maybe give a cheap living option in an area where there are many options, and by doing that, will the project make personal growth possible.

There are many negative aspects concerning happiness about this affordable housing project, but it is positive that the project is built on a site where it is difficult to build small apartments. The fact that many other solutions could have been much worse, this is in some way one of the better things about the project. The project has created cheap housing for many without making the building really tall. The effect of not making the building really tall have forced the volumes close and created dark spaces and the semi-public spaces are in no way helping to increase happiness.

## Conclusion

The project deals with the problem that most affordable housing project in Mexico are built in the edges of the suburbs and in one or two levels. Furthermore, does the project work with the problem of using difficult sites. It creates many small affordable apartments in a central area. All this is good and clear positive aspect of the project, but the spaces created does not invite to social live. The apartment on the lower level will be dark and spaces between the volumes are not big enough to avoid the problems. Furthermore, does the layout seem to aim to get as many people in to a small space, instead of aiming to create good living spaces. The facades are interesting and the way the windows are different on each level helps a bit toward creating privacy. But with other apartments so close and windows so big, the people will still feel their private life disrupted by the neighbors.



## Questionnaire

Most of the research done in this paper have been based on other people's experiences and studies of the Mexican people. To get a greater connection to the information and understanding of the people a questionnaire has been made. The questions are based on the knowledge obtained doing the research. The main focus of the questionnaire was to see, how the architectural aspect related to the happiness and well-being of the people in Ixtapaluca. Each question was chosen to give information that could both strengthen the results of the research and to give new knowledge useable for making architectural decisions in the practical second part of the report in paper two. The questionnaire started with 17 questions about architecture related elements and basic information, the next 42 questions was from a standard Ryff questionnaire about wellbeing. ([http://www.pccy.org.au/PDF/Clubs/Beenleigh/Ryff-s-Psychological-Well-Being-Scales-\(PWB\)-1.aspx](http://www.pccy.org.au/PDF/Clubs/Beenleigh/Ryff-s-Psychological-Well-Being-Scales-(PWB)-1.aspx))

The questionnaire was sent out to people in Ixtapaluca both in a digital form and a physical form, to deliver the questionnaires were local contacts used. The digital edition got the most replies. The full questionnaire can be seen in appendix 1 and the full list of answers can be seen on appendix 3 (Questionnaire in Spanish see appendix 2).

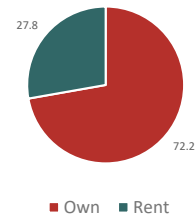
The amount of results was around 40, two of the people answering the questionnaire didn't live close to Ixtapaluca, so their answers were removed from the list of answers. When the people answered they had the option not to answer the questions. This was done because some of the questions were quite personal and other could be difficult to answer because of lack of knowledge on the area. If more people would have answered the results could have been even more valid. Furthermore, it could have been good if there have been even more questions to get more knowledge, but to ensure that most people finished the questionnaire the number of questions was kept down.

### Overall Information.

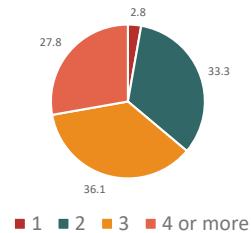
Out of the people asked was were 61 % women and most of the people was young in the age group 21 – 30 years old.

Most of the people live in households with 3 or 4 people there. The people asked lived in different sized homes, the two most chosen house size in the questionnaire were 50 -70 kvm with 23 % and 90 – 110 kvm with 26 %. Really few of the people that was asked only had one bedroom were most had 3 bedrooms. See ill 54. 15 % have made expansions on

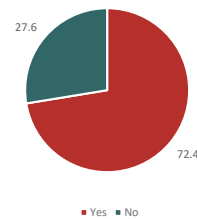
Do you own your home or rent it?



How many bedrooms do your home have?



Do you have a job?



Ill 54 Diagrams; Questionnaire answers

their past home or present home, varying in size from 10 kvm to 64 kvm.

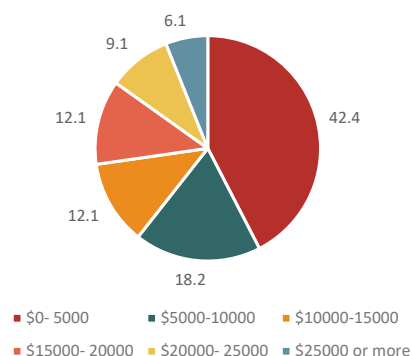
None of the people asked had any kind of indoor heating. 20 % of the people asked said that they have loans in the building they live in, but this was one of the questions that was most unanswered. If all the people that didn't answer had loads the percentage would be 25% instead. Most the people asked have a low income, 42 % of the people say that their household income is between 0 and 5000 pesos, 5000 pesos is about 1600 Danish kroner. Over 50 % of the people in the questionnaire say that they use bus or train to get to work, where only 20 % use a car.

When asked if people like their homes, most people answer that they do, and on a scale from 1 to 6, most answer 5 or 6. When asked if they like the area they live, people seem more unsure, but in general the answers are still mainly positive. People answer that if they could change something about there home, it would be location with 40 % or how it looks with 30 %.

Most of the people answering the questionnaire live in the eastern part of the Ixtapaluca, in areas dominated by cheap housing projects. 70 % of the people say that they have a job and 50 % of them works outside of Ixtapaluca, with most in Mexico City.

The general wellbeing of people answering the questionnaire is quite good not scoring low or high in anything. The area with the lowest score is the environmental mastery. This indicate that they struggle managing everyday affairs. Have problems with seeing opportunities and don't feel control of their external world.

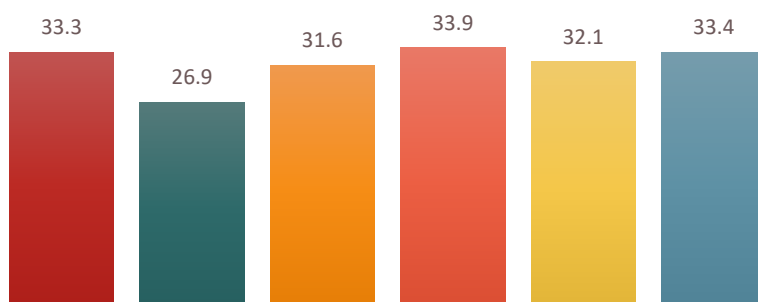
Household shared income? (peso \$)



III 55 Diagrams; Questionnaire answers

## Ryff's Psychological Well-Being Scales

■ Autonomy:      ■ Environmental Mastery:      ■ Personal Growth:  
■ Positive Relations:      ■ Purpose in Life:      ■ Self-acceptance:



III 56 Diagrams; Well- being scales answers



## **People scoring low on the wellbeing analyzes:**

Most of the people that where unhappy, scored their area low when they were asked if they liked the place they lived. Even though they were unhappy, they still mostly liked their homes. They where all in the young group with an age between 21 and 30 years old. Interestingly had most of them big homes, most of them answered that their home was 110 kvm or more. Connected to the home size, is the amount of people living together. Most of the people in this group live in big homes with all of them with 4 or more people in their household. Out of all that answered only about 28 percent were renting their home, in the group with the low score on the wellbeing test 60 % were renters. When asked about what they would change about their home, 60 % answered the location. The people were not living in a special area, they lived in different areas all over the city. Some of them were unemployed, but most had a job. Half of the group is in the highest earning part and the other is in the lowest part.

## **People scoring high on the wellbeing analyzes:**

The people in the high scoring group are of all ages and no clear age group. As with the people with low score the people with high score on the wellbeing test also liked their homes. But they also like their area unlike the unhappier people. In the group of high scoring people were there 60 % home owners and 40 % renters, this means that in both the low and high scoring group were more renter than in the total average. The were more smaller households in this group, this maybe explain why the house sizes are more mixed, with all house sizes represented in the group. And the most represented where people with a midsized home. Asked what to change on the home, the most normal answer was how it looks. Nearly all in the group have a job, but the salaries in the group is neither really high or low, but mainly middle income.

## **Conclusion**

It becomes clear that the area people live in have a big impact on how they are feeling, the challenge is that the same area can feel different to different people. If the people have to feel better is it important to change how an area is perceived more than changing the physical parts of an area itself. On element that could help improving the area is to see which age group dislike the area. In this case it is manly the younger people. By looking at the results does it appear to be a challenge to live more people together. It would be naive to thing that it is possible to stop people from living in groups, and against the research done. So, it is therefore clear that the conditions for living many together have to be changed and improved. As described in earlier sections of the paper, is it clear that big homes and high income doesn't make you happy. Actually, it seems that people in a midsized house with a midsized income are the happiest. The fact that most are happy for their homes, is interesting, it could mean many things. It seems that if the area is good, it doesn't mean that much how the house is, the people manage to make it in to something that they like. It is possible that they don't know what they could have, and they just accept what they have. The homes in the area have never been in good quality, but the people and the area have been changing a lot in tact with the growth of the City. Is point can't been proved by the questionnaire and to prove it more studies in the area have to be made.

## Conclusion of Part 3

The cases showed that there are many different kinds of affordable housing project. The that the site in many ways shapes the buildings, it seems to be a simpler process to make good looking and big homes far from the city. It will be a bad investment for the people, because of all of the many challenges associated with making a good area far from the city cores. The questionnaire also confirms the important of a good area, but it indicate that it is more important to create a good atmosphere than good physical conditions. By building high buildings there are many challenges and many people don't want to live in high building blocks as Elementals participatory design process also proved. But, there process also showed that does not mean that people can't live in buildings with more floors, the privacy is just really important. (Aravena 2016) The challenge with Elementals project is the way it looks, it creates the feeling of moving in to something unfinished, as earlier described in the paper, would people prefer homes that looks finished. Another problem raised in the questionnaire is the challenge of building homes of many people and still give them the privacy they want. The solution is not only to make the homes big, as the answers from the questionnaire shows. One solution could lay in the outdoor area, to create a safe area where people can spend time, away from family and the stress experienced at home. If this have to work, will it not be enough with one big stressful area, but there have to be different places with atmospheres fitting the needs of the people. The questionnaire also indicates that the group with the most troubles is the younger group, it is therefore important that new project take extra focus on them.

# Part 4 - Evaluation

## Research summery

The research started by creating a base to continue the analyses on and base further research on. The problems of Mexico City and Ixtapaluca became clearer in the first part, but the research in to the problems needed extensive continuation which was done in part 2.

Beside continuing the research done in part 1, the method also changed in part 2, instead of only stating the situation, the problems was broad into a greater perspective. Mainly by trying to put the problems in to a different context. By focusing on the second part of the projects title: “Problems of the mega city and how affordable housing affects happiness.” Happiness was used as the perimeter to define how each element of the affordable housing project would affect the people. By changing the perspective, the research became more focused. Each research element helped creating the main knowledge that later would become the architectural design principals.

In part 3 the research changed again, this time the knowledge acquired in the earlier parts was applied. To understand and ensure the relevance of the research, a series of case studies was made and a questionnaire. By relating new knowledge with the earlier research, the final design perimeters were created.

## Conclusion

Doing the research, a long series of information have been accumulated using different tool, each small investigation has led to different conclusions. In this conclusion they all come together, to answer the research questions asked in the beginning of the paper.

The climate of Ixtapaluca is highly effected by the height it is located in, it is located 2240 meters above sea level, this effect the weathers in many ways. One effect is the less warm summers, and colder winters. The area has rain seasons, but yearly is it raining around the same amount as in Denmark. The Ixtapaluca is located east of Mexico City, a fast-growing mega city, this growth has strongly affected the infrastructure of Ixtapaluca. A big part of the people living in Ixtapaluca travel daily to Mexico City, and so does most people of the other suburbs, this create a huge traffic chaos. Furthermore, have the fast growth of the city created other problems for the suburbs, it has been impossible to build fast enough. Which have lead to problems with all kinds of installations, with sewers and with building roads. As in most of Mexico is the trust in the government low, Mexican people don't trust authorities. There is even a distrust for people they don't know. But they have strong families, and the extended family is just as important as the closest family. The family often become the safety net that protect people from the worst problems. The houses in Mexico have been build bad and people have paid with loans they couldn't pay back. One of the ways to avoid this is to share the payment between more people, by for example to live more people together. Another option is to build cheaper houses, which have proven to be difficult without lowering the standard. One way to make them cheaper is to build denser project and closer to the city cores. There are many different

ways, but they all have their problems. One way that ensure that people don't get a house debt is by renting instead of buying. This sadly have its own challenges.

By renting the pried of owning is gone, the homes are lees adaptable, and people invest less in area they live in. This can lead to isolation and a feeling of been lees successful. This have a great impact on the happiness of the users. But owning also can affect the happiness, if people end up in an area without water and roads, stuck in a big loan. So, it is less important if it is rent or own, but the area sounding is important. But renting is often best if people want a lifestyle with fast changes. Where owning is good if the people want stability.

The climate of Ixtapaluca is not the most extreme in Mexico, but it still is challenging to build in, especially if it has to be with cheap solutions. One of the main problems in Ixtapaluca is the challenges associating with water. The water comes in seasons, where the rain falls fast and strong. By making pitch roofs more water will get of the roofs and less leaks will occur. Another problem with water is the lack of water for use in the house, by combining the roof solution with a water harvesting system part of the problem would be solved. It would also decrease the pressure on the sewers. Most walls in Ixtapaluca is not insulated and not many builders think of natural ventilations, if both element were incorporated in the design solutions the living conditions would become better for the people.

Ryff Scales of psychological wellbeing have been one of the driving forces in the paper, it has giving a perspective on one of the parts of architecture that are harder to calculate, the effect on the user's life and their lifestyle. Instead of just making a shelter, it is important to create a place were the user can grow as a person. The scale has been used throughout the paper to understand each of the elements researched and what effect they had on the users. One of the more specific ways to make this happen is to make homes that can adapt to the needs of the user, by being expanded. Another way to make architecture that increase the peoples' happiness is by making shared living spaces.

Social architecture is many thing, one aspect is the indoor environment and how it can be made in a way that help people come together. By sharing spaces with other families or by making strong social areas were the family can enjoy the company of each other. Further, more can big outdoor social areas also create spaces where the people can connect. Often is Affordable mostly about how to get most homes on a small site and the common areas are mainly for the car, but if the buildings are made dense and taller, there will be more space for social spaces.



## Further research

The research of the project started really broad and then began narrowing down into a more specific research. Even so, each topic in the research could have resolved in its own research paper. The complexity of architecture has a tendency to make research and project really broad. If the aim of making design principles and later making a practical project had been removed, it would have been possible to study each element of the research further by itself. For example, to study shared living or expandable housing, but still in relation to affordable housing and happiness. This kind of study could also work as an add on to the research already done in this paper. By making a practical project the knowledge and principles will be tested, this will also work as an indicator for which of the theoretical principles would be most relevant to further research. By looking at the project like that, the project becomes more the initial research project, made to gain understanding of a complex subject and as an introduction to the final research.

## Theory to practice

The transition from theory to practice is always difficult, and even more when theory is not only from one academic field. In this paper there is a big focus on sociological and psychological elements, areas that normally don't manifest in buildings or physical objects. This is why the design principles are important, they are the link between the theory and practice. By making a set of principles the long and complex research can become more useable in a design process. Even when the principles work as the link, the knowledge obtained while making the research will also work as a foundation for ideas and thoughts during the design process. To make the transition easier from theory to practice the order of the paper is also made so it starts broad and becomes more and more specific and relatable to architectural solutions.

# Architectural design principals

The research and investigations gave a lot of knowledge. This knowledge has been interpreted in to a set of principles. By doing so it will be possible to understand if it is possible to translate the information in to a practical context. The principals will not cover all the conclusions or knowledges acquired doing the research, but it will relate to most of the areas covered in the paper. In some way are the principals selected by judging what are relevant to the people in Ixtapaluca and what could have the biggest impact for the area. The research not included in the principals will still be part for of the practical project, in the form of basic knowledges. It will not be used in a visible way but it will help form ideas and lead the project in a direction.

## Financial:

1        The project has to provide cheap housing that can be bought without taking big loans.

Through investigation it became clear that if the houses are too expensive the loan will be big and the people will be put in to situations they can't get out of. By making it a principal that the housing units have to be cheap, one of main problems can be avoided and it will help making the people happy.

2        There have to be units for renters and for buyers.

If there only is the option of buying houses, the neighborhood will exclude a big part of the population. But by making both renting and owning units, the area will be dynamic. If the renters later desire to buy, they don't have to move to another area, but just in to another housing unit. This will also be a big help for first time movers, and young people.

## Technical:

3        The project has to use passive strategies that are simple and cheap, but still fit the climate.

To build housing units that can make people happy, they have to fit the climate. As described a badly build house have big effect on the users, creating problems like fires, leaking roofs, too cold or too warm rooms. By making units that is suitable for the climate and for a low price, it will be possible to create a home that will increase happiness.

## **Urban:**

- 4 Have to be located close to a city core.

If the project is located close to the city core of Ixtapaluca, the city will be strengthened and the need for commuting to Mexico City will decrease. By location the project close to the core will also decrease the need for new infrastructure. The central location will also give more spare time options, which can help the social lives of the users.

- 5 Buildings have to be 2 - 4 levels to create a dense area.

By building higher, it is possible to make the area dense and at the same time use less space on ground level. With a dense city core there will be lower infrastructural cost and it will create more activity in the area. Another affect of more ground space will be more space for social areas.

- 6 Have to have social spaces on the project site.

To ensure a good area the site have to create activities, by making social spaces a lot of activities will naturally occur. By making different kinds of social areas even more activity will be made. If there are more people on the site it will also create a more secure area.

## **Social:**

- 7 The project has to accommodate different kinds of shared living.

By making a project with several kinds of living experiences, it allows many different user groups in the area. It will also create diversity in the visual experience. It will also help people create new connections and social bonds.

- 8 Most of the units have to have a design that makes expansions easy for middle income families.

By making most units expandable people can buy small and expand gradually in the same pace as their financial situation become better. Furthermore, will the architecture of the area also develop and make the area more appalling overtime. By making the area adaptable to the user, will the user also gain a bigger pride and stronger connection to the area.

- 9 Units have to appear finished.

If the units appear finished the people will be proud even before they expand the units. It will help their confidence and also improve the care for the area, which is important especially in the early period before people start expanding their units.

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# Appendix



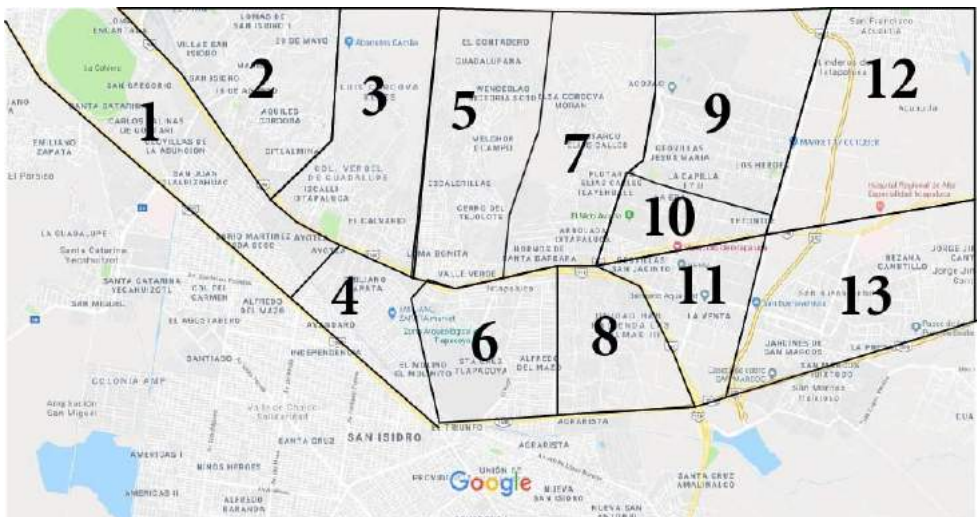
# Appendix 1 Questionnaire English

## Questionnaire

The questionnaire is an important part of my architectural master thesis, the project is about increasing happiness and wellbeing in Ixtapaluca by making better affordable housing. By answering the questions, you will be a big help in the process of making better houses relating more to the people of Ixtapaluca. I greatly appreciate that you are taking the time to answer. If you don't know how to answer a question or don't want to, then you are free to skip it, but the more answers I get the better the research will be. All information will be kept anonymous. The first page of the questionnaire is containing a series of general questions about homes, jobs and families. The second and third page is questions about wellbeing

Best regards Nikolaj Carrillo Kristensen

1. Gender? Man woman
2. Your age? 21-30 31-40 41-50 51-60 61 -
3. How many people live in your home? 1 2 3 4 5 6 7-
4. How big is your home? 10 - 30 m<sup>2</sup> 30 - 50 m<sup>2</sup> 50 - 70 m<sup>2</sup> 70 - 90 m<sup>2</sup> 90 -110 m<sup>2</sup> 110-
5. How many bedrooms do your home have? 1 2 3 4-
6. Do you own home or rent it? Own Rent
7. Are there any heating devices in your home? (If yes which one) No Yes \_\_\_\_\_
8. Do you have a loan on your home and if yes how big, approximately? No Yes, \_\_\_\_\_
9. Household shared income? 0- 5000 peso 5000-10000 peso 10000-15000 peso 15000- 20000 peso  
20000- 25000 peso 25000 peso -
10. Type of transport to work? Car bus/train walk other
11. Have you expanded your former or present home, if yes how big was the expansion? No Yes, \_\_\_\_\_
12. Are you happy for your home? (1 is the least and 6 is the happiest) 1 2 3 4 5 6
13. Are you happy for the area you live in? (1 is the least and 6 is the happiest) 1 2 3 4 5 6
14. If you could change anything about your house what would it be? Size location Buying-prize how it looks
15. Where do you live?
16. Do you have a job? No Yes \_\_\_\_\_
17. Where do you work?



Please indicate your degree of agreement (using a score ranging from 1 - 6 ) to the following sentences:	Strongly Disagree			Strongly Agree		
	1	2	3	4	5	6
<b>1 I am not afraid to voice my opinions, even when they are in opposition to the opinions of most people.</b>	1	2	3	4	5	6
<b>2 In general, I feel I am in charge of the situation in which I live.</b>	1	2	3	4	5	6
<b>3 I am not interested in activities that will expand my horizons.</b>	1	2	3	4	5	6
<b>4 Most people see me as loving and affectionate.</b>	1	2	3	4	5	6
<b>5 I live life one day at a time and don't really think about the future.</b>	1	2	3	4	5	6
<b>6 When I look at the story of my life, I am pleased with how things have turned out.</b>	1	2	3	4	5	6
<b>7 My decisions are not usually influenced by what everyone else is doing.</b>	1	2	3	4	5	6
<b>8 The demands of everyday life often get me down.</b>	1	2	3	4	5	6
<b>9 I think it is important to have new experiences that challenge how you think about yourself and the world.</b>	1	2	3	4	5	6
<b>10 Maintaining close relationships has been difficult and frustrating for me.</b>	1	2	3	4	5	6
<b>11 I have a sense of direction and purpose in life.</b>	1	2	3	4	5	6
<b>12 In general, I feel confident and positive about myself.</b>	1	2	3	4	5	6
<b>13 I tend to worry about what other people think of me.</b>	1	2	3	4	5	6
<b>14 I do not fit very well with the people and the community around me.</b>	1	2	3	4	5	6
<b>15 When I think about it, I haven't really improved much as a person over the years.</b>	1	2	3	4	5	6
<b>16 I often feel lonely because I have few close friends with whom to share my concerns.</b>	1	2	3	4	5	6
<b>17 My daily activities often seem trivial and unimportant to me.</b>	1	2	3	4	5	6
<b>18 I feel like many of the people I know have gotten more out of life than I have.</b>	1	2	3	4	5	6
<b>19 I tend to be influenced by people with strong opinions.</b>	1	2	3	4	5	6
<b>20 I am quite good at managing the many responsibilities of my daily life.</b>	1	2	3	4	5	6
<b>21 I have a sense that I have developed a lot as a person over time.</b>	1	2	3	4	5	6

22 I enjoy personal and mutual conversations with family members or friends.	1	2	3	4	5	6
23 I don't have a good sense of what it is I'm trying to accomplish in life.	1	2	3	4	5	6
24 I like most aspects of my personality.	1	2	3	4	5	6
25 I have confidence in my opinions, even if they are contrary to the general consensus.	1	2	3	4	5	6
26 I often feel overwhelmed by my responsibilities.	1	2	3	4	5	6
27 I do not enjoy being in new situations that require me to change my old familiar ways of doing things.	1	2	3	4	5	6
28 People would describe me as a giving person, willing to share my time with others.	1	2	3	4	5	6
29 I enjoy making plans for the future and working to make them a reality.	1	2	3	4	5	6
30 In many ways, I feel disappointed about my achievements in life.	1	2	3	4	5	6
31 It's difficult for me to voice my own opinions on controversial matters.	1	2	3	4	5	6
32 I have difficulty arranging my life in a way that is satisfying to me.	1	2	3	4	5	6
33 For me, life has been a continuous process of learning, changing and growth.	1	2	3	4	5	6
34 I have not experienced many warm and trusting relationships with others.	1	2	3	4	5	6
35 Some people wander aimlessly through life, but I am not one of them.	1	2	3	4	5	6
36 My attitude about myself is probably not as positive as most people feel about themselves.	1	2	3	4	5	6
37 I judge myself by what I think is important, not by the values of what others think is important.	1	2	3	4	5	6
38 I have been able to build a home and a lifestyle for myself that is much to my liking.	1	2	3	4	5	6
39 I gave up trying to make big improvements or changes in my life a long time ago.	1	2	3	4	5	6
40 I know that I can trust my friends, and they know they can trust me.	1	2	3	4	5	6
41 I sometimes feel as if I've done all there is to do in life.	1	2	3	4	5	6
42 When I compare myself to friends and acquaintances, it makes me feel good about who I am.	1	2	3	4	5	6

## Appendix 2 Questionnaire Spanish

### CUESTIONARIO

#### Página 1

Este cuestionario es una parte importante de mi tesis de maestría en Arquitectura. El proyecto propone el aumento en los niveles de felicidad y satisfacción en Ixtapaluca, teniendo como base la creación de una vivienda accesible y económica. Al responder las siguientes preguntas, estarás contribuyendo en el proceso de creación de mejores casas en Ixtapaluca. Agradezco profundamente que te tomes el tiempo para responder. La primera parte del cuestionario contiene una serie de preguntas relacionadas a la vivienda, trabajo y familia. La segunda parte trata sobre bienestar.

Si no sabes cómo responder alguna pregunta o no deseas responder, siéntete libre de saltar a la siguiente; pero entre más preguntas sean respondidas, más grande la ayuda será en la elaboración de este proyecto. Toda la información es completamente anónima.

Saludos cordiales, Nikolaj Carrillo Kristensen.

#### Página 2

##### Género

☐ Masculino

☐ Femenino

##### Rango de edad (años):

☐ 21-30

☐ 41-50

☐ 61 o más

☐ 31-40

☐ 51-60

##### ¿Cuántas personas viven en tu vivienda?

☐ 1

☐ 2

☐ 3

☐ 4

☐ 5

☐ 6

☐ 7 o más

### Página 3

¿Cuál es el tamaño de tu vivienda?

☐

10 - 30 m2

☐

50 - 70 m2

☐

90 - 110 m2

☐

30 - 50 m2

☐

70 - 90 m2

☐

110m2 o más

¿Cuántas recámaras tiene tu vivienda?

☐

1

☐

3

☐

2

☐

4 o más

¿Tu casa es propia o rentada?

☐

Propia

☐

Rentada

### Página 4

¿Tu hogar cuenta con servicio de calefacción?

☐

No

☐

Si, Cuál

¿Cuentas con algún crédito hipotecario?

☐

No

☐

Si (a cuánto asciende aprox.)

Ingresos compartidos en el hogar:

☐

\$0- 5000

☐

\$10000-15000

☐

\$20000- 25000

☐

\$5000-10000

☐

\$15000- 20000

☐

\$25000 o más



## Página 5

¿Qué tipo de transporte usas para ir al trabajo?

- ☐ Automóvil
- ☐ Autobús/tren
- ☐ A pie
- ☐ Otro

¿Has expandido tu actual/pasada vivienda?

- ☐ No
- ☐ Si (indique en m2)

En escala del 1 al 6 (siendo el 6 el más feliz), ¿Qué tan feliz eres en tu vivienda?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6

En escala del 1 al 6 (siendo el 6 el más feliz), ¿Qué tan feliz eres en el área donde vives?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6

Si pudieras cambiar algo del área donde vives, ¿Qué sería?

- ☐ El tamaño
 ☐ Precios de compra  
☐ La ubicación
 ☐ Como luce

## Página 6

Mapa de Ixtapaluca



¿En donde vives? Selecciona el número de acuerdo al área en donde vives o escríbelo en la línea siguiente.

- ☐ 1
 ☐ 4
 ☐ 7
 ☐ 10
 ☐ 13  
☐ 2
 ☐ 5
 ☐ 8
 ☐ 11  
☐ 3
 ☐ 6
 ☐ 9
 ☐ 12  
☐ Otro

### ¿Trabajas?

☐ No

☐ Sí, ¿Cuál?

### ¿En donde trabajas? Selecciona el número de acuerdo al área donde trabajas o escríbelo en la línea siguiente.

- ☐ 1      ☐ 4      ☐ 7      ☐ 10      ☐ 13  
☐ 2      ☐ 5      ☐ 8      ☐ 11  
☐ 3      ☐ 6      ☐ 9      ☐ 12  
☐ Otro

## Página 7

Indique en escala del 1 al 6, qué tan de acuerdo/desacuerdo está con los siguientes enunciados:

	1					6
	Fuertemente desacuerdo	2	3	4	5	Fuertemente de acuerdo
1 No tengo miedo de expresar mi opinión, incluso cuando ésta puede ir en contra de las demás personas.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2 En general, me siento a cargo de la situación en la que vivo.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3 No estoy interesado en actividades que puedan expandir mis horizontes.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4 La mayoría de la gente me ve como amoroso y afectivo.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5 Vivo la vida un día a la vez y no pienso sobre el futuro.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6 Cuando pienso en la historia de mi vida, estoy satisfecho con el resultado.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7 Mis decisiones no están influidas por lo que otras personas hacen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8 Las demandas de la vida diaria frecuentemente me deprimen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9 Creo que es importante tener nuevas experiencias que desafíen tu perspectiva sobre ti mismo y el mundo.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10 Mantener relaciones cercanas ha sido difícil y frustrante para mí.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11 Tengo la sensación de dirección y propósito en la vida.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12 En general, me siento confidente y positivo sobre mí mismo.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13 Tiendo a preocuparme por lo que otros piensan sobre mí.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14 No encajo muy bien con otra gente y la comunidad que me rodea.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15 Cuando me pongo a pensarlo, no he realmente mejorado mucho como persona a lo largo de los años.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

16 Seguido me siento solo porque tengo muy pocos amigos con quien compartir mis preocupaciones.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
17 Mis actividades diarias frecuentemente parecen triviales y sin importancia para mí.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
18 Siento que mucha de la gente que conozco ha obtenido más de la vida que yo.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
19 Tiendo a ser influenciado por personas con opiniones fuertes.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
20 Soy bueno para manejar las muchas responsabilidades de mi vida diaria.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
21 Tengo la sensación de que con el tiempo me he desarrollado mucho como persona.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
22 Disfruto conversaciones con miembros de mi familia y amigos.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
23 No sé que es lo que estoy tratando de lograr en la vida.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
24 Me gusta la mayoría de los aspectos de mi personalidad.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
25 Tengo confianza en mis opiniones, incluso cuando van en contra de la opinión general.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
26 Frecuentemente me siento abrumado por mis responsabilidades.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
27 No disfruto estar en nuevas situaciones que requieran que cambie la forma en cómo hago las cosas.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
28 La gente puede describirme como una persona bondadosa, dispuesta a compartir mi tiempo con otros.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
29 Disfruto hacer planes para el futuro y trabajar para hacerlos realidad.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
30 De muchas maneras, estoy decepcionado con mis logros en la vida.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
31 Es difícil para mí, expresar mis opiniones en asuntos controversiales.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
32 Tengo dificultad para organizar mi vida de una manera que me satisface.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
33 Para mí, la vida ha sido un continuo proceso de aprendizaje, cambio y crecimiento.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
34 No he experimentado ninguna relación cálida y de confianza con otros.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
35 Algunas personas vagan sin rumbo en la vida, pero yo no soy una de ellas.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
36 Mi actitud acerca de mí mismo es probablemente no tan positiva como mucha gente se siente sobre sí mismo.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
37 Me juzgo por lo que pienso que es importante, no por lo que otros valoran importante.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
38 No he sido capaz de construir un hogar y un estilo de vida para mí, que se acerque a lo que me gusta.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
39 Me rendí tratando de hacer grandes mejoras o cambios en mi vida desde hace largo tiempo.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
40 Sé que puedo confiar en mis amigos, y que ellos pueden confiar en mí.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
41 Algunas veces siento como si he hecho todo lo que hay que hacer en la vida.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>
42 Cuando me comparo con mis amigos y conocidos, me siento bien por quien soy y como soy.	<input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/>

# Appendix 3 Questionnaire Answers

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Man	21-30	3	70-90 m2	3	Own	No	No	\$10,000-15,000	Bus or train	No	6	5	1	location	13	Yes	Cuiceros	4	6	1	6	4	6	3	4	6	6	3	6	1	1	5	1	
Woman	21-30	4	90-50 m2	4	Rent	No	No	\$5,000-10,000	Walk	No	5	1	location	6	No			6	6	6	6	6	6	6	6	6	6	6	6	1	1	5	1	
Man	21-30	5	110 m2 or more	4 or more	Own	No	No	\$25,000 or more	Car	No	6	4	location	4	Yes	4		6	6	6	6	6	6	6	6	6	6	6	6	1	1	1	5	
Man	51-60	4	50-70 m2	3	Rent	No	No	\$20,000-25,000	Walk	No	6	6	How it looks	9	Yes	4		6	6	6	5	2	4	2	2	6	2	6	6	1	1	1	1	
Woman	41-50	4	30-50 m2	4 or more	Rent	No	No	\$15,000-20,000	Walk	No	6	5	location	9	Yes	9		5	1	4	2	4	5	2	5	4	5	5	5	5	5	2	2	
Woman	41-50	3	50-70 m2	2	Rent	No	No	\$0-5,000	Bus or train	No	5	5	Site	9	Yes	8		6	6	1	5	4	4	6	1	6	1	6	1	1	1	1	2	
Man	41-50	1	50-70 m2	2	Own	No	Yes	\$0-5,000	Car	No	5	5	Site	12	Yes	CDMX		6	6	1	3	3	5	6	1	6	4	5	6	1	2	1	4	
Man	51-60	4	50-70 m2	2	Own	Yes	Yes	\$10,000-15,000	Bus or train	No	5	5	location	9	Yes	CDMX		5	5	1	4	4	5	1	6	1	5	5	5	2	1	4	4	
Woman	31-40	3	10-30 m2	2	Own	No	No	\$20,000 or more	Bus or train	No	6	1	location	9	Yes	9		6	6	2	4	3	5	4	2	5	3	5	4	3	1	1	4	
Man	21-30	4	110 m2 or more	4 or more	Own	No	No	\$25,000 or more	Car	No	6	5	6	1	location	9	Yes	9	6	1	6	1	6	1	1	2	4	3	2	6	6	6	6	
Woman	21-30	4	90-110 m2	3	Own	No	No	\$15,000-20,000	Bus or train	No	6	4	How it looks	5	No	5		6	4	1	6	3	4	5	4	6	1	6	4	1	4	1	4	
Man	31-40	5	70-90 m2	3	Own	No	No	\$5,000-10,000	Car	No	6	6	How it looks	13	Yes	3		6	6	1	4	1	6	6	1	6	2	6	6	1	1	1	1	
Woman	21-30	7 or more	90-110 m2	3	Own	No	No	\$0-5,000	Bus or train	No	4	4	location	8	No			6	6	1	6	6	6	6	6	6	6	6	6	1	1	1	6	
Man	21-30	4	30-50 m2	4 or more	Own	No	No	\$0-5,000	Bus or train	No	6	4	location	7	Yes	1		6	6	1	6	6	6	6	6	6	6	6	1	1	1	1	6	
Woman	21-30	4	10-30 m2	3	Own	No	No	\$5,000-10,000		No	6	2	location	10		10		3	2	1	4	4	4	4	1	2	5	5	5	1	1	1	1	
Man	21-30	3	50-70 m2	2	Own	No	No	\$0-5,000	Bus or train	No	6	5	Site	1	Yes	4		6	4	1	6	1	5	5	1	6	1	6	6	1	1	1	1	
Man	41-50	4	50-70 m2	3	Own	No	No	\$20,000-25,000	Bus or train	No	5	5	location	13		JENUSTIANO CARRANZA		5	5	1	4	3	4	4	2	6	4	6	5	2	3	4	4	
Woman	21-30	3	70-90 m2	2	Own	No	No	\$10,000-15,000	Walk	No	4	4	How it looks	12		Centro de Ixtapaluca		2	2	6	3	2	1	1	2	6	1	6	6	1	2	1	1	
Man	21-30	3	110 m2 or more	4 or more	Rent	No	No	\$5,000-10,000	Bus or train	No	3	2	How it looks	13	No	11		3	4	5	3	1	3	5	6	6	5	4	6	6	6	6		
Woman	21-30	4	10-30 m2	2	Rent	No	No	\$0-5,000	Bus or train	No	3	3	Site	9	Yes	Centro		6	4	1	1	2	4	6	1	6	4	4	4	3	3	3	1	
Woman	41-50	7 or more	110 m2 or more	1	Rent	No	No	\$0-5,000	Bus or train	No	5	6	Site		No			6	6	1	6	4	3	5	4	5	5	5	6	3	5	3	3	
Man	21-30	5	90-110 m2	4 or mds	Own	No	No	\$15,000-20,000	Bus or train	No	5	6	Site	12				6	4	1	3	3	3	6	2	6	3	6	6	2	1	2	1	
Man	21-30	3	50-70 m2	2	Rent	No	No	\$15,000-20,000	Bus or train	No	3	1	location		Yes	4		6	1	2	5	4	5	4	6	2	4	5	3	5	4	4	4	
Woman	21-30	2	90-110 m2	3	Own	No	No	\$0-5,000	Bus or train	No	6	6	How it looks		No			6	6	1	6	6	6	6	6	6	6	6	6	1	1	1	1	
Woman	41-50	3	90-110 m2	2	Rent	No	No	\$0-5,000	Bus or train	No	6	3	location	4	Yes	San Juan de aragon		6	3	2	1	5	5	6	1	6	1	6	6	1	1	1	4	4
Woman	21-30	4	90-110 m2	4 or more	Own	No	1,000 MXN	\$0-5,000	Bus or train	No	6	3	location		Yes			6	3	4	2	1	5	6	6	2	5	5	5	5	2	1	1	
Woman	41-50	4	70-90 m2	3	Own	No	No	\$15,000-20,000	Bus or train	No	5	5	How it looks		Yes	CD. MEXICO		6	5	1	4	2	6	6	3	5	5	5	5	5	2	1	1	
Woman	21-30	3	110 m2 or more	3	Own	No	No	\$5,000-10,000	Walk	No	6	6	How it looks	6	Yes	6		4	4	3	6	4	6	3	5	5	5	6	3	2	2	2	2	
Woman	41-50	4	110 m2 or more	3	Own	No	No	\$5,000-10,000	Bus or train	No	6	6	Site	5	Yes	5		4	4	6	6	4	6	1	1	6	1	6	6	4	1	1	1	
Man	31-40	3	50-70 m2	4	Own	No	No	\$20,000-25,000	Bus or train	No	4	6	location	1	Yes	5		2	5	6	5	5	5	6	3	5	6	5	5	3	5	3	3	
Man	41-50	3	30-50 m2	2	Rent	No	No	\$5,000-10,000	Car	No	4	6	1	location	6	No		6	6	1	6	4	2	1	6	4	6	1	6	2	1	2	1	
Woman	41-50	3	30-50 m2	2	Rent	No	No	\$5,000-10,000	Bus or train	No	5	5	How it looks	11	Yes	5		6	1	1	6	4	2	1	2	4	6	1	6	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk	No	6	6	location			Cotapeac Mapilapuca (north of Ixtapaluca)		1	4	5	1	4	2	1	2	4	5	2	5	2	1	2	1	
Woman	21-30	6	90-110 m2	3	Own	No	No		Walk																									

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# Housing in Ixtapaluca

*Problems of the mega city and how affordable housing affects happiness.*

*Part 2*

# Cover

Titel:

**Housing in Ixtapaluca -**

Problems of the mega city and how affordable housing affects happiness.

Part No: 2

Author: Nikolaj Carrillo Kristensen

Theme: Affordable housing

Project period: 01/09/17-23/05/18

Main supervisor: Michael Luring

Technical supervisor: Anna Joanna Marszal

Architecture & Design

Aalborg University,

MSc04-Architecture, 2017/2018

Pages: 103

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Nikolaj Carrillo Kristensen

# Readers guide

This paper is the second and final part of a long thesis report. The paper continues the studies made in the first part, by making a project that uses principals defined in the first part.

The first part of this paper will analyze the site and the context to site in general. Both by understanding the setting, but also by looking at other housing project in the surroundings of the chosen site. Furthermore, will the site also be looked at. Beside analyzing the context, will DGNB be introduced as a factor that will help making the project sustainable. User groups will also be selected. All this will help making the project relate to the near context. By using the new knowledge, will the design principals be reviewed.

The second part is the design process, were the principals will be used to generate a design. This section will show how the ideas was created and how they related to the principals.

The third part of the paper is the presentation. Here will each element be presented, this will be done using different kinds of illustrations and descriptions.

The fourth part is the evaluation. The result of the project will be analyzed, this will be done by concluding on the design and how it fulfilled the requirements set by the principals. Furthermore, will the whole process be reflected on and ideas for future work will be described.

# Abstract

To create a project that makes a difference is a challenge, but that is what this project aims to do. A project that translate research into actual design. The project uses the research by applying architectural design principals, by using them to form the shapes and decisions. The project is placed close to the center of Ixtapaluca and this context also have a big impact on the design.

The design proposal work with strategies to create a sustainable housing project. The project incorporates all of the principals in a natural way. The project works with creating a dense site with many apartments and social areas that help people meet. Buildings that relate to the Mexican architecture, and the Mexican people. With apartment for renters and owners, in different sizes and shapes to affordable prices. A site where the buildings are expendable and adaptable. The project will become what the users wants it to be.





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## Part 3 Presentation

Evolución

Master plan

Apartment plans

L apartment plan 1

L apartment plan 1 expansion

L apartment plan 2

L apartment plan 2 expansion

2 Floor apartment plan

2 Floor apartment plan expansion

Parking block plans

1st floor plan

2nd floor plan

3rd floor plan

4th floor plan

5th floor plan

Cross sections

Facades

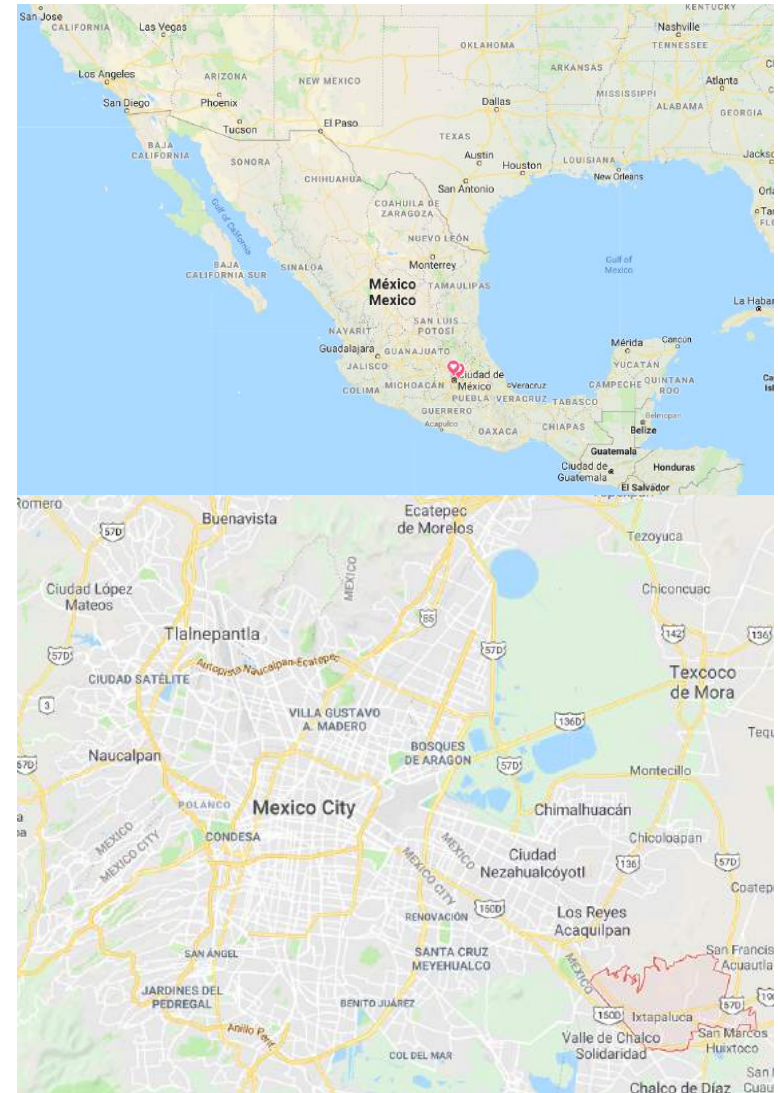
Arrive to the site

DGNB

58	ENV 2.2 Wastewater discharge	89
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# Introduction

To solve some of the problems of the mega city, the city of Ixtapaluca was chosen for the project. The city is a suburb to Mexico City, and one of the fastest growing suburbs around Mexico City. The project is about making an affordable housing project that can improve the lives of the people in Ixtapaluca. The building project is small compared to other housing project in Ixtapaluca, but it will stand as an example of how affordable housing could be made. Most housing project in the area are of low architectural quality, with long rows of identical houses. The houses are poorly build and with few and uninspiring outdoor areas. The best architects of the area, are not educated architect but the people living there. They constantly change and adapts their homes to their need. They want to improve their own area, this is one of the elements, that makes the area so interesting to work with. The project will use this and work with the people as co architects. The project makes the research become in to architecture in a form of many smaller housing blocks. Before the proposal was finish a series of analyses was made which lead to a long design process. This process became the road to an interesting and different housing project.



III 2 Maps; Ixtapaluca

# Architectural design principals

The design principals posted below are the foundation the report will stand on, why will guide and lead the project. The principals will both stands as generators for ideas and as criteria to judge ideas on. Even though the research section of the project has finished, an analysis of the site and its context will also help create an even bigger foundation to create the project on, help make a reviewed version of the architectural design principals.

## Financial:

- 1 The project has to provide cheap housing that can be bought without taking big loans.
- 2 There have to be units for renters and for buyers.

## Technical:

- 3 The project has to use passive strategies that are simple and cheap, but still fit the climate.

## Urban:

- 4 Have to be located close to a city core.
- 5 Buildings have to be 2 - 4 levels to create a dense area.
- 6 Have to have social spaces on the project site.

## Social:

- 7 The project has to accommodate different kinds of shared living.
- 8 Most of the units have to have a design that makes expansions easy for middle income families.
- 9 Units have to appear finished.

# Methodology

Making an architectural project is a complicated process. To achieve a good final result, it is important to use a good method. The method used for this project is the Integrated design process see ill 2. The method helps creating a holistic design, where aesthetic, functional and technical parameters influence the design equally (Knudstrup 2004). The process has 5 phases, after each phase it is possible to loop back to a previous phase, this insures a well thought out work process. So, if one develops new knowledge after making some sketches, one can go back and make new analyses. To understand how the process, apply to this project, a short description of each phase is described below.

## Problem phase

The problem phase is where the design brief normally would be analyzed and understood. But in this project, there is no brief, but instead there is a series of design principals, these have in this case worked as a brief. By analyzing them a site was chosen and an aim to make better housing than on other similar sized housing project in the area.

## Analysis phase

As in the problem phase, the principals used to start analyzing the site and the area surrounding the site. Furthermore, have knowledge from the research paper also been used. Other project in the area was also analyzed and used for inspiration and for defining problems. By analyzing the area and by introducing new information there was ground for adapting the principals.

## Sketching phase

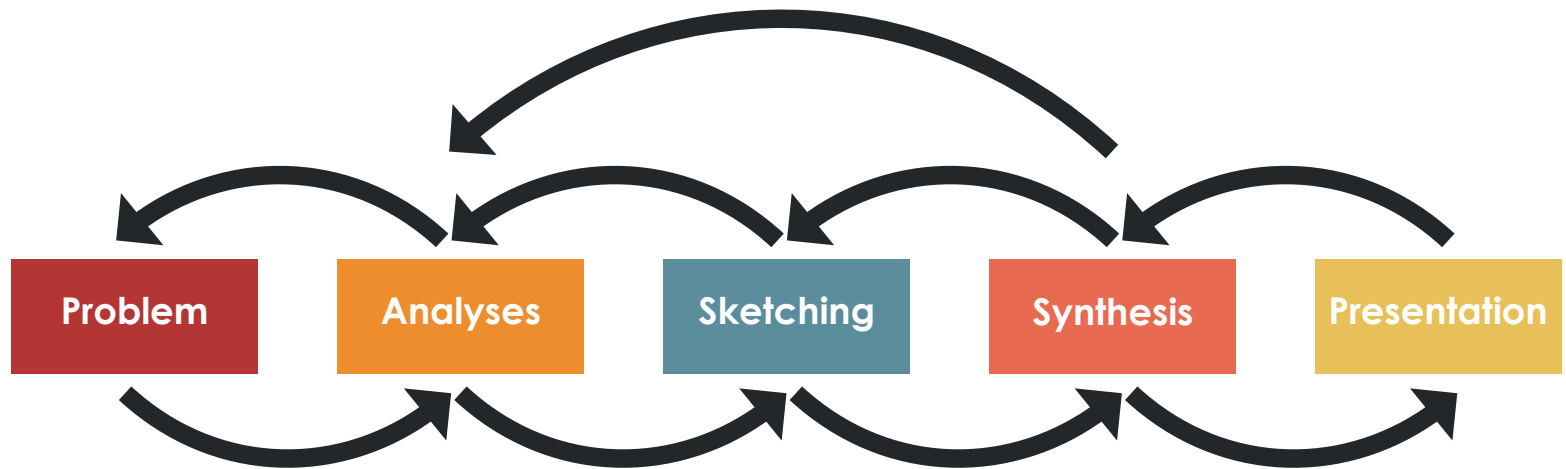
The sketching phase had a strong connection to the analyzing phase, and every time an idea was made it was held up against the principals. In the sketching phase different medias were used, hand sketches were tested computer programs, and ideas made on the computer were printed out and edited on in hand.

## Synthesis phase

In this phase ideas became more defined and detailed. After detailing many ideas had to be reconsidered and some had to be re-sketched. It was also in this phase elements of the design were evaluated to see if it lived up to the architectural design principals.

## Presentation phase

In the presentation phase each element had to be illustrated and described, what were the strong points and how people would experience the project. It is in this phase the project is sold and presented.



III 2 Diagram; Methodology

# Part 1 Program



## Location description

There are many areas in Mexico that could benefit from a change in architectural style and decisions. As in the theoretical first part of the project, the city of Ixtapaluca have been chosen for the housing project. Where the theoretical part is more generally about the whole city, this more practical part of the project, focus on a specific site in Ixtapaluca. In this section of the report, will the site be analyzed and the reasons behind the choice of site will be described.

Ixtapaluca is a city located in the central Mexico, around 25 km east from the center of Mexico City. The chosen site is only around 800 meters east from the center of Ixtapaluca, but at the same time is it also on the edge of the city. The city has naturally grown toward Mexico City and the urban areas is therefore stretching much more in the direction of the Mexico City.

The area is full of different kinds of atmospheres. To the east from the site is there fields and even further east is one of the biggest affordable housing projects in the country. To the south is also fields and further south is the city's mall and shopping area located. To the north is also fields and behind them another affordable housing project. The western side is the only side where there are no more fields. To the west is both affordable housing projects and mixed housing areas, with commercial areas in the ground level and housing on the second floor.

The road located north of the site is one of the most important roads of Ixtapaluca. The roads located south and east of the site are smaller and quieter streets. It is therefore easy to get to and from the site, and at the same time having calm assess roads.

There are many fields around the site but also many roads with some houses, some stand unfinished and the ones that are fin-

ished all look different, it is clear that the area is slowly filling up with houses and becoming part of the urban structure. It appears to be an area without a plan, the fields seem to be too small to be converted in to one of the huge affordable housing projects. So, the growth just happens slow and uncontrolled. All around the site further away from the city huge projects appears, leaving the area of the site stand half developed.

## Atmosphere of the area

The city of Ixtapaluca have a long history, even before the Spanish people came to the country, were there people living in the area. It has changed a lot since the Aztecs was there, but there are still Aztec ruins inside the city area. A big part of the area has been rural farm land for many years with a small population.



ACERVO : AGN

PÚBLICADA EN : Nuestro Antiguo Ixtapaluca Chalco  
Pueblo : Tlapacoya , Ixtapaluca en 1875

III 3 Picture: Ixtapaluca 1875



The population grew and a more urban city core was created in the first part of the 20th century. Even after some growth, the city still seemed quite rural. Because of the location close to Mexico City the industries and farms became important factor of supply for Mexico City. .







Il-5 Picture, San Buenaventura



The city experienced huge changes when Mexico City expanded so much that the two cities became connected, the urban areas of Mexico City and the urban areas of Ixtapaluca became one. This made the city grow from a small suburban farm city into a big city with a high demand for cheap housing. The natural noncontrolled growth that initially had connected the two cities changed and big housing project started appearing all over the city. Even with the huge demand for housing and the many modern changes to the city, is there still local markets and charming small streets full of life and energy. The eastern edges of the city are also still full of farmland and the atmosphere is in some way still the one of most rural cities. As in most of Mexico is there a strong fight between the old and the new, and not far from the local markets lays huge malls in American style with big parking lots. The area where the site is located is just in the middle of all of the different atmospheres. With big housing project, the older city center, farmland and close to the malls and huge roads. In many ways is it clear that the area is not really part of any of the extremes surrounding it, but rather somewhere in between.



III 6 Pictures; Ixtapaluca market



III 7 Pictures; Ixtapaluca party

## Site analysis

The site is currently farmland the only construction on the site is a small farm building on the south western corner. There is a small dirt road on the western side of the site. Just east of the site is series of houses, to the north of the site is more farm land and further north is first a small road and behind it is a bigger main road. The main road for the site is currently located south of the site. The houses are located next to the site is self-build and the architectural style is mixed. Some buildings are unfinished other look well cared for. Most of the buildings around the site have 2 floors, but of all the buildings around the site range from 1 floor to 3 floors.



III 8 Map; Ixtapaluca site



III 9 Pictures; Ixtapaluca close to site





III 10 Pictures; Ixtapaluca site







## Materials and colors

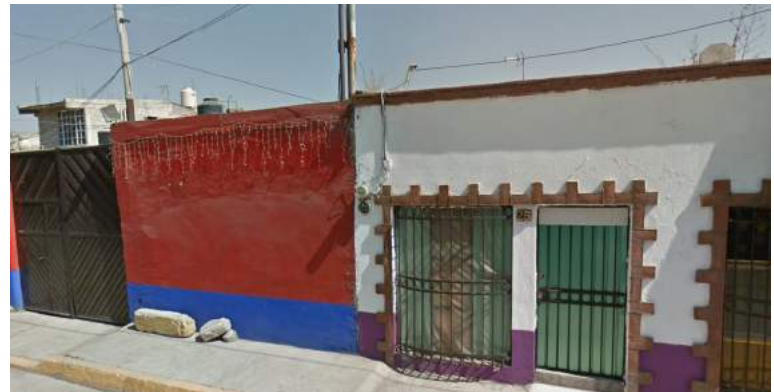
There is big visual diversity in the area. Looking at the buildings in the area is it clear, that there are no restrictions about which colors that can be used on the buildings. It also seems to have no effect on the house owners, which color the sounding houses have. Each building stands strong alone and if an owner wants to have a red house and the neighbor's house is blue, when they still paint it red. This create an interesting atmosphere, but it also seems quite chaotic.

In many ways is the situation the same when talking about materials. It is mixed, but some materials are used more than other. The material seen most is concrete either as concrete bricks or as reinforced concrete walls. There are also buildings made from bricks and different kinds of sheet metal.

The materials and colors are an important way for the people in Ixtapaluca to make their house facades stand out, even when most people don't have a big budget, they still want their houses to look personal. The material is often cheap and simple, so the decoration plays a big role in making the houses look good. The decoration could either be the way the colors are added or by making extraordinary building spades.

Even in the more expensive building is the style similar, with strong colors and simple materials. The play between colors and light is one of the main elements of Mexican modernism.

The strong energy each building gives also make it harder for each building to look unique. Even in the big housing project the people adapt their houses so they have new shapes and colors.

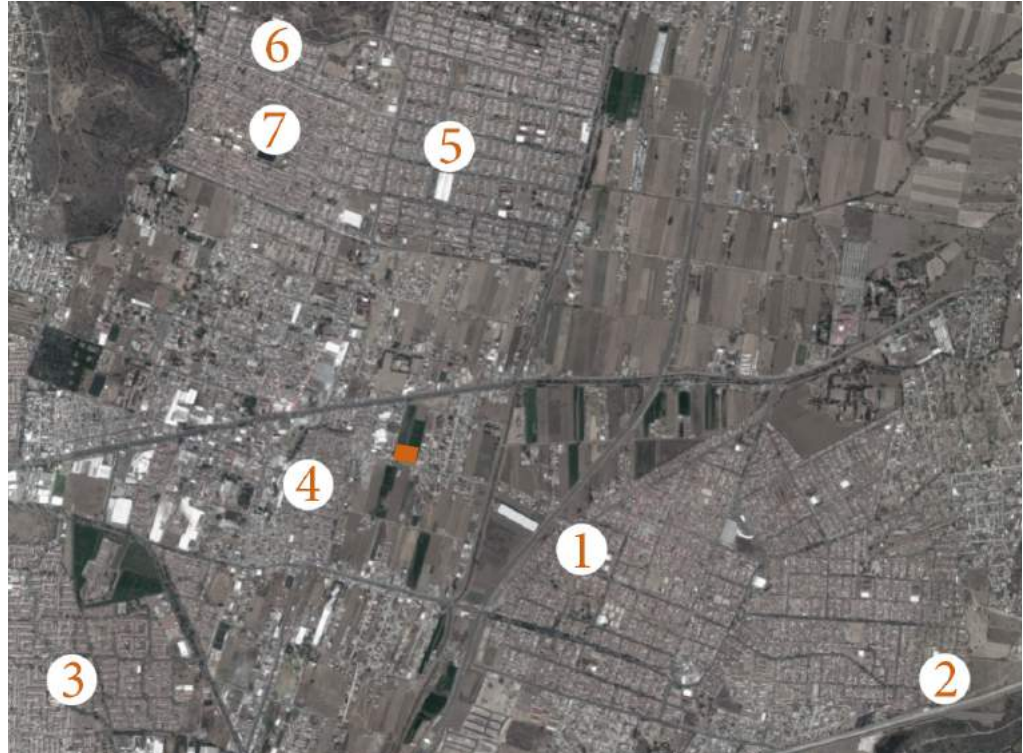


III 13 Pictures; Ixtapaluca close context

## Affordable housing project in the area

There are many affordable housing projects in Ixtapaluca, most of them are located in the area around the site. There are others further west closer to Mexico City, but none of those are nearly as big as the ones in the eastern part of Ixtapaluca. Each area is different, but they all have similarities in their planning. Big areas with between two and three floor housing, with schools, stores and playgrounds in the center of the project. Beside the areas in the central part of the project, the rest of the project is in many ways just an endless repetition of housing units. At least that is how the projects are planned, but by looking in to the streets of the projects it is revealed that many of the houses get changed either so they can have small stores toward the street or to have more space.

On the next pages pictures from different affordable housing projects will work as an exemplification of the architecture and how the people change it to accommodate their needs. Each number on the map (ill 14) relate to a housing project on one of the next pages.



Ill 14 Map; Ixtapaluca with site and housing project



## San Buenaventura (1&2)

The top picture is an example of how the buildings look without expansions or merger changes. Where the bottom picture shows an example of one of many ways people chose to expand their houses in the same area.



III 15 Pictures; San Buenaventura 1



III 16 Pictures; San Buenaventura 2

## Geovillas Santa Barbara (3)

## Jose de la palma (4)



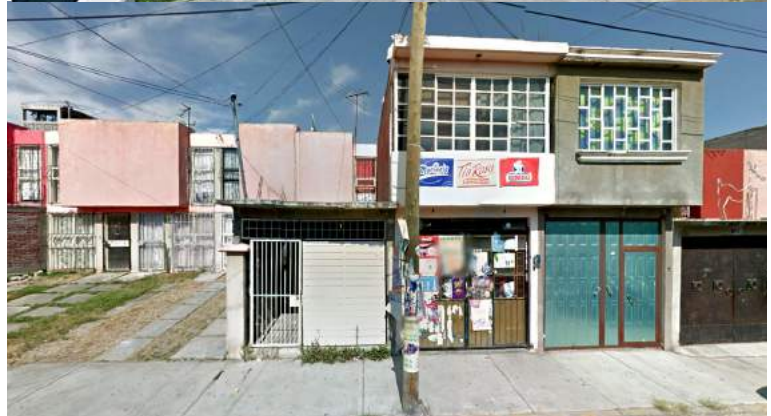
III 17 Pictures; Geovillas Santa Barbara 3



III 18 Pictures; Jose de la palma 4



## Los Heroes (5&6)



III 19 Pictures; Los Heroes 5

III 20 Pictures; Los Heroes 6

## Geovillas Jesus Maria (7)

Each area has its own expression, but there are many elements that are similar in the design and also in the way the houses are being expanded.

The project seems to be long rows of identical houses, the only difference is the minor color changes. The only real break of the endless rows are the houses that have been changed.

In front of the buildings is there placed a parking space, when people starts expanding this space is one of the first spaces that are included in to the build area. By expanding toward the front garden, it also become easier to uses some of the building of small stores. Which many residents have taken the advantages of.

Most expansions happen in a horizontal direction even though they lose their front garden and parking space by doing so.

Even most expansions look quite uncontrolled is it still clear that the style of the expansion is often related to the existing building style. Either in the choice of material, colors or shape. So, in one way, dose the original building stand as base building for further expansions, it does not dictate the result, but it guides the design of the expansions.



III 21 Pictures; Geovillas Jesus Maria 7

# Micro climate

The climate of Ixtapaluca have already been shortly been discussed in the theoretical part of the project, for graphs of temperature and rain see page 15 and ill 5. To sum up the climate in Ixtapaluca is it important factors:

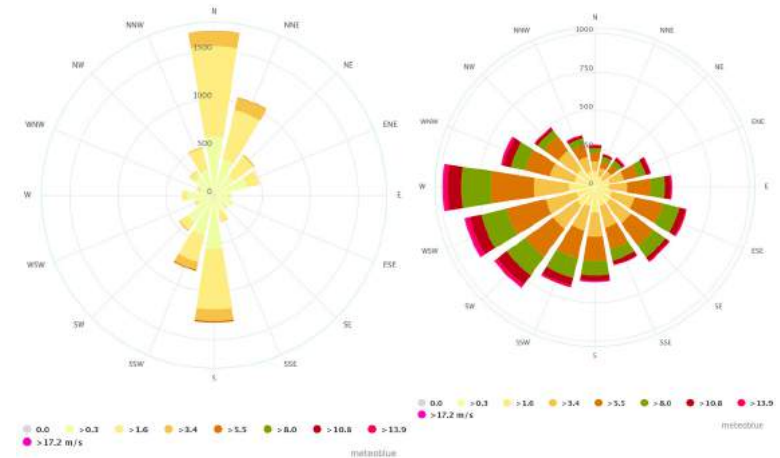
It rains approximately the same amount as in Denmark, but the rain comes in clear rain seasons, instead of being spread over the year. The main rain period is from May to October.

The yearly average temperature of Ixtapaluca is quite constant. Even when the average temperature is quite constant, the extremes go from 4 degrees in winter and up to 30 degrees in summer.

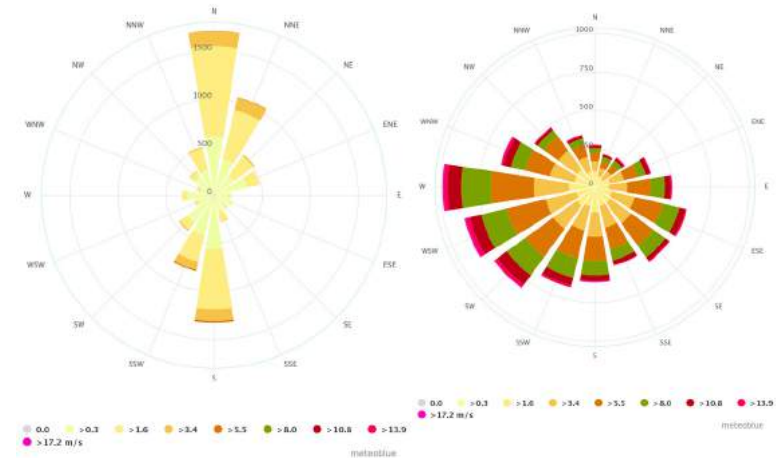
The temperature and the rain will have a big impact on the design choices, and both aspect have to be considered when designing the proposals of the site.

Beside the rain and temperature is wind another aspect that can affect the micro climate of the site. By looking at the wind rose of Ixtapaluca is it clear that the wind manly comes from south and north. March is the windiest month. To but the wind speeds in perspective it is relevant to compare the wind speeds with wind speeds of Denmark. By comparing it is possible to conclude that the wind in Ixtapaluca are much weaker and will have a small effect on the site.

Wind rose Ixtapaluca

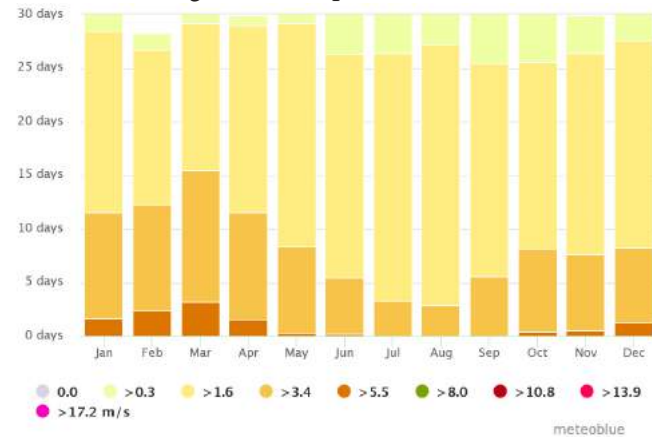


Wind rose Denmark



III 22 Diagrams; Wind rose diagram of Denmark and Ixtapaluca

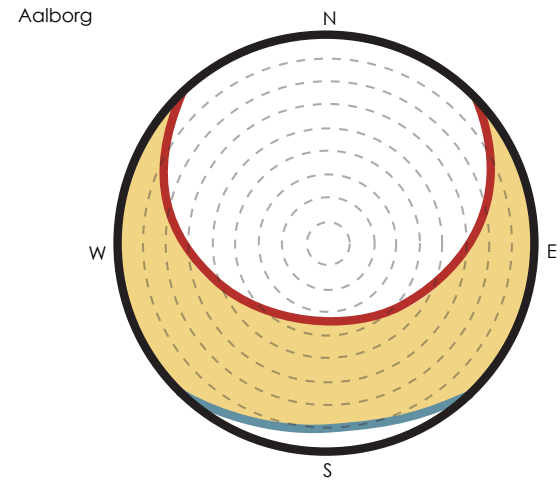
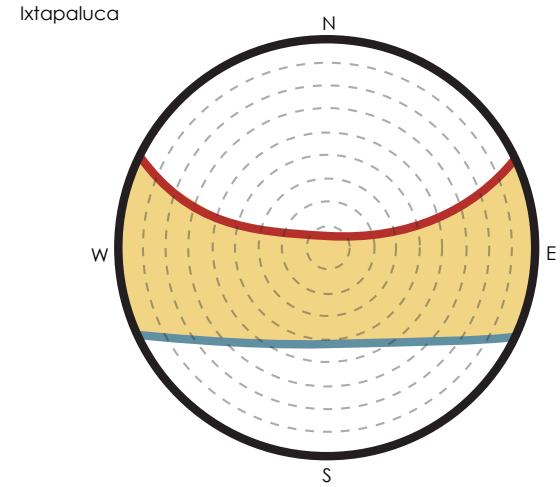
Wind diagram of Ixtapaluca



III 23 Diagrams; Wind diagram of Ixtapaluca



In many countries does the sun position on the sky also play merger part of the micro climate. This is also the point in Ixtapaluca, but not like it is in Denmark. The sun will be lower on the sky in the winter, but the different between summer and winter is small. Compared to Denmark, is the sun nearly higher in the winter in Ixtapaluca than it is in the summer in Denmark. This will have an impact on the kinds of solar shading that can be used to avoid overheating in the homes.



III 24 Diagrams; Sun path of Aalborg and Ixtapaluca

## Mapping analysis's

The area has already been described in the earlier chapters, but by mapping the area it become visible where everything is located and it also give a different perspective on the area by seeing the city from above. On the next pages will different maps be describing the area by analyzing different aspect of the context. The results of the analyzes will help give a great understanding of the site and how the site can relate to the context.

- 1 Housing Geovillas Jesus Maria
- 2 Housing Los Heroes
- 3 Housing San Buenaventura
- 4 Housing Jose de la palma
- 5 Housing Geovillas Santa Barbara
- 6 City center
- 7 Road to Mexico City (30km)
- 8 Road to The state Puebla
- 9 Road to mall (2,5km) and Chalco 3 km

## Distance

The site is located central, both by being close to the center of the city and also by the closeness to the new areas that are coming around it in the form of malls and housing project. The site is close to big roads and local markets, housing project and a vibrant city center mixed of houses and shops. Even when the site is so central it is also in an area without life and energy, surrounded with unfinished houses and fields. This means that the project has to create a connection to the areas close to it to create life or by generating the life itself and help the close surroundings become full of activities.



III 25 Diagram; Distance from site

## Infrastructure

The site is located in an area where most of the street surrounding the site are small and practical, the main traffic is on the bigger roads north and east of the site. Further west is a more mixed area where the streets are next to restaurants and shops, the traffic is also affected by these functions which makes them slower.

- Site**
- Car sale**
- Main roads**
- Simple Streets**
- Mixed use streets**



III 26 Diagram; Infrastructure

## Housing types

The houses in the area are not all of the same type. Furthest to the west is mix- use building with commercial functions located on the ground floor toward the street, and homes behind and on second floor. These building are mostly self-build. Next to the mixed-use building lay a housing project where most for the buildings only function as houses. To the east is another self-build house area. Most of these houses have bigger gardens and there is a lot of space around them, but there only function is as homes.

- Site**
- Mix use homes**
- Housing projects**
- Self- build homes**



III 27 Diagram; Housing types



## Activities

The area is full of activities, beside the ones mapped here is the area with mix-use housing full of restaurants and shopping opportunities. The western area has many small activities where the activities in the housing project is bigger and more defined. The eastern area is less active.

- |   |   |
|---|---|
| <span style="display: inline-block; width: 15px; height: 15px; background-color: #A52A2A; border: 1px solid black; margin-right: 5px;"></span> Site           | <span style="display: inline-block; width: 15px; height: 15px; background-color: #4682B4; border: 1px solid black; margin-right: 5px;"></span> Schools            |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: #D2B48C; border: 1px solid black; margin-right: 5px;"></span> Municipality   | <span style="display: inline-block; width: 15px; height: 15px; background-color: #2F8B82; border: 1px solid black; margin-right: 5px;"></span> Social green areas |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: #FF8C00; border: 1px solid black; margin-right: 5px;"></span> Hospital       | <span style="display: inline-block; width: 15px; height: 15px; background-color: #FF4500; border: 1px solid black; margin-right: 5px;"></span> Markets            |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: #2F4F4F; border: 1px solid black; margin-right: 5px;"></span> Farm land      | <span style="display: inline-block; width: 15px; height: 15px; background-color: #000000; border: 1px solid black; margin-right: 5px;"></span> Hotels             |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: #696969; border: 1px solid black; margin-right: 5px;"></span> Sport and swim | <span style="display: inline-block; width: 15px; height: 15px; background-color: #FFD700; border: 1px solid black; margin-right: 5px;"></span> Universities       |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: #A9A9A9; border: 1px solid black; margin-right: 5px;"></span> Church         |   |



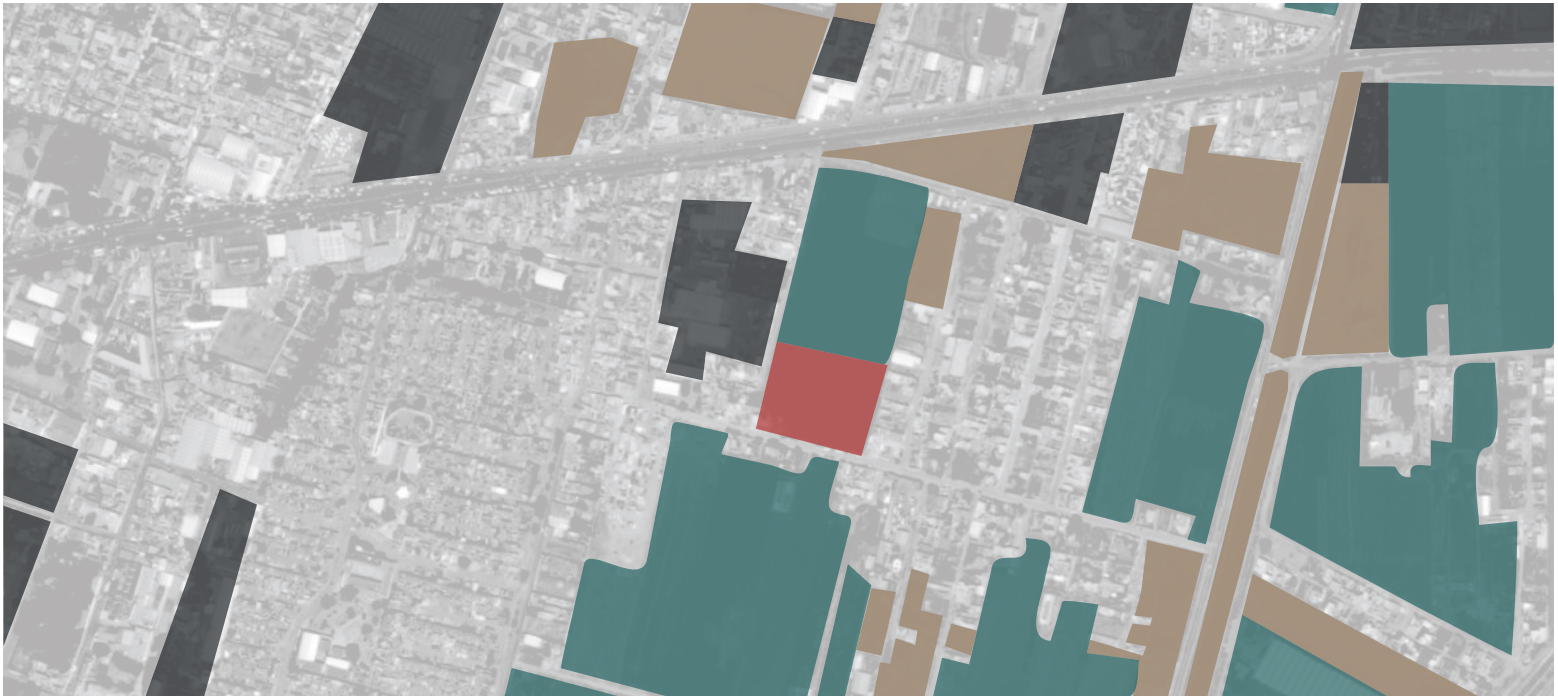
III 28 Diagram; Activities



## Green and Industry

The western area only has some few industries, where the eastern area is full of fields and industries. There are also several areas with no apparent function. The map shows a clear line where the urban zone ends and the farm and rural area starts.

- Site**
- Industry**
- Unused green areas**
- Farm land**



III 29 Diagram; Green areas and Industry

## Choice of site

There have been many reasons behind the choice of the site. The main reasons were discovered in the theoretical part of the project. Both the fact that the site is close to the city core, and that the site is on a field that are too small for big housing project, but perfect for smaller projects. By further analyzing the area, have it become even more clear that there are many good reasons to use the site. Such as creating a project that give a new way to make housing in an area full of huge housing project that don't invite to mixed-use or social activities.

The site is also located so it can take avenges of the existing infrastructure of the area. The area east from the site is quite dead and by choosing a site on the edge of the center and the farm land, would it be possible to create a project that join the surrounding areas.

## User

It is a key factor for the project to build an area for a diverse group of people, where both young people can get there first place and bigger families can find a place to settle. It is important to understand the people of Ixtapaluca, their age, living means, marital status and other factors that will affect their needs.

The people of Ixtapaluca have already been described in the theoretical paper, this chapter will repeat some of the key elements from that chapter, but it will also add extra information.

The poverty in Ixtapaluca is on 33.8 percent, where 5 percent is living in extreme poverty.

39.2 percent have lack of access to health care and 56.1 percent have lack of access to social security

The main safety-net for people is the family and the extended family.

Only around 30 percent of the households have car.

The population is young and the biggest age group is the people between 10 and 14 years and not many people over 55 years old.

Most of the people own the place they live in.

There are 35 percent singles and 34 percent married people in Ixtapaluca in the age group of 12 years old and above.

82.2 percent of the people have cell phones, where only 36.7 per-

cent have internet.

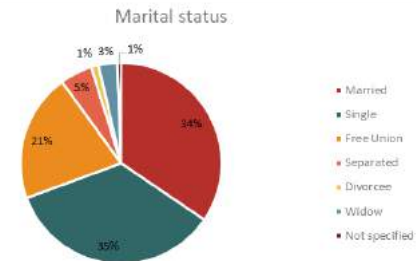
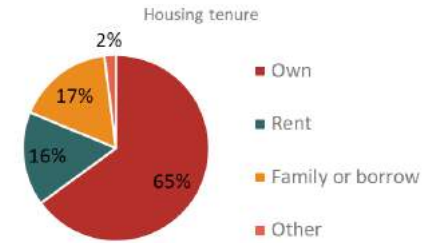
Key words based on information found on :([http://internet.contenidos.inegi.org.mx/contenidos/Productos/prod\\_serv/contenidos/espanol/bvinegi/productos/nueva\\_estruc/inter\\_censal/panorama/702825082246.pdf](http://internet.contenidos.inegi.org.mx/contenidos/Productos/prod_serv/contenidos/espanol/bvinegi/productos/nueva_estruc/inter_censal/panorama/702825082246.pdf), <https://ixtapaluca.gob.mx/wp-content/uploads/2016/09/Plan-de-Desarrollo-Municipal-de-Ixtapaluca-2016-2018.pdf>)

This is just some of the ways to describe the people living in Ixtapaluca. It is clear that there are many couples around 50 percent live in relationship, which is many considering that the statistic includes everyone from an age of 12 years. Even when there are many young and quite many people living in poverty, is there also many in good working age. Another reason to focus on families is the lack of social security and health care, most people need and strong family to thrive in Ixtapaluca. It is important to also think of the singles, they are the most vulnerable, with no safety-net.

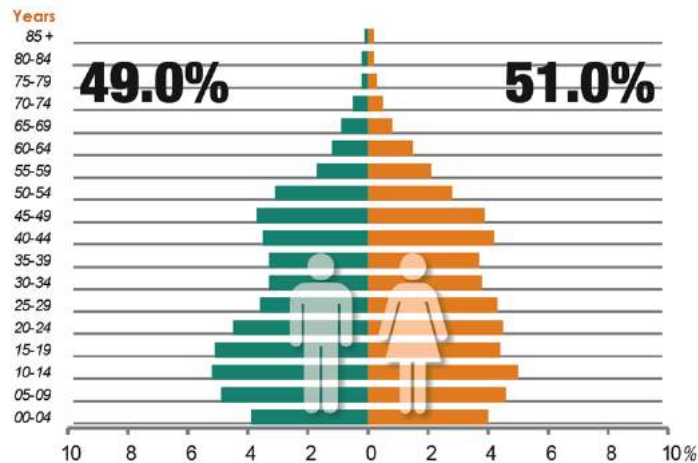
By having 33.8 percent poor is the city of Ixtapaluca challenged, it need to decrease the amount of poor. But it also means that most of the population is not considered poor, even when they are not living in poverty, is it not sure that they are not challenged in some way.

Defining the user groups in focus will help the project stand stronger and relate better to the area. The main group is the low-income family, a big group that need good housing at low cost. If they were lifted in to the group of middle income by moving in to the project, they would also be able to have a strong impact on the

area. Beside the main group, two other groups have been chosen. The first is the young singles and young couples, a big group often forgotten in the housing market, in an area with few renting options is it important to give them a real option. The last group is the middle-income family, they will work as motivators for the area, they will create more jobs and life, they will be able to invest more in local projects. It is on purpose not to focus on the older generation, they are a small group and they will often live with their children when they get older. So, by focusing on the families both low and middle-income, will there be space for them in their homes. This is also one of the reasons that the concept of expansions is important.

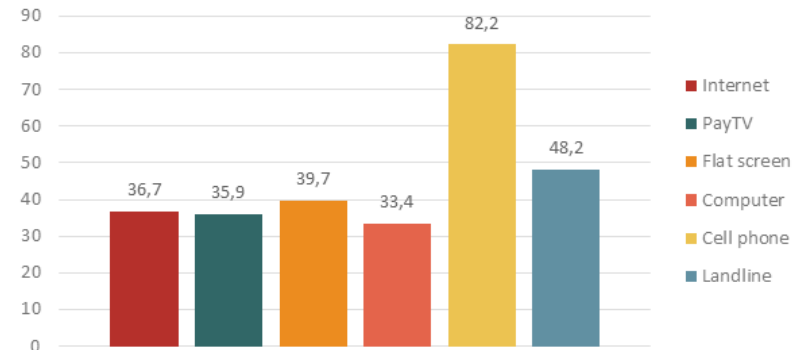


### Age structure of Ixtapaluca



III 30 Diagram; Age in Ixtapaluca

### Availability of information and communication technologies



III 31 Diagrams; User information

# Sustainability

In most of the western world have sustainability become an important part of making architecture, this is not the fact in Mexico. But in the last years there have come many changes to the environmental areas in Mexico and there is slowly coming more regulations that will insure the new architecture will become more sustainable. (<https://www.wri.org/our-work/top-outcome/mexico-and-mexico-city-introduce-energy-efficiency-standards-buildings>) The regulations are not clear and not enforced, but the change has started.

In this project the focus will not be on these new regulations, but instead on how to make architecture much more sustainable than other projects in Mexico, but still for a fraction of the price of a northern European project. To make the project sustainable, elements from “DGNB” have been used to define more specific design criteria. These criteria have been used in the design process.

## DGNB

DGNB is a measurable sustainability certification. It is done by reviewing the building project, not only the finished building, but even doing the planning phase and the building process. By certifying a project, the builder can save money on unnecessary elements. The main point of starting the certification early in the process the finished project will be even more sustainable. DGNB stands for “Deutsche Gesellschaft für Nachhaltiges Bauen” which is the name of the non-profit organization that has created the certification system. ([https://www.hfb.dk/fileadmin/templates/hfb/dokumenter/artikler/Guide\\_DGNB\\_Bygninger\\_2016.pdf](https://www.hfb.dk/fileadmin/templates/hfb/dokumenter/artikler/Guide_DGNB_Bygninger_2016.pdf)) The system uses 40 of criteria, by reviewing each criterion a com-

bined score will be gained. Each criterion is loaded differently, so each element doesn't carry the same value. There are 5 main areas in DGNB which are: “Socio-cultural and functional quality, Environmental quality, Economic quality, Technical quality and Process Quality”. The first 4 areas all are loaded with 22.5 % of the final score while “Process Quality” only carries 10 %, each area and criterion are analyzed differently. There is a 6th area which doesn't affect the final score, but is still part of the certification.

Short description of the 6 areas:

### Process quality

Process quality is about ensuring that quality is increased and maintained from planning to completion. The process quality has been assessed in DGNB based on the degree and quality of sustainability in the building, and the work carried out in the process phase has a significant impact on the final result.

### Environmental quality

An environmentally sustainable building affects the global and local environment as little as possible. The environmental quality of DGNB includes assessments of the energy efficiency of the building, resource consumption, including area resources, use of renewable resources, and reduction in the impact of biodiversity.



## Economic quality

The economic quality is assessed on the basis of the building's life-time costs, value stability and potential for economic development and robustness. The purpose is to ensure the value-optimization of the building on the operational side and includes the ability of the construction project to minimize operating costs, the possibility of higher rental rates, better rental opportunities and increased productivity of the building user.

## Socio-cultural and functional quality

Social sustainability is about increasing the value of the building for users, including user satisfaction, well-being, higher productivity and lower sickness absence due to among other things, better indoor climate, increased flexibility, accessibility for all, safety and security. The social quality of DGNB is assessed on the basis of parameters such as health, comfort, user satisfaction, functionality and aesthetics.

## Technical quality

The technical quality is assessed in DGNB based on the quality of the technical solutions in the building. This applies to the construction itself, but also to the maintenance of the building, and to what extent it is possible to dismantle and remove building parts after use. Technical quality goes across both environmental, social and economic quality, as the choice of technology affects the performance of the other qualities.

## The quality of the area

The quality of the area is assessed both from the building site and the surrounding area. The purpose is to find the optimal location for the building, including identifying potential problems in the area that may affect construction. The assessment of the area's quality must always be carried out to obtain a certification of the building, but the individual criteria do not count in the total points division.

This description is taken and translated from: [https://www.hfb.dk/fileadmin/templates/hfb/dokumenter/artikler/Guide\\_DGNB\\_Bygninger\\_2016.pdf](https://www.hfb.dk/fileadmin/templates/hfb/dokumenter/artikler/Guide_DGNB_Bygninger_2016.pdf)

As described earlier, have each area many sub criteria, instead of focusing on all of them some criteria have been chosen. By doing so, there will be clearer direction, and the project will only work with challenges that would be relevant in the Mexican context. The chosen criteria are as follow:

ENV 2.2 Drinking water consumption and wastewater discharge  
One of the main challenges is the bad drainage systems and the lack of water. (Drinking water is on bottle in Mexico so that part of the criterion is not looked at in this paper.

### ENV 2.3 Efficient land use

The expansion of cities in Mexico destroy the land and it also makes the city grow too much, so by effective land use many of the main problems of the mega city will be solved.

#### ECO 2.1 Flexibility and adaptability

Many houses stand empty because they are not build with the uses in mind, but by making apartments that can adapt to the users, then they will be used.

#### ECO 2.2 Robustness

Most cheap building in Mexico are purely build they leak and make people sick or have to be teared down, by building with a high robustness the building will stand longer.

#### SOC 1.1 Thermal comfort

To avoid sickness or discomfort of the users' thermal comfort is important. Most houses in Mexico is not insulated so in this case just a small change will have a big impact.

#### SOC 1.2 Indoor air quality

To make a healthy living space, air quality is an important aspect. To avoid overheating many Mexican homes have small windows, which often make natural ventilation harden. It is therefore important to make intelligent solutions.

#### SOC 1.4 Visual comfort

Sun is often related to overheating and in Mexico it is a big challenge to give daylight and avoid overheating.

#### SOC 1.6 Quality of outdoor areas

In Denmark people spent most of their time indoor. In Mexico much more time is spent outdoor, this increase the importance of the outdoor areas.

#### SOC 1.7 Safety and security

Safety is one of the most important elements for most Mexicans, when buying a home.

#### SOC 2.3 Conditions for cyclists

In Mexico cycling is related to danger, but by making an area that make cycling safe, it could make a cheap alternative to buses and cars for the users.

Full list of all 40 criteria can be seen on appendix 1(In Danish).

The criteria will not be evaluated in the same way as in a normal DGNB analyzes, but they will have a great impact on the design choses. The 10 chosen criteria will all be part of the design process, but five will be chosen to make an even greater focus.

#### ECO 2.1 Flexibility and adaptability

#### ENV 2.3 Efficient land use

#### SOC 1.7 Safety and security

#### SOC 1.1 Thermal comfort

#### SOC 1.2 Indoor air quality

Some of these criteria have already been covered by one of the other principals, where other will work as specifications of existing, and finally some as new principals.

## Reviewed design principals

The principals presented in the beginning of the paper, where made from the research made in the first paper. To make them even more relevant to the area and to the concept of a sustainability, they have been adapted. These principals are the base all ideas in the project are judged against.

### Financial:

- 1 The project has to provide cheap housing that can be bought without taking big loans.
- 2 There have to be units for renters and for buyers.

### Technical:

- 3 The project has to decrease wastewater and rain water discharge.
- 4 The area has to use the land efficient.
- 5 The homes have to provide cheap solutions to insure good indoor air quality and thermal comfort.

### Urban:

- 6 Have to be located close to a city core.
- 7 Buildings have to be 2 - 4 levels to create a dense area.
- 8 Have to have social spaces on the project site.
- 9 The area has to create a safe environment.

### Social:

- 10 The project has to accommodate different kinds of shared living.
- 11 Most of the units have to have a design that makes expansions easy and insure adaptability for middle income families.
- 12 Units have to appear finished.

## Room program

80 -120 living units

### Small units

Private: One bedroom, toilet, entrance

Shared: Kitchen, living rooms, laundry room

Small apartments or houses that would be cheap. They are meant for young people and singles, many of the units would be for rent. Units with big focus on shared living and creating social network, to increasing happiness and creating a safety net for the users.

### Big unit

Private: 2-3 bedrooms, toilet, entrance, living room, possible expandable space.

Shared: Big social spaces

The big units will be quite big and expandable, with enough space for the small family even without the expansion and a big family if expanded. If the users want to be social, will the unit big have enough space for small events.

### Parking lot

Projected space for cars located central on the site for all. Rentable parking for the area, projected and safe for burglary and weather conditions.

### Social areas

Open area for all, with small shopping/eating stalls and an area for small events. Small playground for children of the area.

## Vision

The aim of the project is to create an area that challenge the normal kind of housing complexes build in Ixtapaluca, both by relating to the near context and to use the knowledge gained in the research. To make an area that both is dense and open, with great outdoor qualities and homes ready to adapt to the users' needs. Furthermore, will the project aim to be better build and offer a great place to live. This will be accomplished by using the design principals. The project will aim to increase the happiness and wellbeing of the future inhabitance.



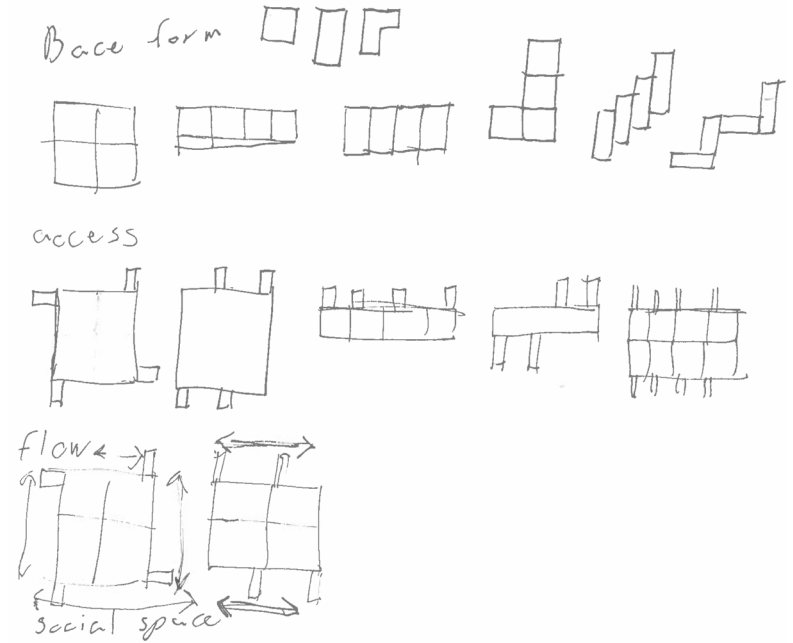
## **Part 2 Design process**

## Design process

The design process is in many an organic process, but to make some kind of structure in the description, it has been simplified and put into phases with different focus. The material shown in the description is only a small part of the total amount. The main object of this section is to give the reader an idea of the thoughts that lay behind the final design and how it was created. The process will not follow the method description, the main elements in these sections will focus on the sketching phase of the process. The visualizations made in the synthesis phase appear similar to the final concept. There will therefore be a clear gap between the ideas seen in the design process and in the presentation.

### Theory to concept

The theory compiled in the research have given a series of principles to use while designing. Happiness and wellbeing will not be mentioned in the design process but they are still represented through use of the principles. It is therefore really important that the design fulfill the needs set in the principles. Another element that is a key factor in the process is to make a design proposal that would be possible to make in real life, and furthermore to be a good business for the contractors. The goal will therefore not be to create a utopian area, but an area that could be sold as a concept for future developments. There will consequently be made many compromises to create the best place that both fulfill the needs and still would be possible to build in Ixtapaluca.



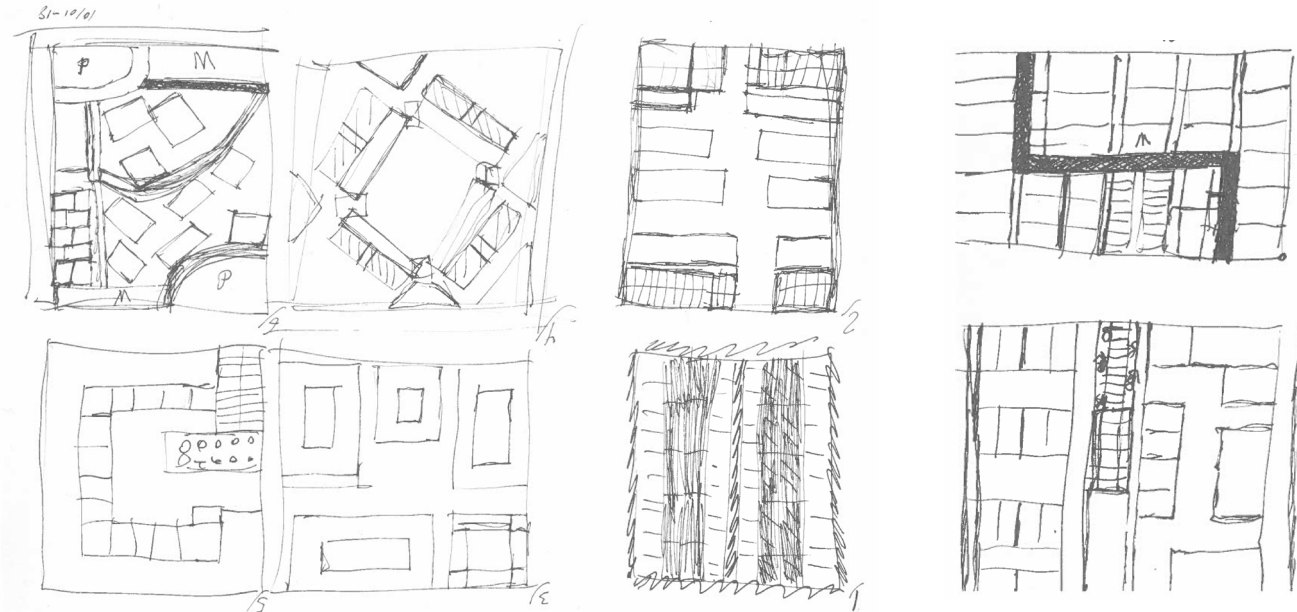
III 32 Sketches; Form, access, flow

## Master plan studies

The beginning of the design process started with free sketches without consciously thinking of the design principals, then gradually start applying the principals more and more. This was done to avoid locking the mind on a direction.

After the more flexible start of the process, a more systematic process started where a long series of simple idea was rated on how well they fulfilled the design principals. In between of each masterplan idea, a series of other ideas was locked at. Some of the elements that have been tried out are different kinds of blocks shapes, apartments types and forms, building heights and access points. Some of these ideas will be described later in the paper.

Instead of taking all principals one by one, the review mixed some of the principals to simplify the analyses. Some principals will not be included in the earlier sketches selection because of the conceptual level it is on, for example that the ideas have to appear finished.



III 33 Sketches; Early master plan ideas

The first 7 concepts were judged on a scale from 1 to 5. Where each idea gave knowledge to how to improve, the ideas therefore gradually got higher scores. The 9 criteria they were judged on is listed below.

### **Cheap:**

One way of defining this is by seeing if there are many units, it will be cheap to build per unit and therefore cheaper for the user. If there are the same number of units a high building will be cheaper, because the construction will typically be cheaper.

### **Rent Buy:**

If all units look the same it will be harder to rent some and sell some. Furthermore, if all homes are big they are harder to rent out, compared to the smaller and cheaper units.

### **Passive strategies:**

This covers both possible good natural ventilation and possible daylight in all rooms. If they would be easy to keep cold in summer and warm in winter.

### **Levels 2 -4:**

To create a dense master plan the buildings have to have more levels, but to make it dynamic it is preferred to have both tall buildings and low building.

### **Space between houses:**

To get a high score the ideas have to create space for bikes and safe walk areas, and also good green areas.

### **Social spaces:**

There have to be enough space for a big social space, but also for other social spaces that create a strong connection and access to the buildings.

### **Different kinds of homes:**

To ensure the possibility of more kinds of co-living, is it important to have different kinds of units, both in size and shape.

### **Expansion:**

Most of the units have to allow expansions preferable in different ways, according to the buildings location.

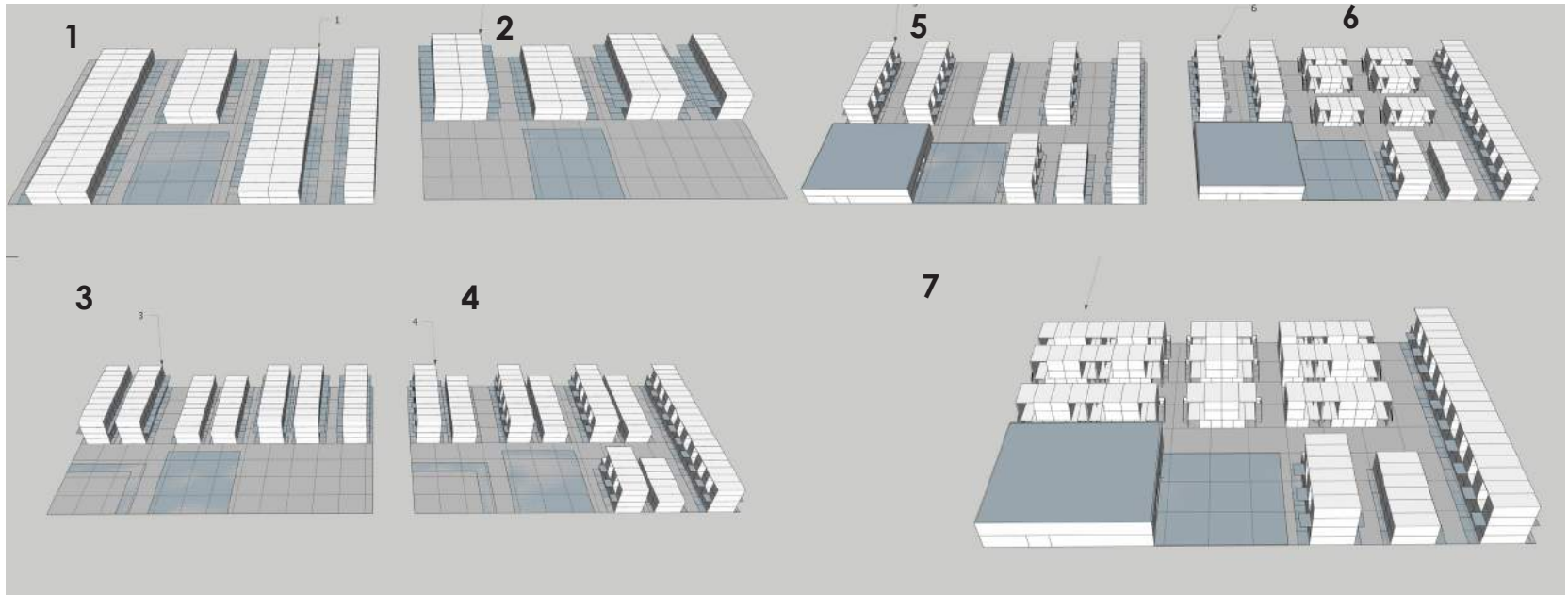
Own entrance: The fewer people that share the same entrance or stair the safer the people living there feel.

Idea 1 and 2 have parking in front of each unit, were idea 3 and 4 have the parking in the lower left corner. The square that are on all of the ideas is an undefined social space.

On idea 5 – 7 is there a bigger building in the lower left corner, this building has parking on the ground level and 20 apartments on the second floor.

form 1	1	2	3	4	5	6	7
Cheap	4	5	5	4	5	4	4
Rent and buy	2	3	3	3	4	4	4
Passive strategies	2	2	3	3	3	4	4
Levels 2-4	1	5	5	5	4	5	5
Space between homes	2	1	1	3	4	4	4
Social spaces	1	3	3	2	4	4	4
Different kinds of homes	1	2	2	2	4	4	4
Expansion	2	1	2	3	3	3	3
Own entrance	5	2	2	2	2	3	4
Score	20	24	26	27	33	35	36

III 34 Table; Phase 1 master plan score



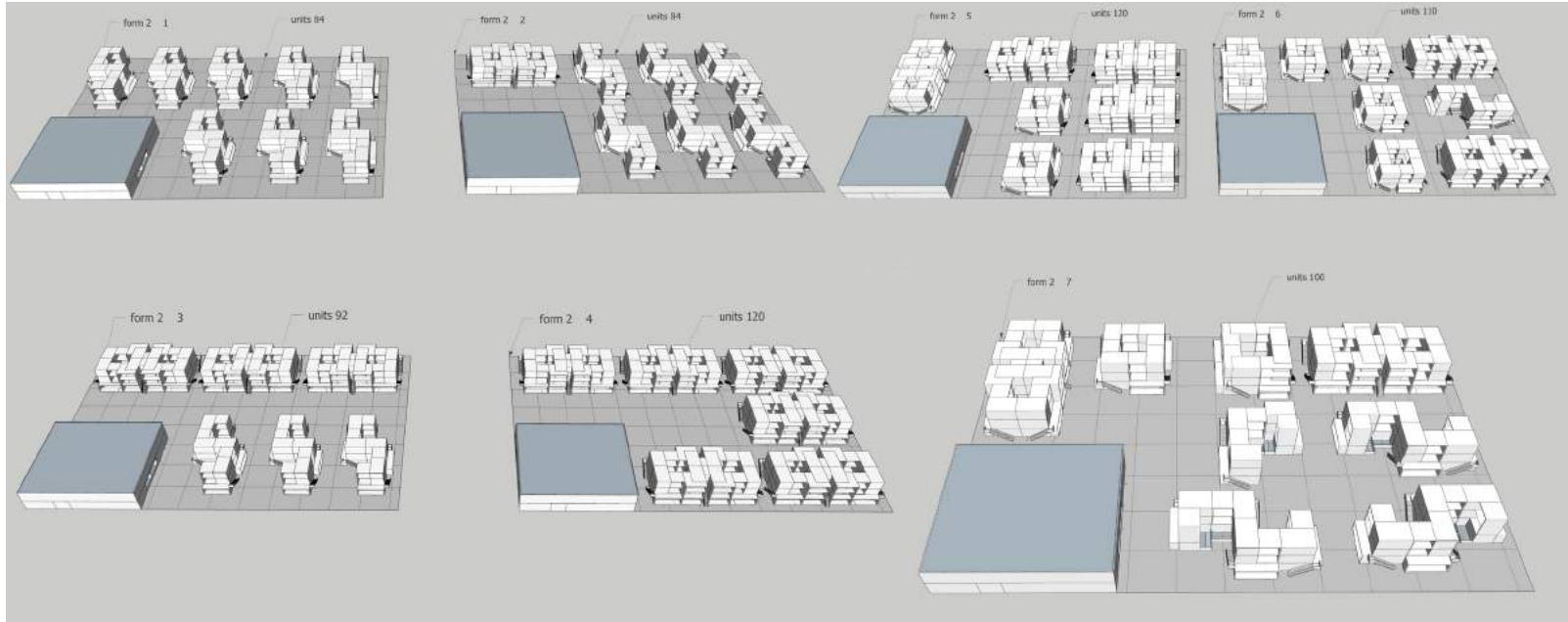
III 35 Sketches; Phase 1 master plan



The second review analyzes new forms and new connections, and how the building can create spaces and flow. Some of the ideas have few units, which have a big effect on the price. The main problem was therefore to find the perfect balance between, an appealing area and an efficient and dense area. The ideas were judged on a scale between 1 and 10.

form 2	1	2	3	4	5	6	7
Cheap	3	3	5	8	8	7	6
Rent and buy	8	8	8	8	8	8	8
Passive strategies	7	7	8	7	7	7	7
Levels 2-4	7	7	7	7	7	7	7
Space between homes	7	7	6	5	4	8	9
Social spaces	5	7	7	8	8	7	8
Different kinds of homes	5	7	7	5	6	7	7
Expansion	7	7	7	7	7	7	7
Own entrance	8	7	6	6	7	7	7
Score	57	60	61	61	62	65	66

III 36 Table; Phase 2 master plan score



III 37 Sketches; Phase 2 master plan

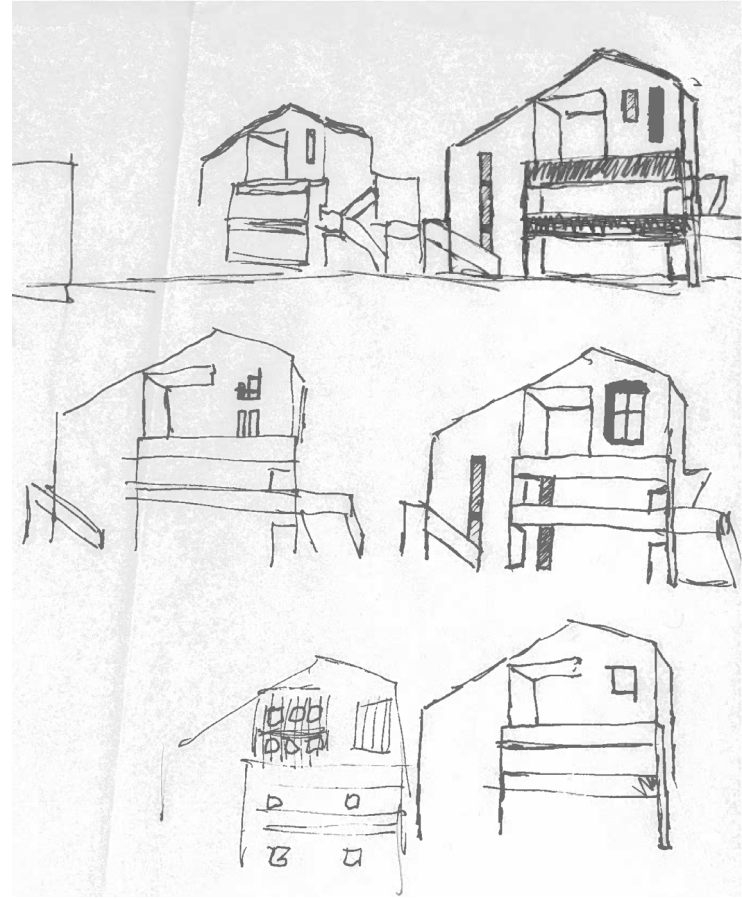
## The block

The block was slowly developed throughout the whole process. The early part of the process was focused on the basic shape, where the process gradually got more and more detailed.

Some of the last elements in the process was to design the kind of windows and the shape of the connecting roof, both was in many ways design with the focus on the technical aspect such as give daylight without direct sun and reducing the rains effect on the buildings robustness. But before this level of detailing a series of simple shapes was tried and compared to find the solution that best lived up to the principals.

Many of the block ideas were review as part of master plan ideas, where different kinds of blocks were added and then analyzed. Each block idea was also look at by themselves and reviewed. This was done to understand the pros and cons for each idea even better.

The next pages will show some of the ideas that have been looked at in the earlier part of the process.

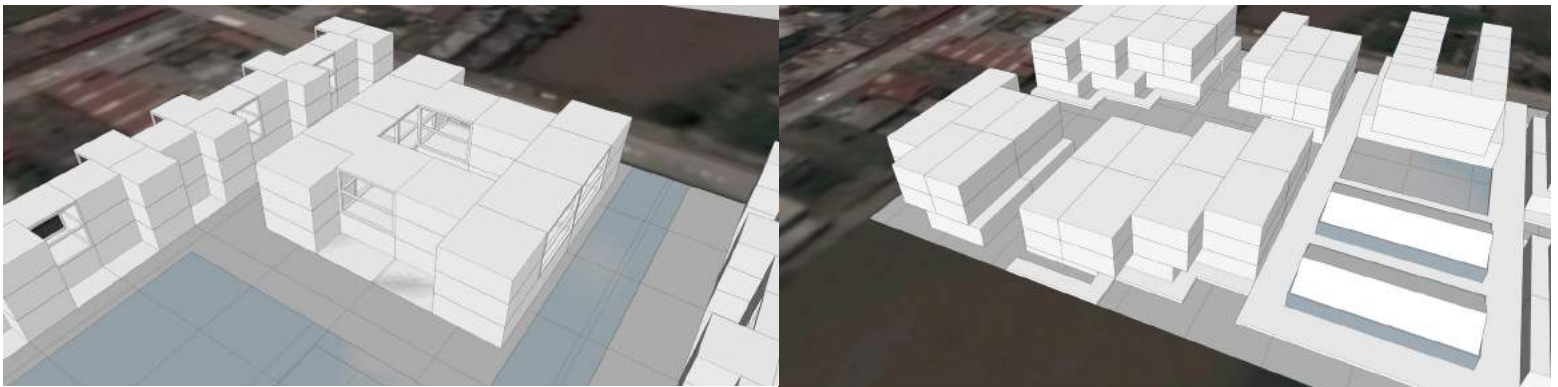
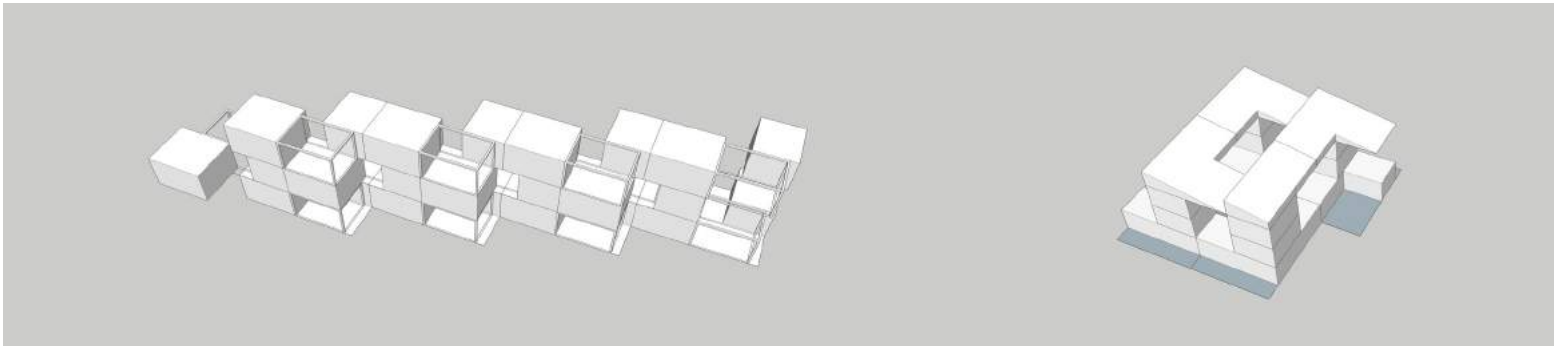


III 38 Sketches; Late block ideas

In the first part of the process there were several track house ideas as seen on ill. 39. One of the main problems with this kind of housing on a small site was how they closed the site and made a bad flow. By making shortening the rows they actually helped creating spaces. Another kind of block was the small square it helped creating different openings on more sites of the building, which

help to make better cross ventilation. If the square was too big, it started to have the same problems as the long row.

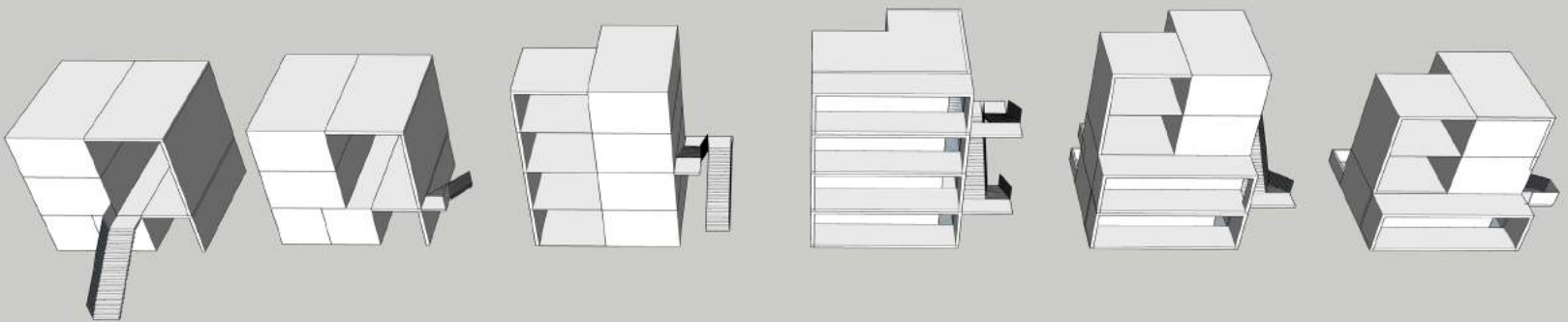
One of the other aspect that were looked at were the way the blocks allowed different version of expansions. Some needed a complicated structure to ensure a safe expansion and other where much simpler.



III 39 Sketches; Early block ideas

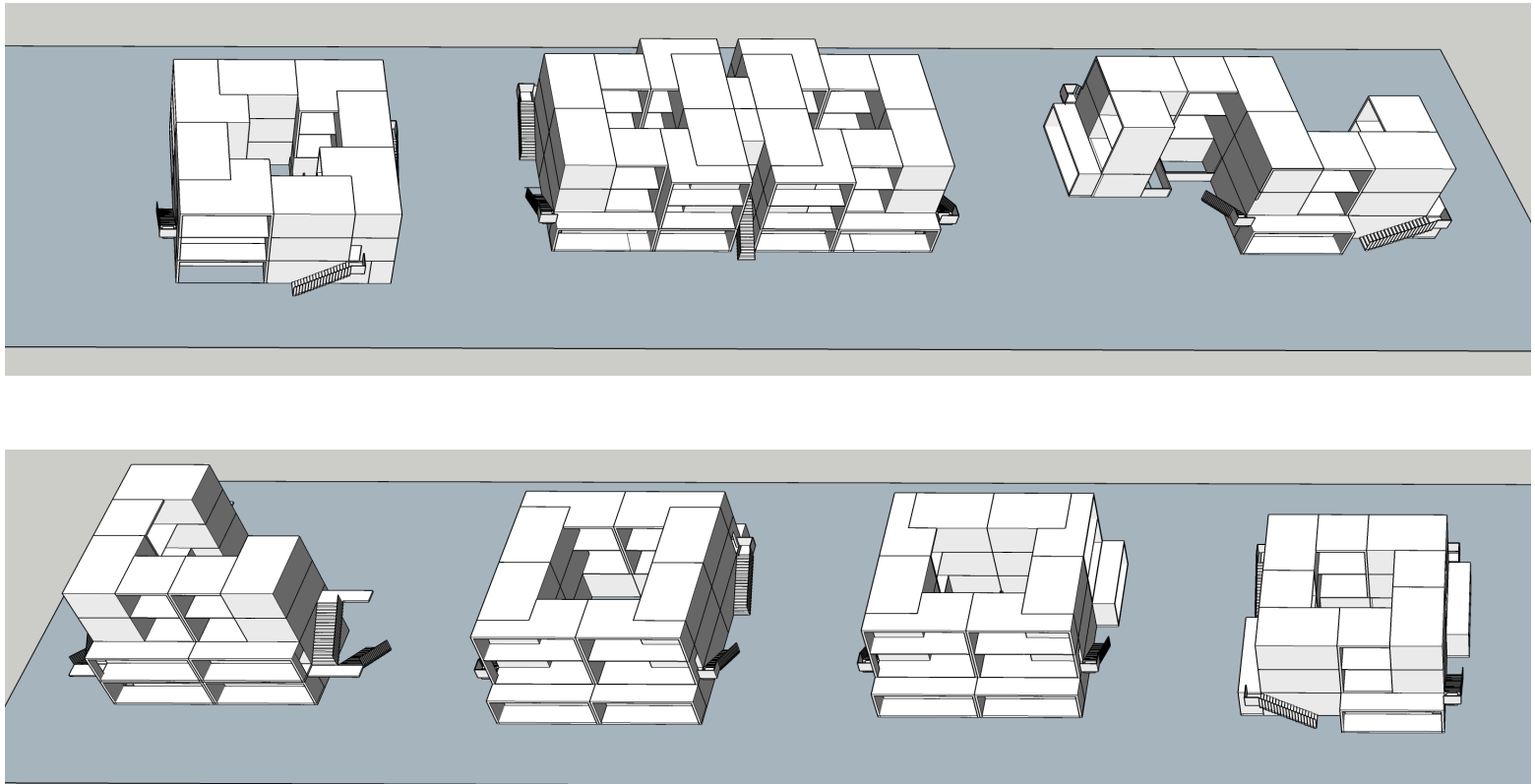
The main form chosen was strongly inspired by the blocks in the project Quinta Monroy made by ELEMENTAL (See paper 1 page 63). The first block seen from left on ill. 40 are a copy of the Quinta Monroy block. By making a long iteration process a series of changes were made to make it fit better this project. After testing the longer rows and realizing that it didn't work on the site, the main reason disappeared for butting the stair in front of the buildings. Placing the stair on the site of the building create a more private entrance and it makes the space in front of the building more dynamic. Furthermore, will the ground floor apartment get a more undisturbed view. Seen on the last two iterations fur-

thest to the right, is an option where the ground floor apartments expansion goes forward instead of sideward. This have both pros and cons; the cons are that the apartment will be a bit darker and expansions could make the rooms even darker. But by letting the expansions go toward the street, allows people to make small private shops and it also allows them to have an even greater power over the expression of their homes facades.



The next series of iterations worked with the different kinds of connections between building, some with access on two sides and other with access on all sites. In this part of the process were most of ideas used in some way, but for different functions and locations, this was done to create an interesting flow between the

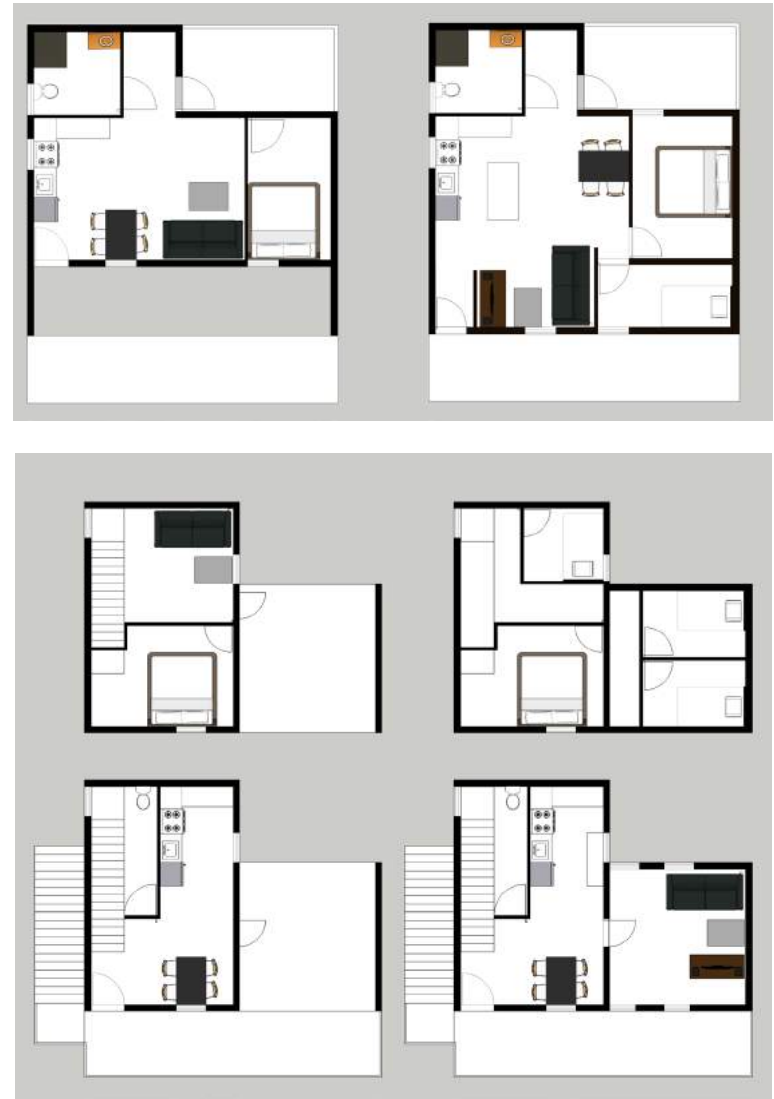
buildings. By making different connections, was it interesting to find a shape and form that could work of all kinds of blocks. This was important to later simplify the building process and make the apartments cheaper.





## Plan studies

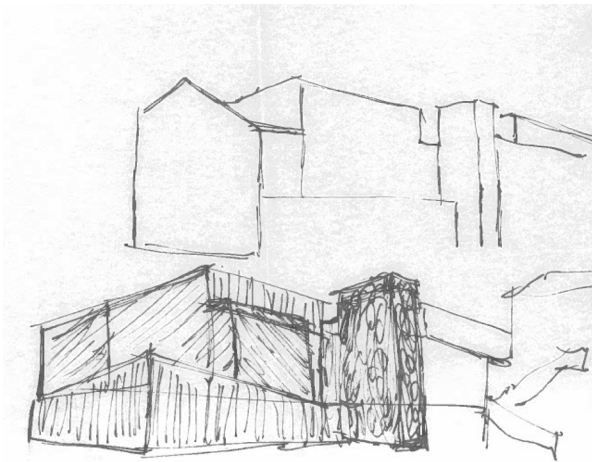
The floor plan design was focused on how to create a plan where the kitchen and bathroom were close to each other and in the same area in both the ground level apartment and the upper apartment. Where the central room allowed to make cross ventilation. To avoid overheating the plans only had small windows, both because of the only kind of ventilation would be natural, each room had to have a window. Another focus on the ideas was to create a simple base so both apartment had a bedroom, a small living room, a kitchen and dining area and a bathroom. Where the expansions would allow them to make more bedrooms and a bigger living room. So, they didn't have to make the more expensive and difficult rooms in the expansion, such as the kitchen and bathroom. The next part of the plan process was focused on minimizing the space used for halls and stairs, to avoid wasted space.



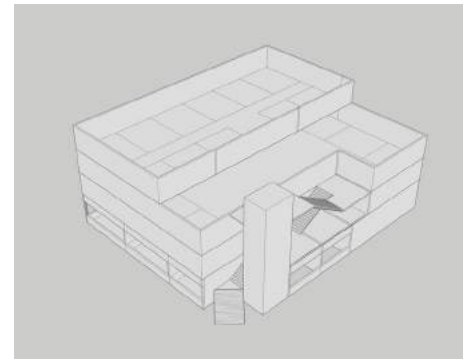
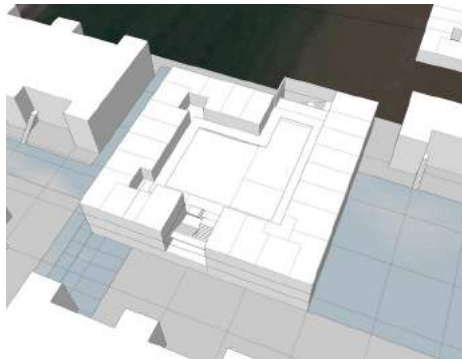
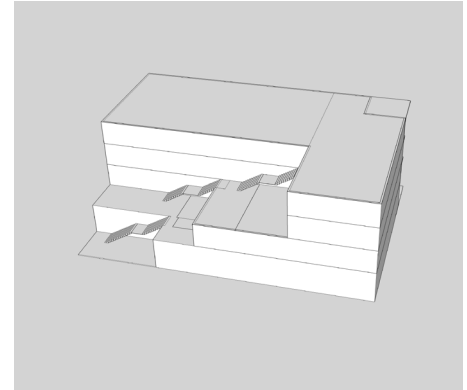
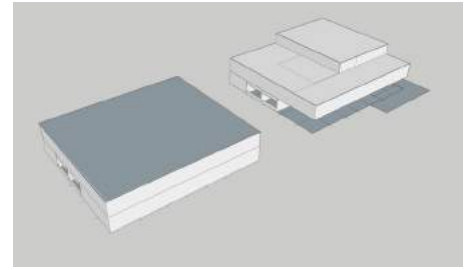
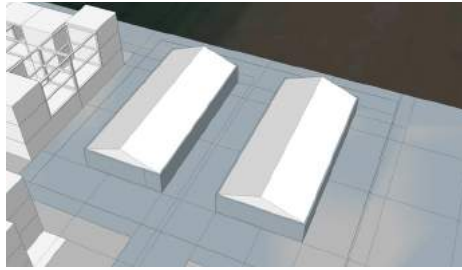
III 42 Sketches; Plan ideas

## Parking block

As described under the master plan section was the parking first thought as parking in front of the building and after some work, was it moved to a parking building. The building only created around 40 parking spots, this was chosen because of the few people having cars in Ixtapaluca. Later were the ideas focused on having an apartment and parking building, this would both save space and create an area that could connect people. One of the ideas were to place the building next to the social area and create small shops. A building with many apartments would create a good chance to make smaller apartments for rent. These apartments would both have private areas and a semi private social area.

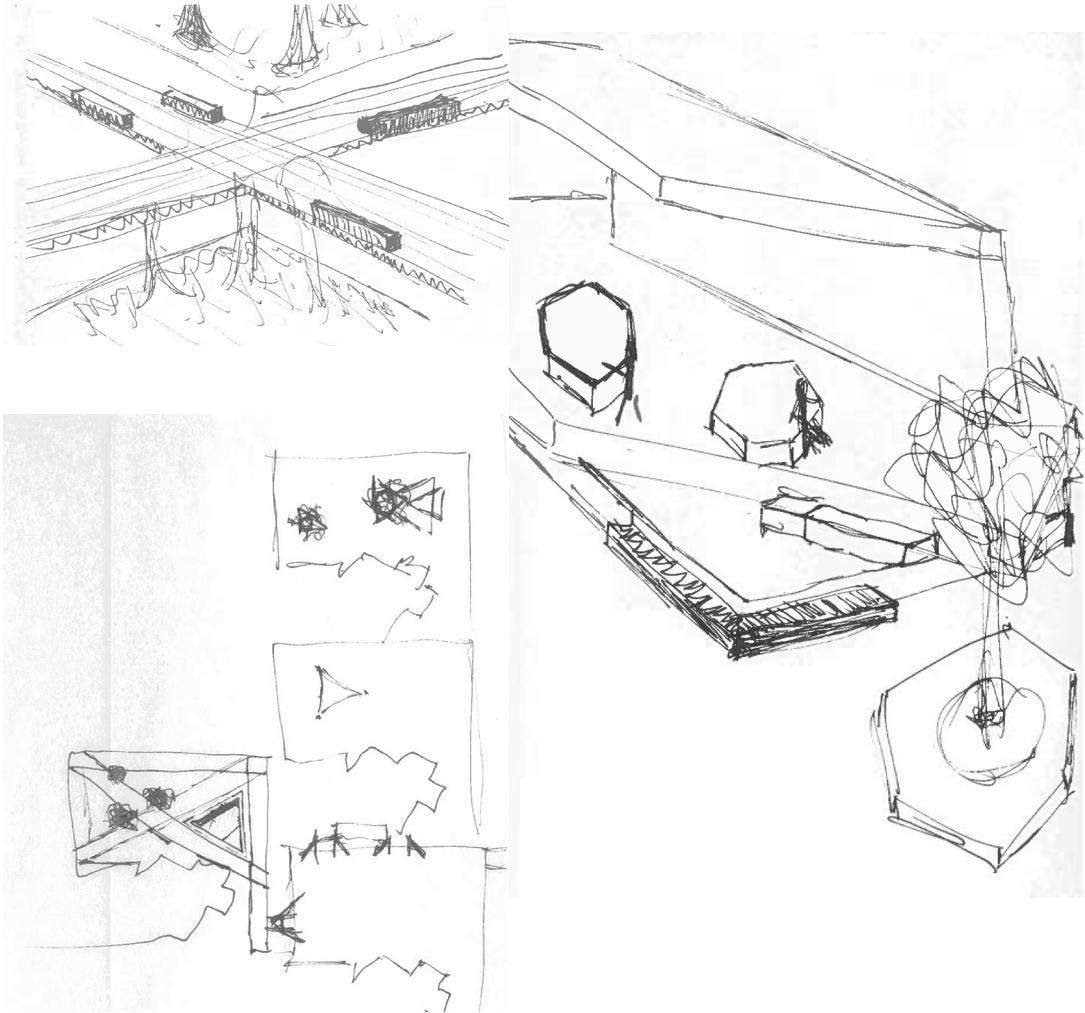


III 43 Sketches; Parking building ideas

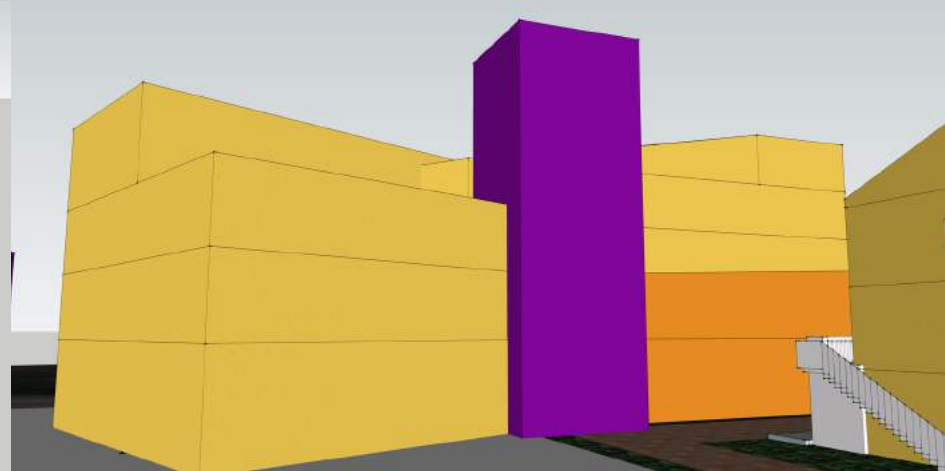
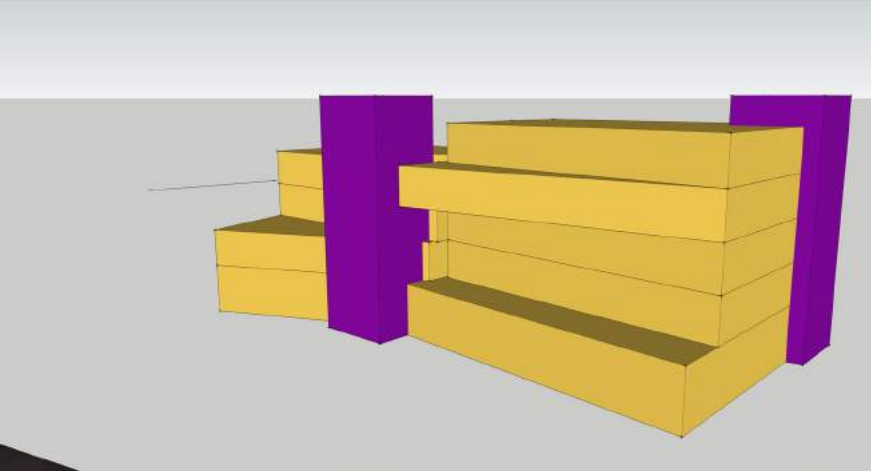
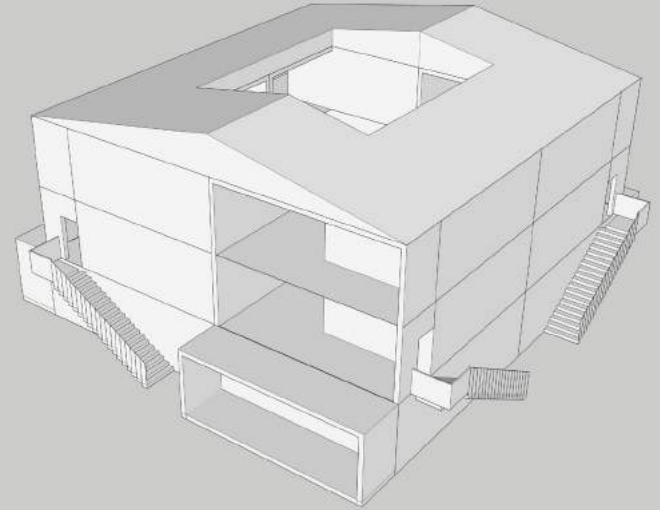


# Plaza

The social public square was a space that in many were defined by the surrounding buildings. By defining the space for the parking block and the other blocks, a space for the social plaza was nearly self-defined. It had to contain some shading elements and some sitting areas. It was important to make the area in such a way that it helped inviting people in to the site. This had to be done without taking all the space and removing the flexibility of the plaza.



III 44 Sketches; Plaza ideas



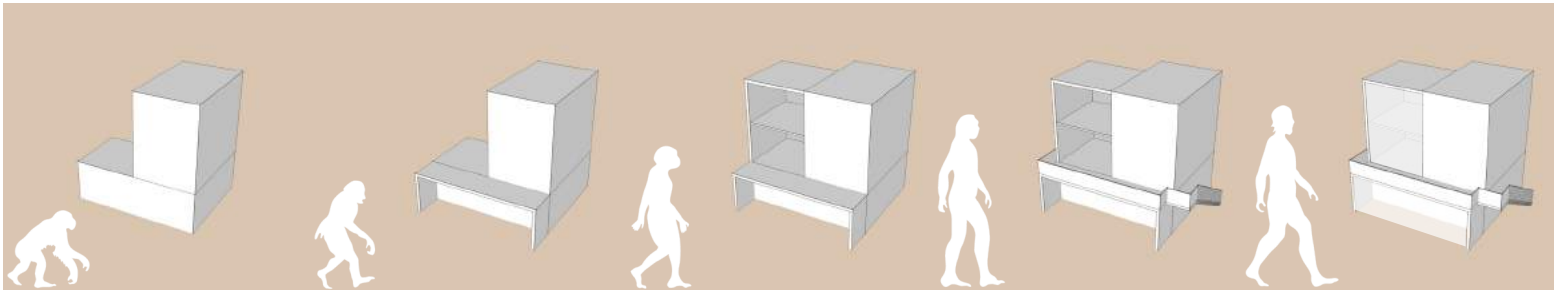
III 45 Sketches; Combination of ideas form synthesis phase

## **Part 3 Presentation**



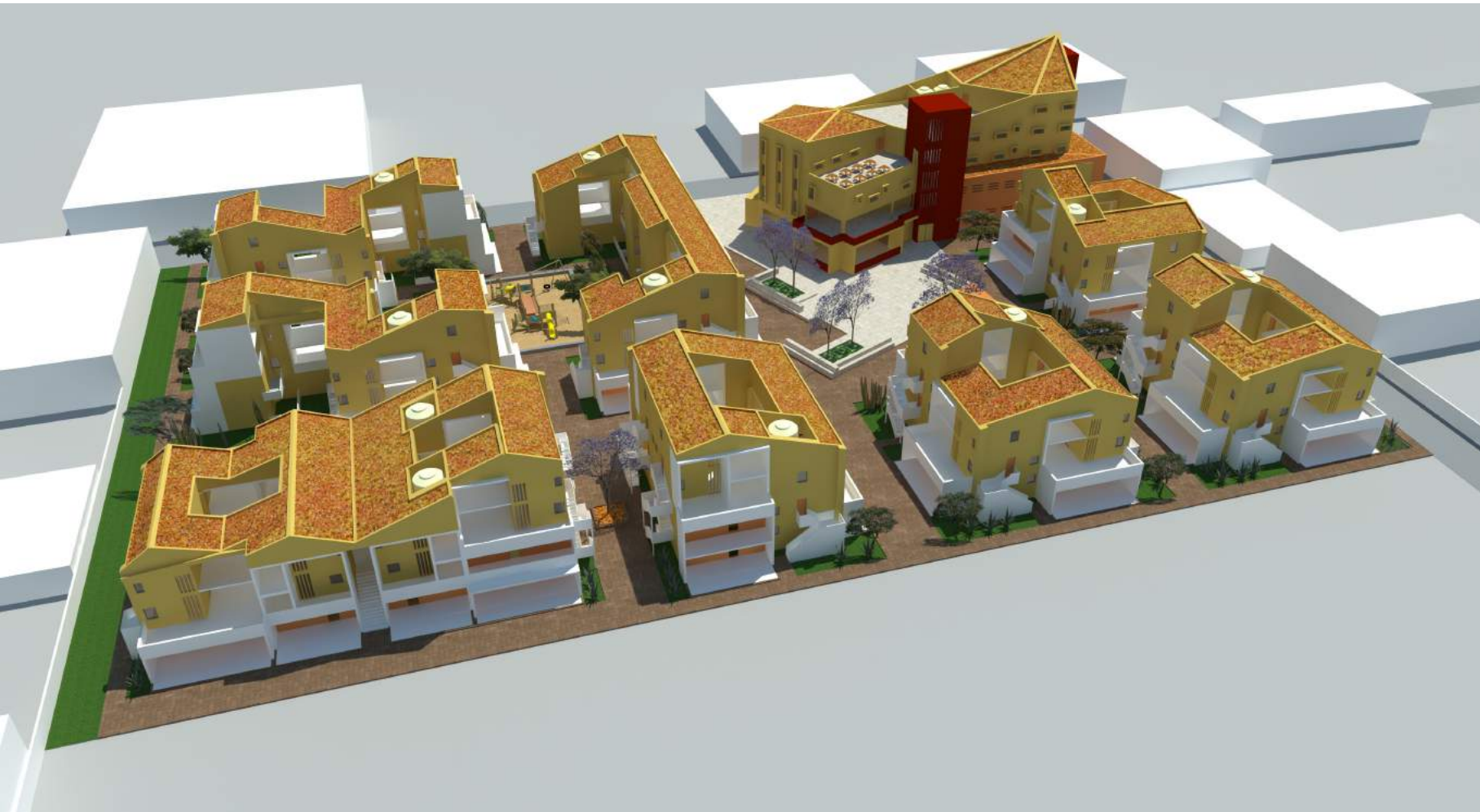
# Evolución

“Evolución” the Spanish word for evolution is the name of the area. This name was chosen because, the way that the area constantly will develop and adapt to the environment and the users. Even though the buildings will look finished when they are build, they will gradually change in to something different and reflect the people that lives in them. Even with all of them changing, they will still be part of a connected area, where the main form and roof of the buildings binds them together. It is not only the buildings that will evolve, people will get new friends and connections helped by the social- and user-based architecture.



III 46 Diagram; Concept







## Master plan

The site isn't huge, but by minimizing the front gardens and moving the parking to the parking block, the site can be both spacious and with a high building percentage. The site has many different spaces all created naturally by the shapes of the buildings. The whole area is car free and this also makes the site calmer and safer. There are many small green areas, which should both create shade and make the area feel welcoming.



# Apartment plans





## L apartment plan 1

The apartments on the ground floor are called L apartment. They have a front area divided in two, the first part is not covered and is only one meter deep. The second part is 3 meters deep and is covered, this area is where a possible expansion would be made. The first wall is a light weight construction of wood slats covered with plaster and with a thin 10 cm insulation in the center. The small kitchen is located so it is in the flow zone, creating a free area for dining and living room. There is also a small bathroom and two bedrooms, one bigger master bedroom and a smaller secondary bedroom. On the opposite side of the entrance is a door to a small garden. The garden can both be used for drying clothes or for social experiences. The apartment is 50 square meters.



III 51 Plan; L Apartment scale 1:100

## L apartment plan 1 expansion

The layout of an expanding apartments could change in many ways, the idea is that the two elements that are always located in the same place is the kitchen and bathroom. Even though that they are in the same location is it still possible to expand them. As seen on the left part of ill. 52 would it be simple to expand the kitchen when the light wall has been moved to the edge of the second entrance area. This expansion also allows them to increase the living and dining areas. Because of the apartment's close location to the public areas, would the expansion also be suitable for small stores, such as small convenient stores as seen on ill. 52 or a small restaurant. It is normal in Mexico to use the family's kitchen for small restaurants and being forced to walk through your store to get to your apartment.

The apartment is 80 square meters after the expansion.



III 52 Plans; L Apartment expansion scale 1:150

## L apartment plan 2

The second kind of L apartments is located on second floor with an entrance on the side of the apartment. This makes the small room even smaller, everything else stays the same. The area in the front can still be used for expansions, but it is only 2 meters deep instead of 3 meters. Instead of a ground level garden is there a small terrace.



III 53 Plan; L Apartment 2 scale 1:100

## L apartment plan 2 expansion

As in the first L apartment is there good changes to create new rooms. One way to expand could be to make to more rooms as seen on ill. 54 to the left. It is also possible to increase the dining and living area as seen on ill. 54 on the right.

The apartment is 70 square meters after the expansion.



III 54 Plans; L Apartment 2 expansion scale 1:150

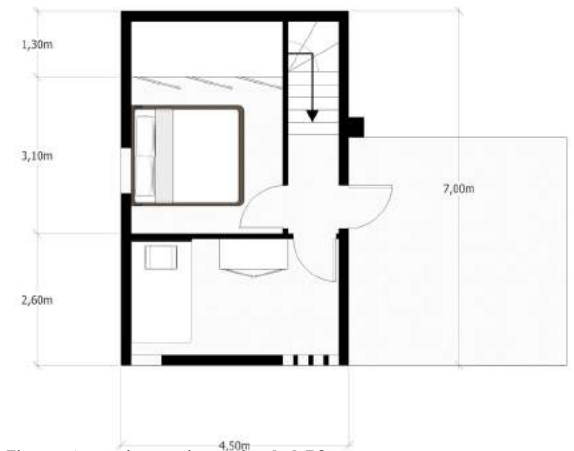


III 55 Visualization; L Apartment



## 2 Floor apartment plan

The “2 floor” apartment is located on top of the L apartment. The entrance is on the side. In front of the apartment is there a terrace area for social activities and drying cloth. On the opposite side of the entrance is located the area for expansions. This area is entered by walking through the center of the apartment, next to the kitchen. As in the L apartment, is there a living and dining area, a kitchen, a small bathroom and two bedrooms. The apartment seems a bit smaller and the L apartment because of the space the stair takes. But the area for expansions is bigger and this will compensate for the space the stair takes. The terrace is also bigger than the one in the L apartment. The apartment is 60 square meters.



III 56 Plans; 2 Floor Apartment scale 1:150

## 2 Floor apartment plan expansion

If all the area for expansions is used, then will the natural access to the terrace be closed. To create access, it is possible to make a door on the left corner of the living room instead of the window (see ill. 57). If this is not wanted, is it also possible to add the door in the expansion. On first floor is it possible to make to more rooms or one big room. The would also be an option to only to expand on one level, if the user needs more rooms, but can't afford the bigger living room. It is also possible only to expand on the top floor and keep the area on the bottom floor as one big terrace. The apartment is 100 square meters after expansion.



III 57 Plans; 2 Floor Apartment expansion scale 1:150

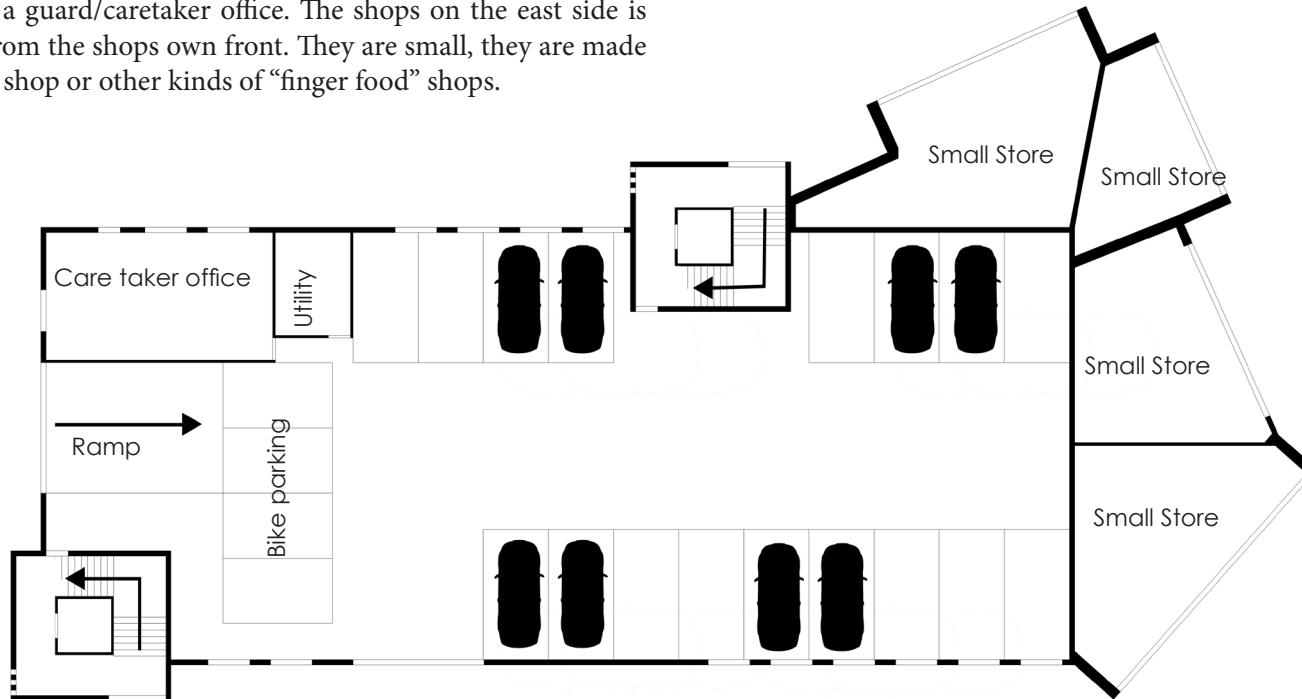
## Parking block plans



III 58 Visualization; Parking block

## 1st floor plan

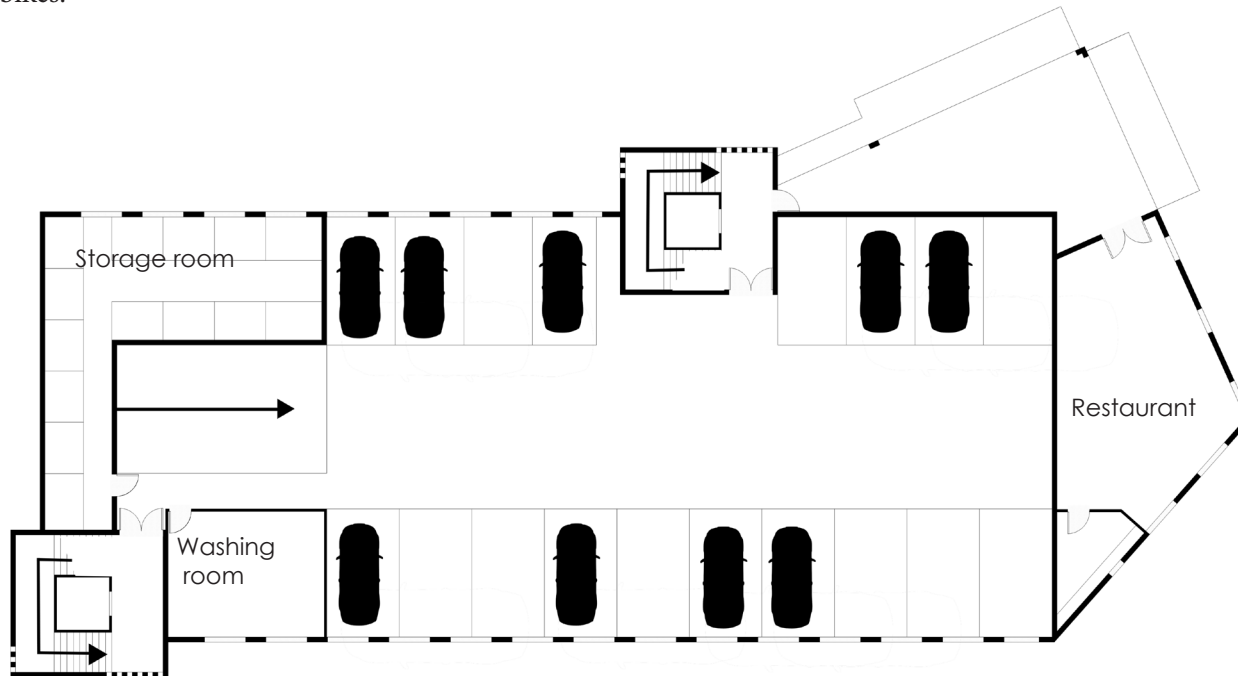
The 1st floor is mainly parking and shops, the parking is entered from the road in the south side of the site. There is also an entrance on the west side of the building, which leads up a ramp to the 2nd floor. The building has two entrances for people walking. Both have elevators and leads to all the floors. In the north west corner is a guard/caretaker office. The shops on the east side is entered from the shops own front. They are small, they are made for a taco shop or other kinds of “finger food” shops.



III 59 Plan; 1st Floor parking block scale 1:300

## 2nd floor plan

The 2nd floor is also parking, but instead of small shop is there space for a bigger restaurant. There is also a room for washing and drying clothes and a storage room. All can enter the restaurant; the parking and washing is only for the people living on the site. Combined is there 39 parking spots on the two floors, and an area for parking bikes.



III 60 Plan; 2nd Floor parking block scale 1:300



### 3rd floor plan

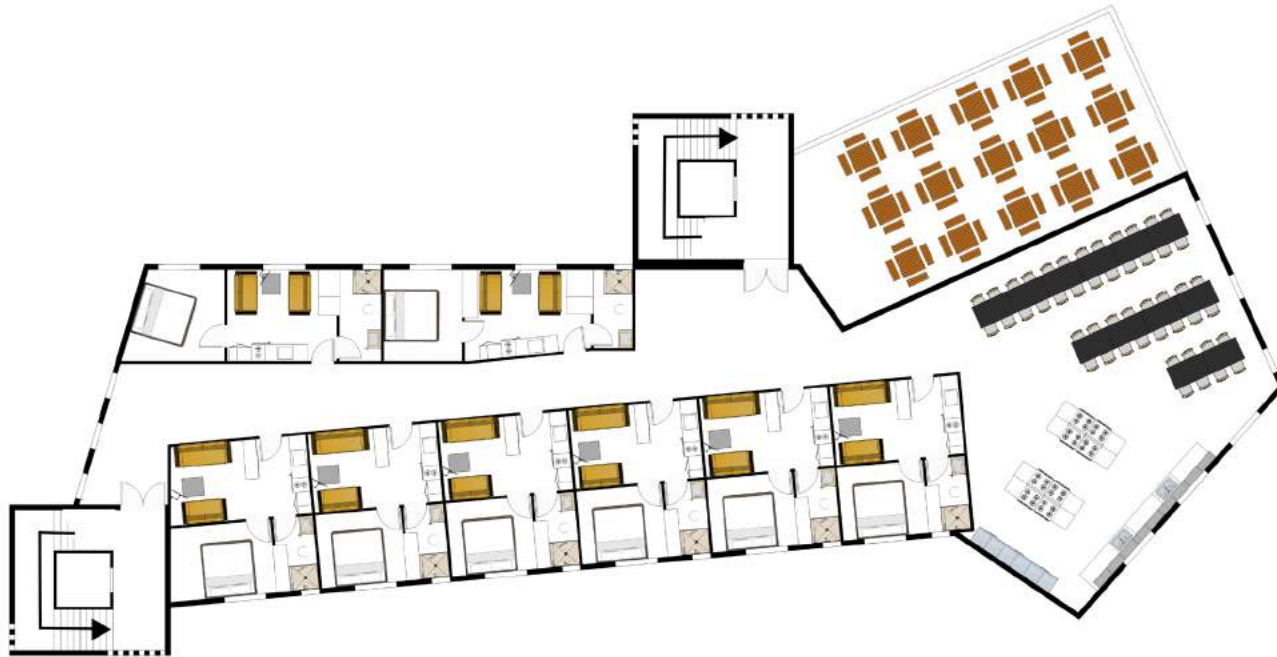
On the 3rd floor is there only apartments, they are between 30 and 38 square meter, the biggest have a challenging shape to decorate, with strange angles. The apartments have a living- kitchen-entrance room, a bedroom and a bathroom. The idea is that they use the shared kitchen 4th floor for bigger meals, but they can still eat small meals in the apartment.



III 61 Plan; 3rd Floor parking block scale 1:300

## 4th floor plan

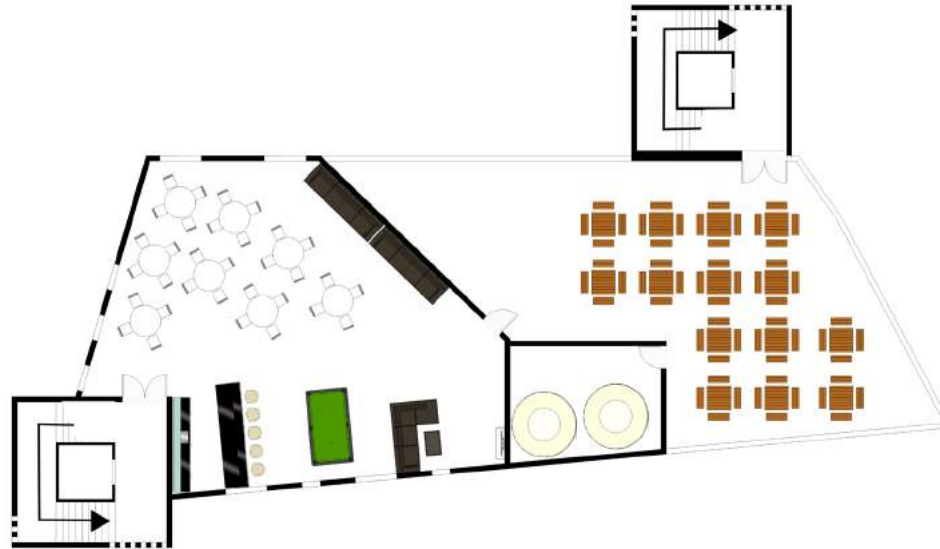
The 4th floor is also mainly for apartment, but it also has a shared kitchen and a big terrace. The two floors with apartments can only be accessed by the people living there or their guests, the goal is to create a small community, where the people trust each other and can help with big and small problems. The apartments are for rent, where rest of the apartments on the site are for sale.



III 62 Plan; 4th Floor parking block scale 1:300

## 5th floor plan

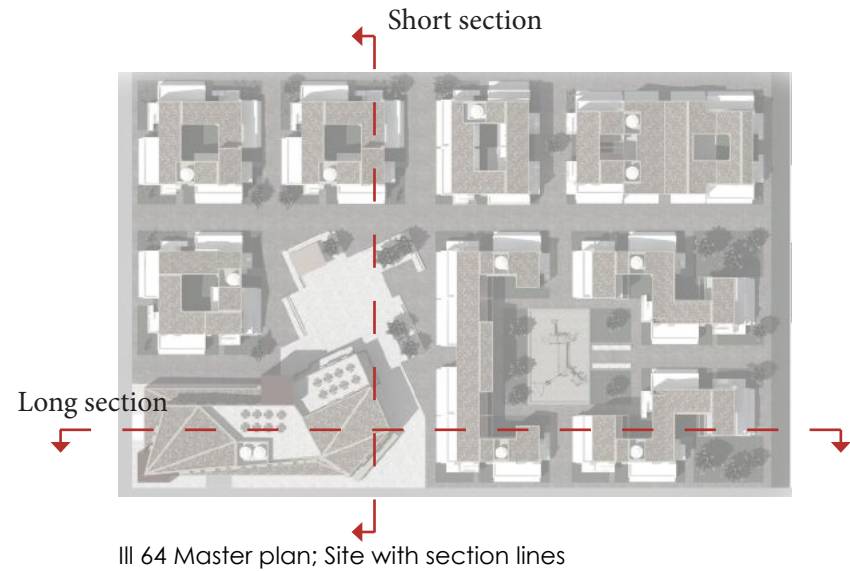
On the 5th floor is a big social room which can be booked for parties and events of the people of the site. The room is supposed to be user driven to further connection the people living on site. The idea is to make it easy to have an area to meet and have fun together.



III 63 Plan; 5th Floor parking block scale 1:300

## Cross sections

The sections give a clear idea of the effect of the roofs, they are both a strong combining factor and an element that gives a more dynamic feeling to the else simple basic shape of the buildings. The first floor of the parking block is 3.70 meters high, this is done to make the area better for food stores, both for the steam and to get more daylight. Where rest of the buildings have a room height of 2.7 meters.



III 65 Section; Long section scale 1:600



III 66 Section; Short section scale 1:500



## Facades

All around the city of Ixtapaluca is there mountains and the project “Evolución” give the appearance of creating even more. The many different roof heights give the area a playful atmosphere. The playfulness is even strengthened by the colors. The site has a lot of repetitions, but the roofs and the locations of the blocks, makes the pattern of repetitions disappeared. This makes the project standout compared to the other housing projects in Ixtapaluca. The roof and the different kinds of blocks create a feeling of a unique area. An area where everyone living there will feel that it is made just for them.



III 67 Facade; East scale 1:500



III 68 Facade; South scale 1:600



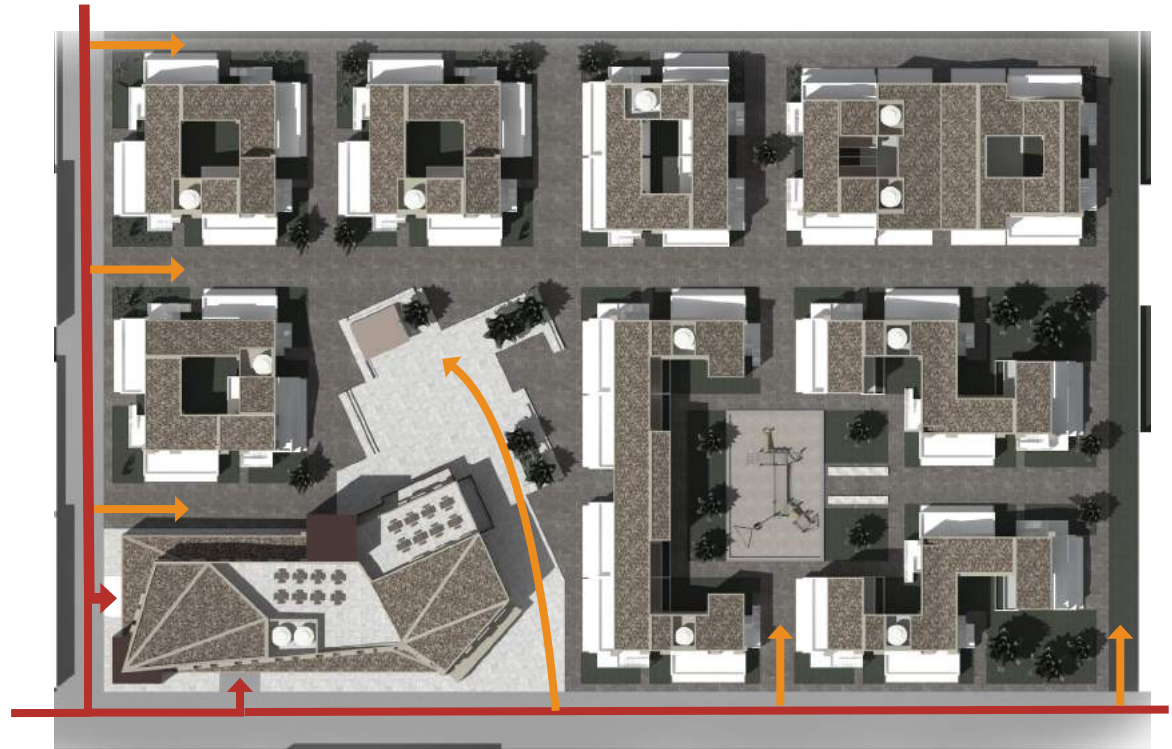
III 69 Facade; North scale 1:600



III 70 Facade; West scale 1:500

## Arrive to the site

There are two entrances for cars to the parking block. There is many for bikes and people walking, this should give a natural flow onto the site. The main entrance is on the south side of the site, where the pavement changes and nearly pulls people in to the plaza. The main entrance is it not a big open space, it is more like a strong invitation to something unknown. This also gives the plaza a more private and safe feeling, it is protected by the surrounding buildings.



III 71 Diagram; Arrive to site







III 73 Visualization; Arrive to site



III 74 Visualization; Arrive to site



III 75 Visualization; Arrive to site

## DGNB

The DGNB had a big impact on the design process and therefore also the final proposal. It has pushed the design in a direction where sustainable solutions became a natural part of the design. The main focus of the process has been social, but all criteria have worked together. In this section of the presentation will present each chosen DGNB criterion and they will be disused and explained.



## ENV 2.2 Wastewater discharge

The focus was on how to create a roof that could both insulate and ensure less drainage water and maybe even recover some water for toilets and watering plants. By making the roof pitch will it insure that the water doesn't stay in one point and leak through to the apartments below. As seen on ill. 76 does the water go from the roof down a drainpipe to a water tank, if there comes more water than the tank can take then it goes to the cloak. The water for washing and cleaning is pumped to the tank on the roof once a day, where it goes to the apartments from there. Drinking water in Mexico is bought on bottle.

The company Rotoplas is the most used water tank brand in Mexico. The company have a series of standard sized tanks. The project uses Rotoplas tanks, and each tank have been chosen to fit the need of each building. To find the right size have simple calculations been made, Rotoplas describe how much one family typically use, and then by multiplying that number with the amount of housing units sharing a tank. The tanks have to be placed high so the water can run down to the apartments. The pressure of the water in each home is effected by how high the tank is located. (<https://rotoplas.com.mx/top-tinacos-rotoplas-precios-caracteristicas/>)



Ill 76 Diagram; Water

## ENV 2.3 Efficient land use

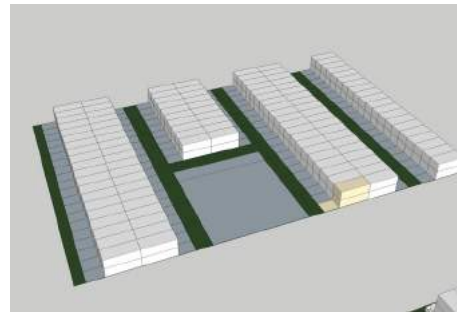
One of the other important elements in the process was to create an area that could be dense and have good outdoor areas. Judging this have be done by comparing the project to the first concept with the most compact site and an actual area in one of the other housing projects close to the site (San Buenaventura). Building percent is quite low when it is only the apartments that is included. If all the expansions are build and included in the building percent, then it is higher than the one of San Buenaventura. If all building is counted, the site has an even higher percent than the fictional concept.

	1 floor	Both Floors	Units	kvm	Expansion v.1
Top apartment	31.5	63	38	2394	40
Bottom floor	51.75		53	2742.75	27.6
Small apartment	33		20	660	
Total			111	5796.75	

Social rooms	288.5			288.5
Hall	253			253
Extra room	154			154
Shops	250			250
Parking	1010			1010
Total				1955.5
Apartment and other areas				7752.25

	Size	Unit	kvm	Site	Build procent
Full site with small plaza	80	120	9600	9840	97.6
Area in san bua	110	64	7040	9721	72.4
Apartments		111	5796.75	9378	61.8
All build			7752.25	9378	82.7
Apartments and expansions		111	8641.55	9378	92.1
All build and expansions			10597.05	9378	113.0

III 77 Diagram; Land use



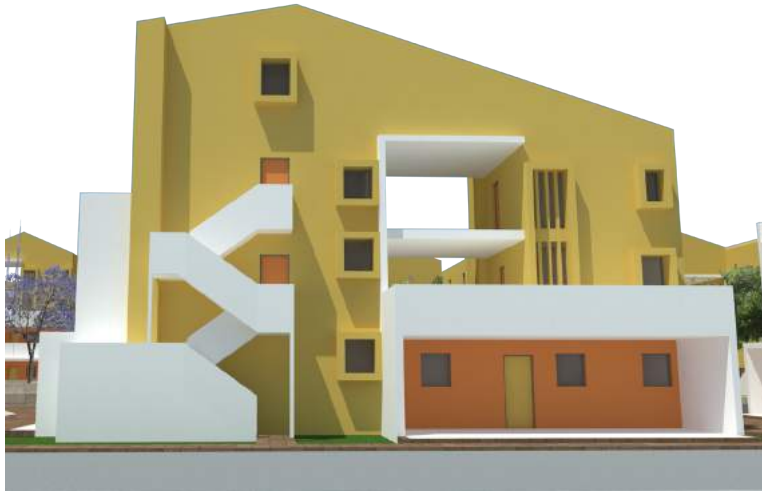
III 78 Sketch; Full site with small plaza



III 79 Map; San Buenaventura

## ECO 2.1 Flexibility and adaptability

The building's ability to adapt to the user has been one of the main elements in the project. It gives the user's family a chance to grow with the building. The building will change and become something else when the user starts to make it their own. The white concrete elements stand strong and when the user starts changing it, it is like they start using the canvas and create their own picture. If all part of the building could be expanded there would be no frame to hold the picture together. So, the yellow concrete and the roofs hold the building together and help keep the area from breaking in to pieces.



III 80 Visualization; Building without expansion



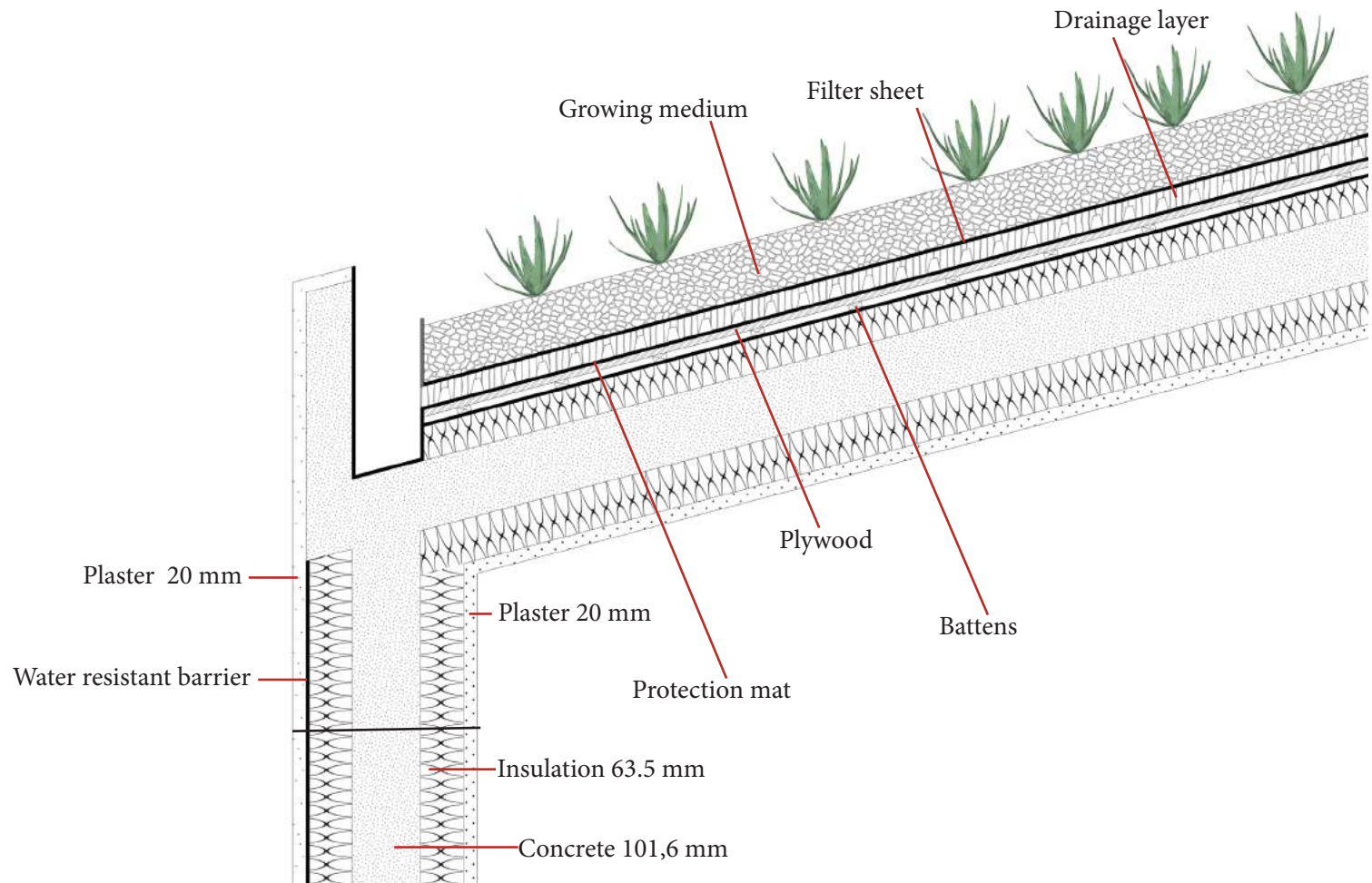
III 81 Visualizations; Building with expansion

## ECO 2.2 Robustness

### SOC 1.1 Thermal comfort

Many of the buildings in Mexico could look robust, but with no insulation of protection against water damage, they often break down fast. Make this project robust project have the walls and roof been insulated. Furthermore, have the green pinched roof also a great protecting effect on the building. The things done to make the building more robust have also so an effect on the thermal comfort. The insulation will help cooling the building on the warm days and keep it warm on cold days. The green roof also has a strong cooling effect on the indoor climate. When green roofs have been tested on homes in temperated climates on well in a insulated building does it have a clear strong cooling effect. This would seem even greater on a none insulated building or building with only little insulation. ([https://www.researchgate.net/publication/260862666\\_GREEN\\_ROOFS\\_AS\\_PASSIVE\\_COOLING\\_STRATEGIES\\_UNDER\\_TEMPERATE\\_CLIMATES](https://www.researchgate.net/publication/260862666_GREEN_ROOFS_AS_PASSIVE_COOLING_STRATEGIES_UNDER_TEMPERATE_CLIMATES)) It will therefore be a good stretegie to use green roofs on the projects buildings.

The wall and decks of the building are made with use of a building module called “BuildBlock” it is a simple construction. The main material in the module is made of rigid expanded polystyrene foam with high density. It is structured with two galvanized steel profiles. The foam modules can be but together by stacking them on top of each outer. Then the final shape and hight is reached, reused concrete and steel are being put in the center module between the foam elements. (<http://buildblock.com/>) This is a easy process, which should insure a well build home. The walls are covered by two thin layers of plaster on both inside and outside of the wall. All indoor concrete and plaster materials are polished.

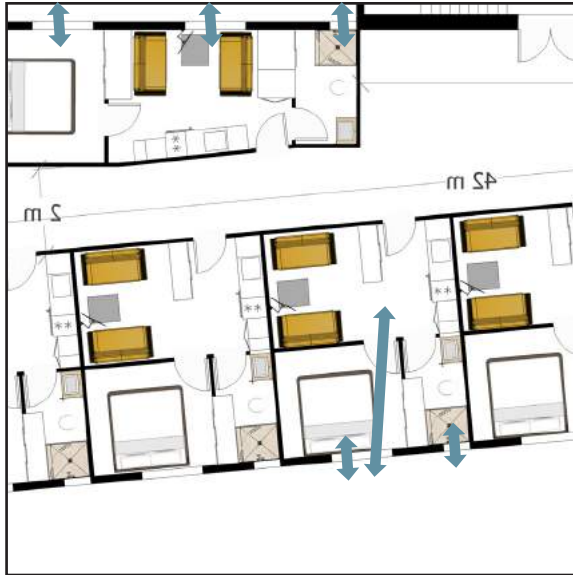
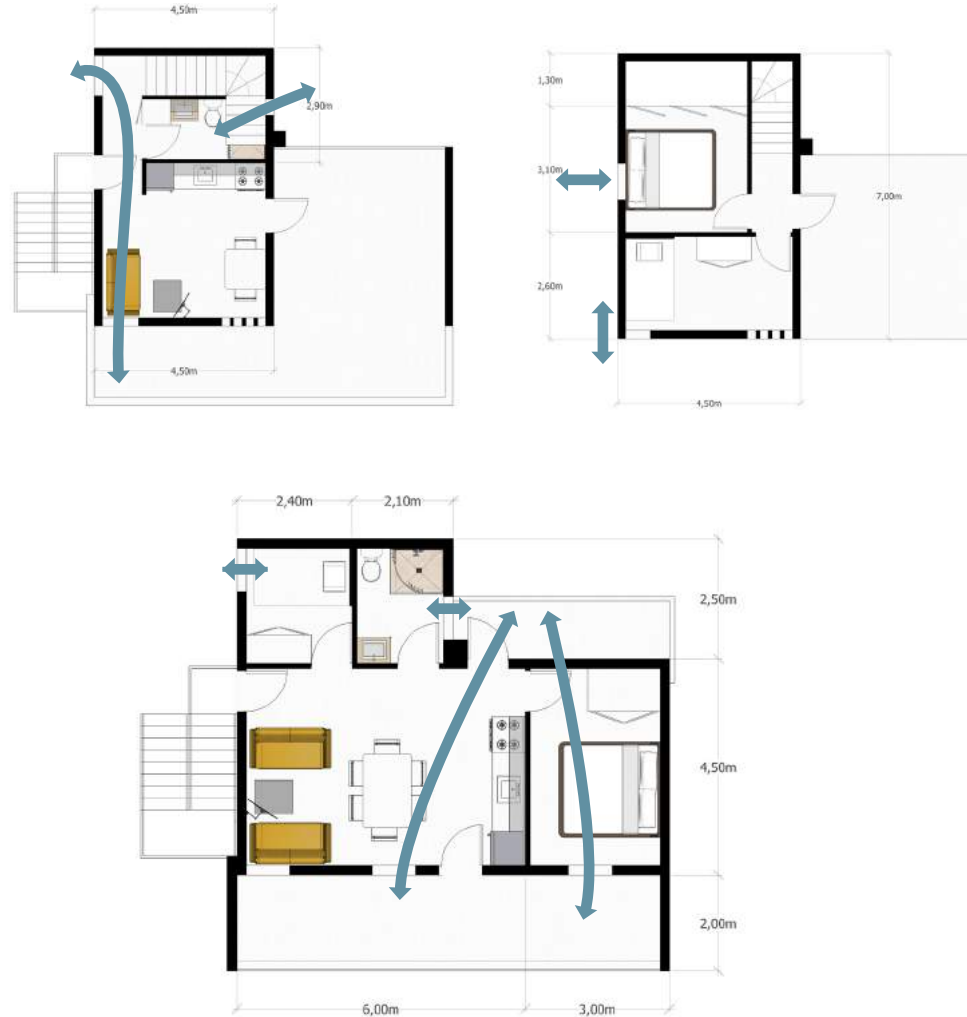


III 82 Detail; Green roof and wall 1:10



## SOC 1.2 Indoor air quality

To insure good indoor air quality, was the main concept to give all main rooms possible cross ventilation and all other should have at least one window to insure good air flow in the rooms. In the apartment in the parking block is it necessary to ventilate through the bed room, normally that wouldn't it be good to let the air from a kitchen go through the bed room, but in the apartment will there be minimal cooking.



III 83 Diagrams; Ventilation of apartments

## SOC 1.4 Visual comfort

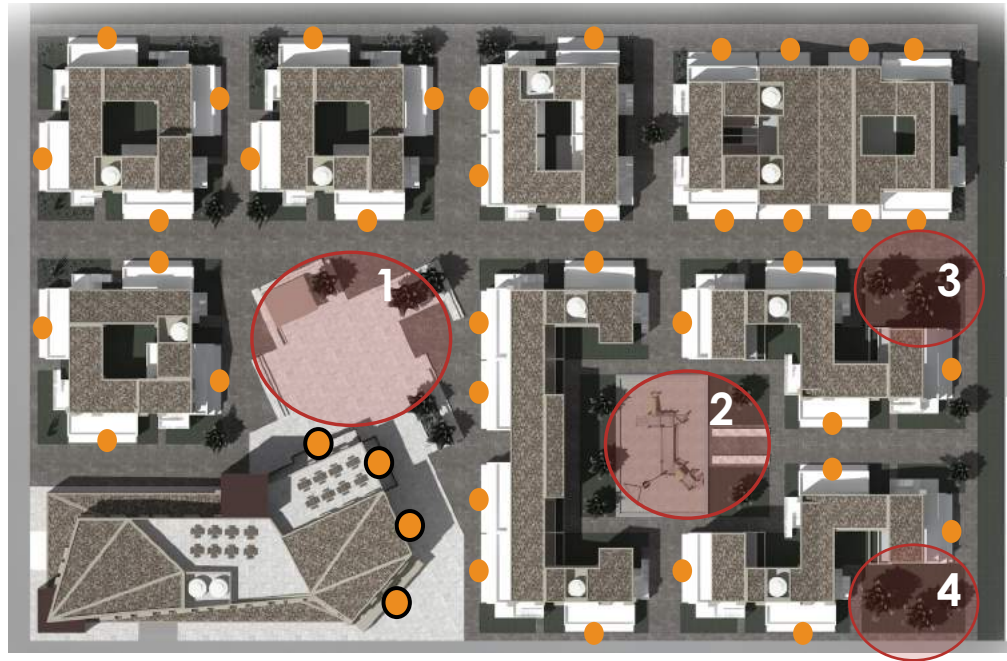
The apartments mainly have small windows and this will affect the daylight, furthermore have all south turning windows outdoor shading boxes, to avoid overheating in the rooms. This will also decrease the daylight a bit. But the idea is not to make windows that always will be covered by curtains as you would see on all building with big windows in Mexico. So, the main goal was to make windows that could be used without making the rooms to warm. One way to get quite a lot of daylight is by making a long window that are split in 4 small, this will stop sun light, but allow daylight to get in. All work places have big openings, but also more ways to ventilate.



III 84 Visualization; South turned building

## SOC 1.6 Quality of outdoor areas

There are many different experiences on the site. On ill. 85 is the main outdoor areas marked with big circles. The small circles show shops that possibly could be build, and the small circles with a black outline is the ones that a build from the start. The first big social area is the main plaza located north of the parking building, it is an active space and this is the place for events and social meetings or the place to buy your dinner. The square in the upper left corner, can be used for small concerts or just a place for cover if it rains (see ill 87 on page 98). The plaza has benches and trees to create shade when sitting there. The second area is a more private area, a place with a playground and some benches, a safe place for the families. Number 3 and 4 are just green areas, they don't have a function beside than creating shade and a good atmosphere. The many shop opportunities, allow the area to grow in to a small shopping area, but on a human scale where the stores will be controlled by the people living there.



Ill 85 Diagram; Outdoor areas on site



III 86 Visualization; Plaza and parking block





III 87 Visualization; Plaza seen from parking block



## SOC 1.7 Safety and security

There are many ways to ensure safety on the site, one way is to increase the people looking at the street, and have more people walking around. But it is important that they care about the area else it will not have an effect. It is therefore important to make the people feel strongly connected to the area and each other. It is easier to steal from strangers than people you know. So, by making people expand their houses they invest in the area, and by meeting on the social areas they get to know their neighbor. Furthermore, by removing the cars from the area, safe walking and cycling areas have been created. Another way to make people feel safe, is to create entrances that are private and only used by few families. Most apartments on the project have their own entrance, either by stair or through the front of the apartments. Some share with one other family. If the stairs were used by many, nobody would feel real ownership and they would become unclean and unsafe. The red circles on ill 88 show some of the entrances, where most are only for one family.

## SOC 2.3 Conditions for cyclists

In Mexico not many cycle, so by creating a car free area, it helps creating a safe place for cycling. It would be a good place for young children to learn to cycle, on streets with no cars. Some of the street will at some parts of the day have many people, but there will always be another quieter street nearby, where fewer people walk. The red lines indicate some of the many small streets.



Ill 88 Diagram; Entrances and bike roads

# Part 4 Epilogue

## Conclusion

The base for the project was created with a long research paper. The paper made the framework in form of a series of principals. To create a project a site had to be chosen what lived up to the principals. By choosing a site, a context was also chosen, this context was analyzed and became part of the framework for the project. Furthermore, was a series of DGNB criteria chosen to make the project sustainable. The principals were the elements that carried the theory from the first paper to the second, it was the principals that helped ideas to be made and chosen.

The project is an example of how ideas can be made by following strong principals. The project is collection of simple apartments. Apartments that give the users the just essential, places for users without a lot of money. Homes where the users can grow, they can make the apartments grow in the same speed as their savings and families grow. There is no need for big loans, the apartments can change in the same speed as the families get the money for the changes. By creating 3 main kinds of apartment, there will space for different people. The two biggest apartments for people who wants to buy and share less, and a smaller for rent and for people that are ready to share with other people. The user will invest a lot in making the area feel like home, it is therefore important that the building will withstand the climate and that the homes have good indoor climate. This have been achieved by insulation the walls and roof, and by having a green roof. The apartments have many windows so all rooms can be ventilated, but the windows are small and placed so the building won't overheat, but still have light and fresh air. Most homes in Mexico have problems with leaking roofs, by adding the green pitched roof the buildings are also secured against this problem.

The Mexican people are not always indoor and to insure a strong connecting to the area, is it also important to create a well functional outdoor area. By making the buildings tall and still on a human scale, has it been possible to create a site with many homes and still a lot free space. This free space has been used to create different experiences, one main plaza with a dynamic atmosphere, a playground area with a calm feeling and other small green areas. The outdoor areas are also a big part of the shared experience. None of the apartments have big kitchens, so some will be expanding their kitchens. Some will just use it as it is. Many will use the many small food stores that are located on the site, here will they meet their neighbors, and some will then eat together. Each apartment also has an outdoor area, this will at times be used for grill parties. Another way of share living is the way that will happen when the people decide to live more generations in one unit. This is made easy by the many possible ways the homes can be expanded. The shared lifestyle created in the small apartment in the parking block, gives opportunities to create strong relationships with the other people from the building. The site will constantly be changing, and each user will be part in the process of letting the evolution happening. On each step it will look finished, but it will always be adapting to the new atmosphere created by the users.

## Reflection

The project was response to the research created in first part of the long thesis, the result was an example of how affordable housing in Mexico and especially in Ixtapaluca could be made. The project has in most aspect lived up to the principals. One of the most important aspect of a building project, is trying to make it possible to finances, it would therefore have been helpful to have calculated a building price. This could only have been done while being in Ixtapaluca, which sadly was not possible. Even without a clear calculation it is possible to say that the project is cheaper than most buildings in Denmark, but it is likely not cheaper than other affordable houses in Mexico. Even when the base house is small, it would be well build and with insulation and good installations, which often isn't is the case in other cheap homes in Mexico. The next challenges would therefore be to find the best arguments to build homes of better quality. The task would be to convince them to buy a smaller home that is well build instead of a big poorly build home. This is also why it is important to start with small scale project, so the buildings won't stand empty, resulting in becoming part of the problem. It is therefore possible that many compromises have to be made, to make the price more attractive. It will therefore be a long process to make big changes, but by introducing this project there is another way of making social housing. A change to make architecture that makes the user happy.

## References

To see references for this paper, look at the references list of paper 1 on page 87.

## Illustrations

Own

Ill 1 Picture; San Buenaventura <https://www.pinterest.es/pin/565483296934212578/>

Ill 2 Maps; Ixtapaluca <https://www.google.com/maps>

Ill 2 Diagram; Methodology Own

Ill 3 Picture; Ixtapaluca 1875 <https://www.facebook.com/Nuestro-AntiguoIxtapalucaChalco/posts/1461329437293780>

Ill 4 Picture; Ixtapaluca <https://es.wikipedia.org/wiki/Ixtapaluca>

Ill 5 Picture; San Buenaventura [http://www.liviacorona.com/#S7,,Two\\_Million\\_Homes\\_for\\_Mexico](http://www.liviacorona.com/#S7,,Two_Million_Homes_for_Mexico)

Ill 6 Pictures; Ixtapaluca market <https://www.google.com/maps>

Ill 7 Pictures; Ixtapaluca party <https://twitter.com/IxtapalucaAntes/status/868639296990957568>

Ill 8 Map; Ixtapaluca site <https://www.google.com/maps>

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# Appendix 1

## Oversigt over kriterier

TEMAOMRÅDE	KRITERIEGRUPPE	KRITERIUM	ANDEL (%) AF DEN SAMLEDE BEDØMMELSE
PROCESKVALITET	PLANLÆGNING	PRO 1.1 Kvalitet i forberedelsen af projektet	1,7 %
		PRO 1.2 Integreret designproces	1,7 %
		PRO 1.3 Vurdering og optimering af kompleksitet i planlægningen	1,7 %
		PRO 1.4 Bæredygtighedsaspekter i udbudsmateriale og ordretildeling	1,1 %
		PRO 1.5 Vejledning om vedligehold og brug i bygningen	1,1 %
	UDFØRELSE	PRO 2.1 Byggeplads og byggeproces	1,1 %
		PRO 2.2 Dokumentation af kvalitet i udførelsen	1,7 %
MILJØKVALITET	GLOBAL OG LOKAL MILJØPÅVIRKNING	ENV 1.1 Livscyklusvurdering (LCA) - miljøpåvirkninger	7,9 %
		ENV 1.2 Miljørisici til byggevarer	3,4 %
		ENV 1.3 Miljøpåvirkning ved indvinding af materialer	1,1 %
	RESSOURCE-FORBRUG OG AFFALD	ENV 2.1 Livscyklusvurdering (LCA) - primærenergi	5,5 %
		ENV 2.2 Drikkevandsforbrug og spildevandsudledning	2,3 %
		ENV 2.3 Effektiv arealanvendelse	2,3 %
ØKONOMISK KVALITET	TOTALØKONOMI	ECO 1.1 Bygningsrelaterede levetidsomkostninger	9,6 %
	ØKONOMISK FREMTIDSSIKRING	ECO 2.1 Fleksibilitet og tilpasningsevne	6,4 %
		ECO 2.2 Robusthed	6,4 %

SOCIAL KVALITET	SUNDHED, KOMFORT OG BRUGERTILFREDSHED	SOC 1.1 Termisk komfort	4,3 %	!
		SOC 1.2 Indendørs luftkvalitet	2,6 %	
		SOC 1.4 Visuel komfort	2,6 %	
		SOC 1.5 Brugernes muligheder for styring af indeklimaet	1,7 %	
		SOC 1.6 Kvalitet af udearealer	1,7 %	
		SOC 1.7 Tryghed og sikkerhed	0,9 %	
	FUNKTIONALITET	SOC 2.1 Tilgængelighed	1,7 %	!
		SOC 2.2 Offentlig adgang	0,9 %	
		SOC 2.3 Forhold for cyklister	0,9 %	
	ÆSTETIK	SOC 3.1 Arkitektonisk kvalitet	2,6 %	
		SOC 3.2 Bygningsintegreret kunst	0,9 %	
		SOC 3.3 Plandsponering	1,7 %	
TEKNISK KVALITET	TEKNISK UDFØRELSE	TEC 1.1 Brandsikring og sikkerhed	3,0 %	
		TEC 1.2 Akustik og lydisolering	4,5 %	
		TEC 1.3 Klimaskærmens kvalitet	3,0 %	
		TEC 1.4 De tekniske systemers tilpasningsevne	3,0 %	
		TEC 1.5 Bygningens vedligehold og rengøringsvenlighed	3,0 %	
		TEC 1.6 Egnethed med henblik på nedtagning og genanvendelse	1,5 %	
		TEC 1.7 Commissioning	3,0 %	
		TEC 1.8 Dokumentation med miljøvaredeklarationer (EPD)	1,5 %	
OMRÅDETS KVALITET	OMRÅDE	SITE 1.1 Ydre miljøpåvirkninger	0,0 %	
		SITE 1.2 Områdets og kvarterets image og tilstand	0,0 %	
		SITE 1.3 Trafikforbindelser	0,0 %	
		SITE 1.4 Adgang til faciliteter i nærområdet	0,0 %	

! Knockout-kriterier, hvor der kræves en minimumscore

Oversigt over kriterier i DGNB