11-3-2008

Socializing Housing Phased Early Response to Impromptu Migrant Encampments In Lima, Peru

Raul E. Mayta
University of South Florida

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Socializing Housing
Phased Early Response to Impromptu Migrant Encampments
In Lima, Peru

by

Raul E. Mayta

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Architecture
School of Architecture and Community Design
College of Graduate Studies
University of South Florida

Major Professor: Vikas Mehta, Ph.D.
Trent Green M. Arch.
Franklin Sebastian M. Arch.

Date of Approval:
November 3, 2008

Keywords: Migrant Encampments, Low Income, Mountainous Architecture, Peru, Social Housing
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Dedication

To my parents who show me the meaning of hard work, to my high school friends in Peru who always supported me. And to Hannah for showing me the meaning of true friendship.
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ABSTRACT

Every year hundreds of people migrate from the highlands of Peru to the coastal capital of Lima searching for economic and social stability. These groups of people have similar characteristics that keep them together: they come from the same city, are members of the same family, have the same religion, have similar goals, and so on. Once in Lima they take possession of the only free areas left in the city: the mountains. Due to a lack of economic resources, poor urban planning and unsuitable site conditions, the settlements grow for years in a disorderly, unsafe and unsanitary way, creating dangerous conditions for themselves and for the neighboring communities.

The Private Bank of Materials and the government’s overdue efforts to fix these neighborhoods by reinforcing the retaining walls, building roads, planting trees, or connecting utility services do not address a neighborhood reorganization strategy but rather a “face lift” of the existing housing units.

This thesis aims to come up with an early response to the housing problem focusing on the design of a self-sustaining neighborhood organization where the housing structure complements the social public spaces. By organizing the urban fabric in a way that the neighborhood accommodates the density needed to keep the cost low, as well as provide the necessary gathering spaces, a richer social environment can be developed. This reorganization considers the residents’ socio-cultural characteristics, public spaces, dwelling, flexible program, urban integration, and the site’s topography.
During the research, I lived with the community for two weeks, analyzing the existing public realm and its surrounding neighborhoods focusing on their gathering spaces. These studies included visual information and interviews documented through a journal, photographs, and videos all focused on residents’ social behavior. I visited and analyzed similar housing projects emphasizing the flexibility of their programs.

I also looked at affordable construction methods in order to select the most appropriate to implement on site. The engineer Jose Pelaez (Florida department of Transportation) guided my project in its geographical aspect so that it became feasible. These studies lead to the development of an organizational system that creates a community focused on social interaction.
CHAPTER ONE
SOCIALIZING HOUSING

Introduction to the Project’s Concepts:

According to Spiro Kostof; “cities grow constantly creating new areas sometimes connected through the city fabric.” These new areas are classified as formal or informal. The formal sector is planned and enjoys advantages such as utility services (water, sewer, and electricity), social networks, and good transportation infrastructure. On the other hand the informal areas grow from the “spontaneous, undirected, untrained efforts of the squatters”, and usually do not have any basic services, street networks, or a built environment suitable for living. In Latin America the informal sector constitutes at least 34% of the total population; in Lima Peru alone, the numbers go up to 3 million. According to the 2003 national Census, 87% of the population living in informal districts has migrated from the rural areas to Lima. These immigrant groups have formed new neighborhoods called “acentamientos humanos” (“human settlements”); a type of housing development located between the limits of the city and outskirts of the mountains. These “human settlements” started taking possession of federal property illegally, building temporary housing units such as tents and cardboard shelters. The illegal character of the settlement is an impediment to obtaining help from the government or other institutions; therefore their development depends only upon the neighbor’s resources. These areas struggle for years to survive without basic services that can provide a "standard" quality of life to the growing number of neighbors. Many years later (from 5 to 12 years) the original tents are replaced with brick structures and eventually the neighborhood presents stable living units. “Las Flores” is one of the “acentamientos humanos” affected by extreme densification, lack of planning and lack resources during the past twenty five years. As a result the settlement has been disconnected from the city network, has no public spaces, contains numerous dangerous environments and has no utilities or defined functional areas.
The government’s overdue efforts to improve the neighborhood are focusing on the “superficial” improvement of structures: painting houses and planting trees. The housing areas that started to develop in a clear organic way ends up creating environments similar to the subsidized housing projects around North America and the world; similarities such as: segregation, crime, lack of green spaces and dangerous areas. The “subsidized housing” and the “Acentamientos Humanos” show lack of planning for areas of social development. According to Mr. Steven Rothenberg Psy. D., Using public spaces will increase our social relationships, these relationships are fundamental for the development of a social character.

“We are dependent upon our relationships to provide us with a sense of well being and to support us in our times of need. When these relationships fail us or when our behavior or difficulties become obstacles to obtaining the gratification we need, then we are without an important lifeline necessary for emotional survival...”

In order to avoid the unfortunate consequences mentioned in “Las Flores” it’s necessary to propose and early “organizational plan” based on the way residents will interact in their neighborhood and build social relations. The proposed plan has special emphasis first: on understanding characteristics of the immigrant population, second: public spaces, housing infrastructure of both the unit and the group, third: the urban network (integration) and finally: topographical influence of the site.

A. Characteristic of the Immigrant population:

Besides understanding the general characteristics of race, income, cultural background of the immigrant population, it is also important to understand their way of life. Only then can the study propose effective and suitable alternatives for the future neighbors. During the investigation stage of the project; interviews were done in order to find the common customs that can influence the design of spaces, both public and private. Included in the research were site visits to neighboring “settlements” (with different development stages) as well as observation and documentation of specific conditions. Throughout these investigations, the research was focused on understanding who the targeted population is, what their customs are and what their main social expectations towards their new neighborhood are:
1. Who are the immigrants in Lima?
According to the INE (National Institute of Statistics and Economy), most of the immigrants are people under 34 years old (57% between fifteen and thirty four, 24% under 14 years old) originally from the highlands of Peru. These people have migrated to Lima mainly to obtain a better education, as education is considered the main way to improve their economic and social status. Of these immigrants, 90% of the school age population (in “acentamientos humanos”) attend some school or college in Lima. All the members of the family work to contribute to the household income—the starting working age is 6 years old, where children work after school mainly selling groceries in the street. Most of the immigrants above school age have some knowledge of agriculture and farming which is not the most applicable for finding a good job in the city. Because of this, therefore they are “forced” to work in street commerce (50%) or other activities such as construction, security staff, textiles, or housekeeping.

2. What are the immigrants’ customs?
Some of the various customs that could lead into space definition include:
   a. Carnivals:
      During the month of February people from the highlands celebrate the carnivals with two purposes—celebrating the days before Lent and giving thanks to mother earth for the products obtained in the past year. During these festivities the community exhibits their cultural arts through music, dancing, sculpture and painting. Neighborhoods often form parades and march from block to block inviting everyone to the party. This once a year celebration is the only time people stop working to be part of a social group.
   b. Weekend markets:
      Every Sunday after church, each neighborhood’s plaza becomes an informal “commercial fair” where people sell (sometimes exchange) homemade products. The distribution of space is informal; each neighbor takes an area along the sidewalk where they display their products. These products mainly include handicrafts, and food. During these markets there is usually some musical expression happening in the middle of the market. The Sunday markets are also places for neighbors to discuss the current community issues.
c. Productive Backyards:
Coming from an agricultural background, the immigrant families in Lima give particular importance to their house’s backyard and create mini farms. People grow fruits or medicinal herbs in their back and front yards. In these instances, plants are appreciated for their use more than for their ornamental appearance. Because green areas are limited due to lack of water, few green areas are used for non-production purposes.

3. What is the immigrants’ main social expectations?
According to the PDPU’s (Program for the Urban Property) survey the second main reason for people to migrate is the search for social security. The thesis research didn’t analyze all the issues concerning social safety; however it will locate the “dangerous” environments where the major percentage of delinquency is observed in order to avoid/improved them through the design proposal. From the studies in “Las Flores” we can identify at least three of the main insecure sectors of the neighborhood:

a. The Stairs:
Even though they are the most transited spaces (only vertical circulation elements), they are dangerous because of their narrow dimensions and numerous intersections. These intersections are places where delinquents can hide through a 24 hour period.

b. Pedestrian Streets:
Due to the extreme densification of the neighborhoods, most of the streets end up being only for pedestrian access. The standard streets observed were about 800 feet long (minimum) by only 8 to 10 feet wide. The streets become especially dangerous at nights.

c. Recreation Facilities (soccer fields):
Barely used during weekdays, they become very visited at nights by drug dealers and gangs who choose this space for meetings and fights against rival gang groups.

B. Public Spaces:
Given the research of social character, the focus was finding public spaces suitable to the social needs of the neighborhood. The studies will
be based on visits and documentation (video, pictures and journal) of existing public spaces. The selection of precedents was done according to their multi-functionality and frequency of use; this selection didn’t limited to spaces existing in low income sectors. Some of the spaces to analyzed were:

1. **Parks (green areas):** As mentioned before, the green areas will have a functional character (not only ornamental) due to the lack of water. Some water-less facilities such as skate parks were considered due to the growing popularity and good influence among people of the area.

   The studies on green functional landscape by Kongjian Yu (Turenscape) was considered an important precedent due to the similar conditions with the site (low budget, functionality and search for social identity). Mr. Yu centers his designs on representations of city’s history as a way to develop unity and identity among the community; satisfying the neighbor’s social needs. Yu’s use of native elements is another approach to explore during the studies.

2. **Plazas:** Traditionally plazas have been the “official meeting area” between authorities and neighbors; they are also used for weekend events and informal commerce on weekdays. They are also characterized by the presence of a very small amphitheater which serves as a stage for street performers; its use is limited to daylight because at night it becomes a gang meeting spot.

   Kongkian Yu’s approach to plazas will also be a precedent. On his Dujiangyan plaza; historical events are expressed using pavements textures and landscape features. The square design to serve not only as recreation but as the main transition between two neighborhoods, the project also includes an innovative use of water; where irrigation channels create a stream thanks to the use of the steep natural slope of the site. Dujiangyan Square provides spaces with different scale of privacy on a 24 hour schedule; having small spaces for couples and elders to play cards (used during day), and at the same time bigger spaces for groups and tourist (used at night).

3. **Stores and Market’s outside area:** Mainly a daylight activity, it concentrates some of the informal street commerce, becoming a dirty and highly transited area. The intensity wears off at night when it becomes a “normal” street.
The research also considered the informal public places (spaces that were not meant to be social but that are regularly used by groups of people). These spaces were located after the visit of the site:

1. Street Corners: Most of the street corners are accompanied by an extra element such as news stand, grocery store, bus stop. Either accompanied by an extra element or by itself the corner is place for casual meetings.

2. Stairs: Due to the hierarchical presence of the stairs on site, the investigation will be focus on finding approaches to convert this circulation space into a more public place.

C. Housing Infrastructure:

The project is centered around an “adequate” social transition from the public spaces to the housing units (public to private relationship). For this purpose, first the research centered on the housing unit and then its organizational group.

1. Housing unit: Due to the limited budget and to the changing family needs the unit’s program needs to satisfy two main needs: flexibility and social character.
   a. Flexibility:
      The research looked at projects like the “Elemental-Iquique” by Alejandro Aravena for its accomplishment in flexibility. The Elemental-Iquique project changed the perspective for social housing, creating units that “will gain value”. To satisfy the required density with the limited budget, the initial unit's program was restricted to the minimum basic dwelling spaces. The decision was taken understanding that the “50% of the unit would be self built”, this design strategy was to create flexible spaces that could expand within its initial structure.
   b. Social Character:
      The social areas present in the “standard” house will be studied based on their frequency of use. These social spaces included: living room,
balconies, and a special focus in garden typologies. The social importance of the garden is commented by Phillip Bay in his book “Tropical Sustainable Architecture”:

“The survey shows that residents with more plants in there fore courts tend to know more neighbors, and have a higher sense of community, belonging and security”.

According to Bay there is an interrelationship triangle where people, climate and gardening in semi-open spaces are connected. In this triangle the neighbors play the key role keeping in touch with nature and enjoying the outdoor living spaces. At the same time the micro environment created by the green space facilitates ample gardening activities, then casual encounter with neighbor’s increases too.

2. Housing Organization: Once the basic unit was defined, the research focused on housing organization typologies such as: housing towers, clusters, and individual units. The organization must create new spaces and functional areas that complement the existing public/private realm. The selection of precedents was based on similar conditions such as topography, budget and culture. One of the chosen projects was the Elemental housing in Iquique by the arquitect Alejandro Aravena (Chile), selected for their innovative proposal for public spaces with sports functionality.

D. Urban Network:

The “Human settlements” are currently located between the mountains and the limit of the city. Its location has been one of the reasons for these neighborhoods disconnection from the city, therefore the Project mentioned some strategies to re-connected it to the neighborhood back to the city fabric. With this goal in mind, we explored the use of roads with vehicular and pedestrian purposes.

1. Vehicular Roads: The main goal will be to connect and limit the car access into the site. Because of the site inclination, it will be necessary to study the road requirements (maximum slope, etc.). The Japanese public housing (Daichi) road system achieves a balance between cars and people, this example will also be observed during the thesis research.
“Our housing complex is relatively safe from vehicles, which allows our children to grow more independently outside, and to be able to build good social relationships with other children.” (Daichi owner)

2. Pedestrian Streets:
Once the car accessible areas were defined, the pedestrian network will be defined, given their main role in social activity (communication, entertainment, etc).

3. Topography: Due to the peculiar geographical conditions, the studies considered its elements along each of the final design strategies. The main physical requirement for building in the mountain is Retaining walls, for its design we'll look into vernacular ways of building it. (for being affordable and an expression of Peruvian history)

Conclusion
As described before the research stage included the selection and analysis of housing precedents, analysis of the chosen “acentamiento humano” and similar sites (with different development stages). The observations were documented through pictures, videos and journals. On site interviews with the residents were done in order to get an inside perspective of living in the “human settlement”.

The thesis’s purpose was to create a housing prototype that promotes social interaction for people living in extreme conditions. The investigation explored different areas but not all of them were studied with the same intensity. Looking at the influential fields made the design more effective. The research’s final product established “rules” for a housing organization that can define more than a building; they can create a future community!
CHAPTER TWO
CASE STUDY:
INFLUENCE OF PARKING IN HOUSING COMMUNITIES

“Our housing complex is relatively safe from vehicles, which allows our children to grow more independently outside, and to be able to build good social relationships with other children.”

Japanese” Daichi” (public housing)

Abstract

Housing and commercial design has always brought with it the challenge of parking space. This issue becomes more influential in the design process when we talk about high density housing in a low income area (where land is scarce). Many times the location of parking spaces defines the character of the project; in the case of housing, affecting the way people interact in the neighborhood. The current regulations push the ideal of a society owning a car first and later the use of public transportation, this “ideal” isolates people and neglects our social needs.

For the people living in San Juan de Lurigancho; car ownership is definitely not one of their main priorities, however considering the development as an evolutionary process we have to identify a path of growth that provides a house unit that offers enough parking spaces. In housing buildings; the parking space not only provides an extra commodity but raises the value of the property, and gaining value is one of the challenges to achieve with our future prototype community once it developed into stage 3.

The transition between the automobile and home is also an opportunity for the owner to meet his neighbors and engage in group activities, therefore this transition space should provide comfortable informal/formal gathering spaces that promote interaction between neighbors. In order to find an approach that satisfies parking needs and provides social spaces, it’s necessary to understand the elements that affect the mentioned transition car/home.
The housing project that was selected for this investigation is called Broadmoor and presents some similarities with settlements in stage 3 from San Juan de Lurigancho; some of these similarities are:

1. Cultural diversity: Broadmoor offers housing for low income people; the community is formed in its majority by people of Latin and African American descent.

2. Population density: The amount of people per building living in Broadmoor is close to the amount of people living in each “cluster” of the housing projects build in Chile (project used as case study).

3. Similar urban setting: Both sites (elemental and Broadmoor) are partially disconnected from the city; they are both surrounded by commercial and housing developments.

Limits of the study

Because the future location of the thesis project is in Peru and not in North America, the limitation of this case study is influenced by the cultural difference of the two countries. Broad is part of the car-based type of culture, in the other hand people from San Juan de Lurigancho mainly use public transportation. The study recognizes the existing cultural gap between the projects, however after looking at finished social housing projects built in Peru and Chile, it is obvious that the parking takes a large percentage of land.

Hypothesis

Increasing the distance between the resident’s car and his dwelling unit will also increase the resident’s potential for social encounters and an engagement in to group activities.
Methods

The first part of the study consists in looking at social encounters that happen between the transition spaces from the car to the house. Using Broadmoor apartments as object of the research the goal is to identify the main relationships between social behavior and the architectural features of the transition.

The observations at Broadmoor will be focus in 2 areas (area A and area B). the areas have been chosen because of their different parking conditions.

1. Area A: It presents transitions larger than 150’ which is not common at Broadmoor or other housing complexes.
Views 1,2,3 show the first area, where the pedestrian experiences the scale and narrowness of the corridor. The area is comfortable during sunny season because the 45’ tall buildings provide enough shading for the area, however at night the poor illumination and scale of the buildings convert the space into an unsafe area.

Figure 5. First views of the path to walk from the car to the apartment in Area-A

Views 4,5,6 show the second section of the transition towards home, this second area has a different scale; it’s open, has landscape features, it also has natural and artificial illumination during the whole day.

Figure 6. Views of the path to walk from the car to the apartment in Area-A
2. Area B: with short transitions spaces (aprox. 20’) this area presents more parking than landscape; some neighbors (mainly from the first floor) use the porch for grilling and drinking beer.

![Figure 7 views from car to apartment on Area- B](image1)

![Figure 8. Neighbors grilling and drinking beer during memorial day](image2)

![Figure 9. Area used by the children as playground](image3)

**Interviews**

A survey was done without selection; people who were occupying the transition space in the moment of the observation was subject of the questionnaire. The interrogated population had a different background (ethnicity, age). During the interview some specific questions about the topic were asked to the neighbors. The questions focused on the social behavior of people on the transition from their cars to home.
1. Besides going to pay rent, How many days a week do you use the club house?

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<th>AREA-B</th>
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Table 1. Survey results for first question

Comments: People expressed their desire to use the club house more often, however its schedule conflicts with residents availability. They wanted the spaces of recreation open 24 hours a day.

2. How frequent do you use your porch?

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<thead>
<tr>
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<th>AREA-A2</th>
<th>AREA-B1</th>
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Table 2. Survey results for second question

Comments: A2/B2 represent people that live in the second floor of the A and B areas. People expressed their discomfort for the narrow dimensions of the second floor balcony, and its limited view access. Neighbors from the first floor said that the porch was used as an extension of their living room thanks to the sliding doors.
3. How much time do you spend in your porch?

Table 3. Survey results for third question

Comments: People said they would spend more time if there were better views to enjoy and a cooler weather.

4. How far from your apartment would you like to park your car?

Table 4. Survey results for fourth question

Comments: Everyone expressed their willingness to have a longer distance from car to home, however the neighbors expected this transition to present improvements (landscape, shading, etc). The main reason why they didn’t like parking far is security; they want to be able to see their cars from their living rooms. Some women said that a longer distance meant carrying bags for a longer distance and that was too much of a hassle.
5. How many neighbors do you see walking from your car to your apartment?

Table 5. Survey results for fifth question

Comments: Some people mentioned that they try avoid sharing sidewalks and paths with people at night.

6. How many neighbors from your own building do you see everyday?

Table 6. Survey results for seventh question

Comments: half of the interviewed people said they usually see their neighbors but they don’t talk or share activities.
Conclusions

From the survey we see that people need social spaces with proper dimensions and proper availability. Neighbors are willing to walk more (park their cars further away) if the conditions are better, however there is a limit given by the security of their cars.

The importance of the transition between car and home is not only due to the distance but due to a series of supplemental elements that make this path a space comfortable for interaction; some of the observed elements are:

a. Distance:

As the study shows, people are only willing to walk a "strictly necessary" distance. Certain distances create discomfort in the residents especially when combined with adverse weather conditions. On the other hand a longer distance gives the potential to create “social encounters” where people meet and share experiences.

Figure 10. Parking spot in Area-A

a. Scale of path:

The dimension of the paths reflects how inviting the transition is, and how many people can use it at the same time. As shown in figure xx a social space designed under restrained limitations doesn’t invite/keep people in the areas as long as we may expect.

Figure 11 Walking sidewalk from area A
c. Scale of building next to the pedestrian paths:

Besides having a path with comfortable dimensions, the surrounding buildings need to be of an adequate scale to complement the environment. Tall buildings can overwhelm pedestrians. Some of the desired effects provided by surrounding buildings are; shading and visibility.

![Figure 12. Forty five feet tall buildings frame a 10’ corridor at Broadmoor apartments](image)

Figure 12. Forty five feet tall buildings frame a 10’ corridor at Broadmoor apartments

d. Scale of Social Spaces:

As was mentioned before, the dimensions can’t be the same for a second floor balcony and a first floor porch.

![Figure 13. Balcony space (2nd floor) Area A](image)

Figure 13. Balcony space (2nd floor) Area A

![Figure 14. Balcony space 2nd floor in area B](image)

Figure 14. Balcony space 2nd floor in area B
e. Contact Between Social Spaces:

Once obtained a comfortable transition path, it needs to have contact with other social spaces. The contact creates a social network that provides security and potential social interaction between neighbors.

Figure 15. Outside areas of the buildings in use by the neighbors

f. Cultural environment:

Walking a hundred feet in a dangerous neighborhood is not the same as walking the same distance in a safe neighborhood. Also we must mention that people that use public transportation are more likely to walk longer distances without feeling discomfort.

Figure 16. Outside areas of the buildings in use by the neighbors-2
g. Time/Weather:

Walking on an deserted mountain and walking during the rain at night change the “feeling” of the place. People always look for comfortable micro-environments, these can be created with the use of shading elements and water features.

Figure 17. Photos of Landscape features: seating area and shading trees

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CHAPTER THREE
CASE STUDY:
SOCcer Fields AS SoCIAL SPACES

Abstract
"Public spaces are without doubt the point where societies meet and escape...somehow like a valve that controls the social pressure of the country"

Vega Centeno, Pablo

When we think about public spaces, we think about people meeting, neighbors sharing an event, children playing, and many other different types of activities that involve people reacting to people. In the last decades with the formation of “spontaneous cities” the public space became the space left without built structure within a neighborhood. Most of the time the local government in their infinite wisdom fills the voids left in the city with what the new Peruvian definition of social spaces are: soccer fields. But are these new social icons really promoting social interaction? Are they really needed to the point that they are built before green areas, sidewalks, paved roads and public illumination?. During this study the researcher will analyze the positive and negative effects of the sports field, in order to decide if it is the main space people need at the Cristo Rey site.

Hypothesis
Sports fields (soccer fields) shouldn’t be the main public space among “spontaneous neighborhood”

Methodology
- Analyze the effects a soccer field has in a neighborhood using examples from fields built in sites similar to Cristo Rey.
- Analyze popular activities involving men, women and children that occur in varying public spaces.
- Review the projects developed by Cenca which proposes non athletic public spaces
- Compare the impact these different public spaces have on the activities that can take place within them by the surrounding neighbors Use this information to determine what type of space is most appropriate for Cristo Rey.

What is a Public Space?

“It’s one of the elements that define the city and the urban condition as such. Is the city’s piece of property accessible to everyone, and to be transited freely. They can be open such as plazas and parks, or closed like Libraries and markets.”

What are the dimension of a Public Space?

Does a Soccer field have them? According to the book “Housing Densification” (Desco) public spaces have the following dimensions:

Social Dimensions: If something defines the public spaces it is the anonymous scenario it offers, and that is the basis of social interaction. It frees people from justifying their origins and social conditions and considers everyone as equal. A soccer field (that is not fenced) accepts everyone, however creates a hierarchy where the neighbors living closer to the field have the right over the rest. Then the anonymous dimension of the space is broken in order to fulfill the use.

Physical Dimensions: The public space occupies a visible/accessible piece of land that is easily recognized by a group of people that give it a function. It needs to be conceived with a capacity of adaptation, so it’s able to hold different activities through time. The character of the public space as space of personal identification, depends on its infrastructure and from its capacity of adaptation. The land is the support that all the other dimensions (political, social, economic, cultural) used to relate in an organic manner.

The way I remember the soccer field close to my house is completely different to the way my sisters remember it (if they do remember it). For me it was a playground, for my sisters a place where girls didn’t have access. Although being basically a flat paved site, if in theory could allow many functions (market, festivals, etc), the local regulations established that it could only be used for “sports” meaning just for soccer.
Political Dimensions: Public space expresses a dialogue between the public authorities and the neighbors. However the quality of the space depends on the users (neighbors) and not from the planners (authorities). The dialogue is between the male neighbors and the authorities, it doesn’t include everyone.

Cultural Dimensions: The public space is a space of history, of identification with our past and the past of the city, it expresses our identities and common origins. Even though I remember and identify with the field close to my house in Lima, the “feelings” are completely different for my sisters. The place didn’t expressed a historic act (like plazas do) but generates memories and maybe a personal “story” (not history).

Economic Dimension: The public space is sometimes used as space for work (shoe shiners, ice cream vendors, etc). The park, the plaza, the avenue are now traditional places of work in Peru. This mix of functions, recreation and work, creates conflicts that define the character of the space.
Physical requirements for successful public spaces:
- Location: Considers the problems with topography, quality of the land (steep slopes in a mountain) and problems with connectivity between the site and the urban fabric. In order to build a soccer field in Cristo Rey there has to be a major topographic change; as the site has no flat spots. During my first visit, one of the neighbors told me they were planning to build a field on the top of the mountain, I asked him: so, who is going to go get the ball when somebody kicks it out of the field? (“out of the field” meaning 400’ down hill)

- Water access: Lima sits in a desert terrain, however the presence of green elements is one of the first demands of people for public spaces. The lack of water and the high cost generates a conflict between expectations and budget, there is not sustainable approach (from the government side) in order to create a cheaper way of planting green areas.

  Many people demand the presence of plants and trees for its shading qualities and the environment that it creates, however there are lower class districts that want green areas, because the high class neighborhood have them (they can afford them). Obviously a soccer field as is usually build (paved) doesn’t satisfy the “green” need of the neighbors.

Figure 19. Two social classes merging in the mountains.
Common Problems in Public spaces:

- Lack of administrative and technical support:
  Once the government builds the fields their “homework is done”. The local government considers the building the final goal of social interaction, under this thought “the more we build the more social the neighborhood is”.

- Lack of dialogue between authorities and public during the design process:
  The fields comply with standards, and there is no discussion with the residents in order to customize (it would increase the budget) or make the space belong to the people living around it.

- Conflict between the residential and the spontaneous commercial activity:
  Soccer fields don’t generate much commercial activity, however the nature of the typical public space is that commercial activity is generated around it.

- The space is not properly connected to the City:
  The soccer fields are connected to the neighborhood, however they become disconnected when people decide to fence it, then they stay isolated with limited access.

- Lack of use and depreciation of the equipment provided:
  The local government doesn’t provide maintenance of the equipment and the residents who live around the field have to take responsibility for the field. They pay for the maintenance (paint, cleaning) in order to keep a good environment in their neighborhood. This “intervention” creates a sense of ownership from the side of “residents who pay for the field”.

- Lack of multi-functionality:
  Local government has created spaces mostly for male population.

- Lack of regulation for the uses:
  The space is used for only one function and local rules prohibit other activities because they may disturb the residents living around the field,
however their peace has already been altered with the construction of the field across the street. These regulations end up reducing the publics’ use of the spaces.

Figure 20. Neighbor’s participation on public space’s maintenance

Public Space Uses Enjoyed by Men Women and Children:

“The use and control of the space in the city reveals the type of existing relations in one society..the popular city is the contemporary product of the evolution of the neighborhoods generated by construction built by the owners”

(Present, but Invisible: Women and the public space)

The role of women has been limited to the administration of public dining places or as house keeper taking care of the house specially during the initial stage of occupation of illegal settlements. Being in the public space implies a process of learning, socializing, and acceptance for different people.

The semi public space:

It is usually the space between the entrance door of the house and the street; it allows two conditions: publicity( shows to people what we are doing) and chances of meeting somebody (different meeting from the ones occurring inside the house). The Semi public space has a special role solving women problem facing the public, it is their protection space. This place is also highly use by the elderly who like to observe activity without getting involved in it.
Common activities in public spaces:
Passive enjoyment:
- Chats between couples and groups.
- Walk: implies presence but in movement.
- Resting: usually in benches or under trees reading the news.
Recreation and sports:
- Playground: used by children under somebody’s supervision.
- Play soccer: male activity
- Play volleyball: female and male activity
Other activities:
- Drinking: male activity
- Drugs selling and use.

Figure 21. Activities engaging men and women

Figure 22. Activities engaging men

SYMBOLOLOGY
FREQUENCY
CONTINUOUS
LITTLE FREQUENT
FREQUENTLY
SOMETIMES

DAY OF THE WEEK
EVERYDAY
MONDAY TO FRIDAY
SAT-SUNDAY

DURATION
◆ MORE THAN 1 HOUR
◆ BETWEEN 30 MIN. AND 1 HOUR
◆ LESS THAN 30 MIN.
Transit:

This activity implies the movement of people around the neighborhood. It’s duration is short and usually done Monday through Friday. It is associated with going to the grocery store. Women who go shopping usually go with empty bags and come back carrying full bags of food, when they stop to take little breaks is when an inevitable social encounter happens. These type of casual encounters require special attention since they are one of the few opportunities for women to engage in social activities.

Men’s presence in public spaces is strong from childhood to their teenage years (until they start to work or going to the university) then their presence drops to just being on the weekends when they play football and have drinks. Among women the behavior is completely different, the change of use is also decreased with age but this change is more gradual.
Problems found in Public spaces:

The lack of security issue is the main concern and is solved many times by putting a fence around the public areas, creating discomfort by the users. Many neighbors express that insecurity rises when the public space is too attractive and brings people that don't belong to the neighborhood.

Figure 25. Problems found in public spaces

Attractive elements found in Public Spaces:

People need to complement their recreation with other services. Little grocery stores (bodegas) usually open around the parks and public spaces.

Figure 26. Attractive elements in Public spaces
Maintenance of public spaces:

Many times the local government assumes that once they build the space, the neighbors will take care of it. In the same sense, neighbors often think that once the area is built; the local government will take care of it. This creates a conflict between the two parties where the only victim is the neglected public spaces. In order to create a public space that will not present a maintenance problem in the future, the following must be considered:

- materials for the paths and sidewalks
- where is the water coming from for the plants
- the investment for and frequency of cleaning services
- neighbor’s role in preserving the area
- existence of delinquents in the area that can damage the space
- presence and allowance of animals

Physical changes of the public space:

According to Cenca, these are the indicators that define the physical characteristics of the public space:

- The design of the space follows the topographic contours.
- The public space allows visibility for the residences from all angles.
- The design of the residences in the areas around/next to the public space create a visual control point. There are no blind corners or places when people could hide.
- There are some commercial areas around the pubic space that revitalize and bring some dynamism for the users of the space.
- Pedestrian paths have a landscape design allowing the enjoyment in movement and during stops. These paths are properly connected to the major circulation paths (sidewalks, roads) of the neighborhood.
- Vehicular circulation is restricted from the public spaces and limited around it. i.e the use of brick in the roads to slow the traffic.
- Inside the public space there are no permanent structures for the commercial activities.
- Any sport related facility should allow diverse sports, and activities for everyone, regardless of gender or age.
- There should be space for sitting next to the playgrounds in order to provide comfort for people taking care of the children.
Why do local authorities build soccer fields?

Building a soccer field in the neighborhood is the main demand to please on the list of local government interventions, most of the time is the only one. The selection of the function comes from a predominantly male society. If in fact practicing sports is vital to keep the neighborhoods alive, it must be considered that they also produce a series of unwanted activities related to the place, putting just a soccer field is providing a really limited space. The government often chooses to build these fields because it's the cheapest, most evident and popular way to show an improvement has been done, it is the easy fix to improve the neighborhood.
Who uses the space?

Soccer is not popular among the female public so the male population of all ages are the only ones that really use the spaces. Being a public space, the soccer field is meant to be for the residents of the surrounding neighborhoods. The use of a particular field defines smaller social groups among people of the same district, some times these groups get corrupted into gangs that fight each other for the use of the fields.

My memories of a soccer field are of a place where guys from different blocks would play against each other and where intense “soccer championships” were organized once a year. These championships brought different teams from around the area and brought families together around a safe fun environment of competition. While there are clearly many positive aspects to having a soccer field, the problems start when people used them on the wrong schedule or for illegal activities.

- People would play too late or too early; at time when the neighbors across the street wanted to sleep.
- People would drink or used drugs at night.
- The games would end in fights between the teams.
- Place was used for gang fights

In addition to these concerns, the use of the fields creates too much negative pedestrian movement around residential areas which want a safe environment. These problems eventually influence the neighbors to fence the field. This mechanism of control tries to achieve security, however usually only creates tension between the neighbors and the users of the field. The placement of fences around a public space is considered privatizing a public space, and it seems to become the property of the neighbors who paid for the fence and now feel they can control the use of the field.
How many are too many?

Figures 32 and 33 show us two different context that use the same “public space strategy”, in which they both over-construct soccer fields. La Molina, a high class neighborhood, provides many soccer fields but also has green areas that are used as playgrounds. On the other hand San Juan de Lurigancho, a middle low class district, tries to provide multiple soccer fields as the only source of public space for the community.
Positive and negative consequences of having a soccer field:
1. Positive consequences:
   - Promotes sports
   - Brings families together
   - Doesn’t require much investment

2. Negative consequences:
   - Needs maintenance.
   - Becomes a dangerous place at night.
   - Sometimes brings too many unwanted people to the neighborhood
   - Hard to control unless fenced.
   - It requires a large flat area; so it would not work on sloped sites.
   - Promotes only one sport only among males.
   - Only used by the entire neighborhood once a year or on rare occasions.
   - Doesn’t provide much for people who don’t play soccer.

Examples of alternative Public Space projects developed by Cenca:
1. “Alameda de la juventud” (youth boulevard.)
   The main objectives of the project were:
   - Create a water treatment plan that would provide gray water (cleaning 3 liters per second) for the irrigation of the park and the surrounding green areas. The plant’s location (higher area of the avenue) would allow for gravity-fed distribution to all the surrounding green spaces in the main avenues. This would set a precedent to mimic around the city.
   - Create an environmental committee in the area in order to get the public involved in administration of the space.
   - Organized the commercial areas (they would be located surrounding this boulevard).
   - Create a recreation area that can be used by everyone regardless of age, social condition, or gender. The boulevard included spaces such as: childrens playground, library, monuments, water treatment plant, amphitheater, and checkers tables.

   This project was built from 1999 to 2001, occupies 6 city blocks and cost a little over US$110,000 to construct.
The main problems were:
- Local government didn’t maintain the space after change of authorities and the equipment ended up either stolen or damaged
- Illegal commerce took some areas of the parks.

Even though this project is of a large scale in size and budget, it presents an alternative to imitate: reuse of water to irrigate green recreational areas (food production can’t be possible because of sanitation). As was discussed before, the access to green spaces not only improves the environment but generates spaces of casual (everyday) interaction for everyone.

Figure 35. Diagram showing interventions of the Youth Boulevard project\textsuperscript{13}
2. Project “Nueba2”

The project Nueba 2 consisted of a series of interventions that created public spaces of different scales around a neighborhood with similar characteristics to Cristo Rey. The objectives of the projects were:

- Promote resident’s participation in the improvements of their area.
- Create links between authorities and residents of “spontaneous neighborhoods”; typically segregated people without property titles.
- Generate different social dynamics between residents according to the design of the spaces.
- Create areas that can be used by everyone, for example, “Plaza de la amistad” (see figure 36) holds parties, markets, and spontaneous concerts. The plaza is small enough so that the activity is controlled by the scale of the place.
- Create circulation systems: Many stairs were built by the neighbors. These stairs were designed to create casual social encounters; having rests of good size where people can stop and talk or just turn around and enjoy the view.

This project differs from the “youth blvd.” because it used residents participation as the main force, not only in the construction but in the design and maintenance of the areas as well. The residents worked in coordination with the local government using Desco as a moderator between them (people don't trust the local authorities). The spaces were maintained by the residents without need for a district’s budget. People identify with the space not only because they use it but because they helped build it as well.

Figure 36. Interventions as part of the “nueba 2” project: Plaza de la amistad

Figure 37. Intervention as part of the nueba 2 project
The Nueba 2 project also incorporated “sustainable” qualities as the “youth Boulevard” did. This project used the rocks from the area for construction, filled the green areas with organic waste for fertilizing and irrigated it with treated water. Nueva 2 shows an example that relates more to Cristo Rey and that differs the most to the standard public space which is the soccer field. Nueba 2 considers different scales and intensities of social interaction; from a plazas to enjoy on the weekends, to stops along the stairs to gossip everyday.

Example of places built on sloped sites:

Figure 38. Terraces used as benches
Figure 39. Stairs connected to public spaces

Figure 40. Machupicchu terraces
Conclusion

Proposing a soccer field in a site like Cristo Rey does not only go against the physics of the site (topography) but also goes against the “feeling” of the kind of neighborhood desired. The feeling that brings everyone to participate in public activities; male, female, children, and elderly. The feeling that allows their survival through mutual cooperation. The creation of a soccer field in the neighborhood, even when there are two other fields five minutes away from the site, represents a wasted opportunity to create a more efficient intervention, it represents taking the easy way out of the problem.

The creation of places like sports fields becomes a standard that forgets about individuality, forgets about peoples’ real needs and possibilities. Cristo Rey’s possibilities stem the most from the casual social spaces, the ones that happen everyday because residents depend on each other constantly (at least in their current situation). The existence of formal public spaces are also necessary, however they are necessary as long as they can be multi-functional and can adjust to the resident’s needs. For all those reasons and after looking at some applicable alternatives I don’t think a soccer field is needed in the site of Cristo Rey.

3 Cabrera Teresa and Villaseca Miguel, 39
4 Cabrera Teresa and Villaseca Miguel, 39
5 Cabrera Teresa and Villaseca Miguel, 39
6 Cabrera Teresa and Villaseca Miguel, 46
7 Cabrera Teresa and Villaseca Miguel, 67
13 Cabrera Teresa and Villaseca Miguel, 49
14 Cabrera Teresa and Villaseca Miguel, 50
15 Cabrera Teresa and Villaseca Miguel, 51
Abstract

Many times successful projects become prototypes that people try to apply to different contexts. This strategy has happened many times in housing developments where the same house style is copied without consideration of the future owners.

The Elemental Project in Iquique, Chile changed the way the Chilean government approached social housing; it proposed a housing typology that understood people’s needs and way of building. Although the social context where this project was built is really similar to the one in Cristo Rey (Lima, Peru), we should not follow our first instinct by trying to apply the typology from Iquique in Lima. There are other factors (besides the social ones) that must be considered before such a rushed decision is taken, there are other factors that determine what elements from one project can be used in other location and what elements need to be modified.

Hypothesis

The Elemental Project located in Iquique Chile can be applied to the site of Cristo Rey in Lima Peru without major modifications.

Methodology

Conduct an in depth analysis of the Iquique project’s characteristics to determine which element could possibly apply to Cristo Rey’s site. The analysis must consider results from the survey made in Cristo Rey in order to see if people approve of if the ideas or they are too different from what they really need. In the end, some of the elements (if not the whole typology) of the project will be mentioned as part of the ideas that can be implemented in design of Cristo Rey
1 Elemental project Iquique, Chile

City Information:
Location: The city of Iquique is located in the desert north of Chile
Weather: Iquique's annual climate is mild, ranging from an average winter low of 12.5° C to an average summer high of 24.4° C.
City activities: Iquique has re-invented itself as a commercial center and a tourist base for explorations into the desert: sports, recreation, deep sea fishing, beaches and archaeological tours. In the city, the small historic center is surrounded by modern growth, including new housing sectors, development of the beaches and hotels. The city of Iquique is one of the country’s most visited areas. The attractions are a mild climate, commerce and the Atacama desert.

Project Information:
Number of units: 93 families = 93 units / 5.205 m² (714 hab/há)
Location: Av. Pedro Prado Iquique Chile
Budget: $1,085,000 ($11,550 fam subsidy + $350/fam saving)
Cost per house = $7,500
House area: 70 m² (36 m² initial + 34 m² enlargement)
Apartment area: 72 m² (25 m² initial l + 45 m² enlargement)
Project process

The project started in January 2004 and finished in December of the same year. Because the project was built on the same site where the residents lived before, a relocation system was established. The residents had to moved for one year to a nearby hospital where they paid rent every month. Although the residents were involved in the design process, they weren’t called for the construction stages.

Figure 43 Neighborhood conditions before intervention²

Figure 44 Architect meeting with the neighbors³
In order to make a more efficient use of the land, they tried working with row houses, but even reducing the width of the lot to make it coincident with the width of the house, and furthermore, with the width of a room, they were able to host just 66 families. Aravena conclude on his website: “The problem with this type is that whenever a family wants to add a new room, it blocks access to light and ventilation of previous rooms. Moreover it compromises privacy because circulation has to be done through other rooms. What we get then, instead of efficiency, is overcrowding and promiscuity design team also considered a high-rise building, which is very efficient in terms of land use, but discarded it because it would block expansions (they intended that every house could at least double the initial built space).

Figure 45. Development of the housing typology

Project organization

The architects first considered the 1 house = 1 family = 1 lot, but they were able to host just 30 families in the site. The architect says on his website: “The problem with isolated houses, is that they are very inefficient in terms of land use. That is why social housing tends to look for land that costs as little as possible. That land, is normally far away from the opportunities of work, education, transportation and health that cities offer... This way of operating has tended to localize social housing in an impoverished urban sprawl, creating belts of resentment, social conflict and inequity”.

Figure 45. Development of the housing typology\(^4\)
Instead a designing a small house (in 30 m² everything is small), they provided a middle-income house, out of which they were given just a small part of to start with. This meant a change in the standard: kitchens, bathrooms, stairs, dividing walls and all the difficult parts of the house had to be designed for a final scenario of a 72m² house. The final organization wasn’t linear, it had a “U” shape, where the houses were organized around a public courtyard. The original land was divided in four sectors (four “U” courtyards), there are about 23 units per sector. This distribution was possible thanks to the flat terrain. Since the site was in the middle of the city, dividing the project in sectors allowed for the creation of controlled access points that allowed free circulation for all the residents in and out of the block. This organization didn’t change the block shape, keeping its connections to the urban fabric.
The conditions of the settlements in Peru are quite different:

1. They are not located within the city limits, they usually are at least 2 miles away from the urban fabric, therefore these settlements have no “city grid” or layout to follow. Due to its remote location, they need to create links for circulation in order to guarantee services and access.

2. The geographical characteristics of these areas are different, these terrains are full of mountains. Usually the organization of the houses follow the contour of the terrain, unless a major intervention was done and the topography was drastically changed which means a major investment.

3. The main circulation is vertical instead of horizontal, this gives a strong hierarchy to the stairs which are the only access points for people to get to the houses.

4. As the proposed plan (figure 49) shows, the tendency of these developments is to build one unit per lot, this layout continues the sprawl which creates overcrowding and saturation.
What did the Chilean project gain from the “u” organization?
1. One gate: The reduction of access points provided increased security; before many thieves would run into the neighborhood and hide or easily escape thanks to multiple corridors that penetrate the lot. Reducing the access and creating the courtyard produced a dead end corridor where thieves (in case they get in) can’t escape. The gate wasn’t provided by the government but it was easily paid for by the 23 neighbors of the each sector (costs are split between users).

2. Many eyes: The reduction of entrances provide security but the location of the houses play a complementary role in that aspect. All the houses face the courtyard, therefore whatever happens in that area is probably seen by at least 1 of the 23 families surrounding the area.

Figure 50. Before and after organizational diagrams from the iquique housing

Figure 51. Main gate to the courtyard

Figure 52. Windows facing the courtyard
3. Double check points: Having an organized layout allowed (forced some) people to obtain legal connections. There were two checkpoints for each utility, one by the door, and one by the gate, every month the municipality checks both and in case they wouldn’t match, the resident get a penalty for “stealing service or modifying the readings”.

4. Commercial expansions: The design allows for the spontaneous formation of commercial areas among the units located next to the main avenues. These local stores not only provide income for the residents, but create street activity; inviting people to use the street, during the day.

As was mentioned before the layout was only possible due to the stability of the terrain, however all the aspects mentioned above are goals for the future layout in Cristo Rey and the technique used in Iquique will influence the design decisions in our project.
5. Spontaneous uses:
A. Commercial areas: The units from the Elemental Project that were located next to the main avenue were modified in order to allow a commercial use (see figure xx). The change consisted of opening the wall that faces the avenue. The structure of the house allowed this modification that now provides some income to this family. The grocery store is located in a room that was formed by to the division of the first floor living room. It’s important to say that this one wasn’t the only store in the area, many neighbors would sell products even inside the courtyard area; they just keep their doors open to present their products, the environment is safe with the main gate. The customers for the last type of store are the neighbors from each “courtyard sector”

* The same characteristics were observed in Cristo Rey where the front of the houses facing the main avenue were designated for commercial uses.
B. Extra Living Space: The framework created by the initial structures in the Elemental Iquique Project allowed the neighbors to fill the space left to their will. In the residence visited, the owner created an extra level; he built three levels where there were only supposed to be 2 (he reduce the height of each level). Doing that he was able to rent the rooms to some ladies that couldn’t afford to rent a whole apartment. The space left by the architect in this case allowed functions that let the owner earn additional income.

* Due to lack of budget the only solution in Cristo Rey is to also create a framework that can allow a future organized growth. The growth will be defined by the owners and his future needs.

6. Building stages:

The building given to each family was ready provided a big room, kitchen and bathroom. the rest of the spaces (50% of total built area) had to be built by the residents of the house.

During the researcher’s visit to the project, 3 years after project completion, it was observed that 92% of the total housing units were able to fill the void with their new rooms.

Figure 57. Ladies living in house addition
CONSTRUCTION PROCESS

Figure 58. Housing construction process

Figure 59. Housing units floor plan
According to the architect Aravena, “when the given money is enough for just half of the house, the key question is, which half do we do. We choose to make the half that a family individually will never be able to achieve on its own, no matter how much money, energy or time they spend.”

* The building process is different in Peru mainly because of the illegal status of the residents who can’t build anything without having a property title (process takes years). Another reason is that the government doesn’t these sector of society as much, there is not an organized program for reacting to the immigrant settlements.
Then the construction process takes about 25 years per family, this structures are 100% finance by the owners money. The establishment of federal help like the one in Chile would benefit many people in the area, however the provided subsidy (16,000 soles= $5,640) may or may not produce enough areas to create a basic structure. In order to lower the costs, the Peruvian government has labor programs, where the future owners are hired to build their units in exchange for a minimum salary. This program creates a job opportunity and guarantees the best quality for each house (since the owner is building it, he really cares about it).

In conclusion the goal of reducing the construction time to 1 year providing a safe shelter is something Peru needs, however the question is if the units provided can provide what people in Cristo Rey need in the future. Looking at the “standard” house (Figure 62) we appreciate many differences between the finished Iquique proposal and the finished Peruvian house.

Figure 62. House development 1971,1978,1988,2005
Materials

The materials used in the elemental Iquique Project were concrete blocks, concrete and wood. The materials were chosen for their price and their resistance to the weather. The concrete volumes that create the void for the future addition are made out of concrete so they protect the future wood structure from any loss or gain temperature.

During the visit I noticed the bad conditions of the outside stairs which used wood as the main material. Some people also complained about how the windows didn’t open horizontally (hinge system), this system doesn’t let people stick their heads out the window. The temporary dividing lateral wall is made out of wood and its reused once the family builds the addition in the void space. The idea of providing the materials that are going to be used in the future guarantee some quality in the construction.

* In the case of Cristo Rey the materials have to be chosen based on price, resistance to the weather and structural stability (earthquake resistant). The standard in Peru is to build out of brick and apply stucco to the walls for finishing, there is no much wood used even though is pretty cheap. The used of concrete is limited because of the expensive prices.

![Figure 63. Housing unit before and after owner's addition](image)
Public spaces

During the visit it was observed that the courtyard served as playground and parking; according to the neighbors there is a schedule so the cars can’t park inside till after 11pm. This schedule allow the children and neighbors to use the space for social activities. Some of the courtyards have been paved with the residents money, and some have added details like concrete benches or soccer goals. The neighbors also expressed their discomfort about the dimensions of their immediate outside space, they said it was not enough to put any plants because the proximity from the cars. Scheduling the uses for the social spaces helped to establish an order where everyone can make use of the space and helped maintain it.

* The social space in Cristo Rey needs similar characteristics however the topography of our site may not allow us to build a flat courtyard that allow different functions.
Conclusion

The Chilean project has great elements that can be applied in the design of the neighborhood in Cristo Rey; however the main concern is the topographic differences which don’t allow a direct “application” of the typology. From the results obtained in the survey we observe that the needs are different between the Chilean and the Peruvian groups, these needs are based on the people and the location of the site. While in Chile the site is connected to the city, in Cristo Rey the site is outside the city, so it needs to reconnect but also grow as an independent element. Despite geographic differences, people’s backgrounds are similar; in Chile the neighbors knew each other; in Peru the residents are really close, they work together, many are members of the same family, some come from the same city, in few words they form a stronger group that wants to work and live together.

Among the ideas that can be implemented from Chile to Peru the main ones are:
- Shared public spaces: neighbors share also the maintenance of the space.
- Stages of construction: create framework and live space for future growth.
- Utility system (Double checking to avoid illegal connections)
- Use of materials: provide some of the future materials to be used as part of the basic structure.

11 Zolezzi,Mario and Tokeshi Juan, Densificacion Habitacional; Un Propuesta de Crecimiento para la Ciudad Popular, Alternativas de Desarrollo(Lima: Centro de Estudios y Promocion del Desarrollo, 2005),88
12 Elemental Projects- Chile
Definitions

According to Cofopri (Organization for the Formalization of the Informal Property), “acentamientos humanos” (human settlements) are defined as: “a form of urbanization characterized by the way the construction happens; through the organized invasion of private or federal territory. These invasions happen using different ways of occupation, from a pacific staged settlement to violent invasions and authorized relocation ordered by the government.”

These settlement pass through development stages, according to Cofopri they can be classified in 4 stages: highly consolidated, medium consolidation, consolidated and no consolidation.

<table>
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<th>points</th>
<th>water</th>
<th>sewer</th>
<th>phone</th>
<th>roads</th>
<th>house material</th>
</tr>
</thead>
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<tr>
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<td>% in house</td>
<td>%in house</td>
<td>%paved</td>
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<td>%none</td>
<td>%none</td>
<td>%dirt</td>
<td>%cane, plywood</td>
</tr>
</tbody>
</table>

Figure 67. Cofopri’s classification system

The addition of points established the four types of urban consolidation:
Type 1: Highly consolidated (4-5 points)
Type 2: Consolidated (3 points)
Type 3: Medium consolidation (2-0 points)
Type 4: No consolidation (0 or less points)

In reality the classification established by Cofopri doesn’t always work due to the individual development of some neighbors, that can afford the services faster than others. This uneven development is common among neighborhoods where each lot is owned by a different owner and where the construction process can take up to 25 years. For that reason the researcher has come up with a classification which considers: first, the common growth and later the individual growth of the housing units.
This classification considers three development stages
Stage 1: Considers the neighborhood since the day the land was occupied until the day they start building their temporary shelters. These temporary shelters are usually built with plywood, recycled sheets of steel, woven canes, etc. The name “temporary shelters” is relative because as these structures are usually used for 5 to 10 years. During this stage some shelters are placed on “temporary foundations made out of stones.

Stage 2: Considers the neighborhood from the moment they obtained their “legal property titles”. This legal status allow them to start replacing their “temporary shelters” and build a solid housing unit; and solid structure using permanent materials such as: brick, concrete and adobe. During this stage the neighborhood works together to obtain their utility connections, connections that as observed in “Las Flores” may never happened due to structural problems. I consider that the end of stage 2 is the moment a basic-permanent housing unit has been built and the residents start living in it.
Stage 3: Considers the neighborhood from the moment they inhabited their basic units up to when they have added enough rooms/elements to the house that they can live comfortably. Stage 1 and 2 can be considered about equal in time duration for all the neighbors of the settlement, however “stage 3” depends totally on each family’s budgets and therefore it has no limit in time. From the studies done in San Juan de Lurigancho by Cesal (private organization), the standard housing unit (two to three stories made out of brick) is finished in about 25 to 30 years.

Why did I choose a site in Lima, Peru?

The site selected for the project is located in Lima, Peru; Lima was selected because it is the most affected city by the migration process, a process that has produced settlements like Cristo Rey for the last 40 years.

During the 1950s Lima saw an exponential increase of the city inhabitants, most of them Andean immigrants and their descendants, who settled in the northern and southern outskirts. The political and economic instability in Peru during the latter half of the twentieth century created unprecedented poverty and violence in the towns of the countryside or Andean highlands, forcing hundreds of thousands of peasants of Amerindian descent to migrate to Lima, thus greatly augmenting Lima’s population.
Among the districts affected by migrant settlements there is one that stood aside from the rest, and that’s because of the way it developed over the years: San Juan de Lurigancho. With a current population that might have exceeded a million people, it is the nation’s most populated district. It was founded in 1967 and because of its peculiar topography, constitutes a challenge for formal and informal residential settlements.

The article below is from the Lurigancho's municipality (June 21, 2008) and shows that the illegal settlements keep growing in the district, and is a constant problem for the older residents of the area. The article also shows that there hasn’t been an effective strategy to slow down the migration process 58 years after it started.

"INVADERS FIGHT WITH NEIGHBORS" 500 PEOPLE INVADEN PRIVATE TERRAIN NEXT TO POLICE COMMUNITY
Why did I select Cristo Rey?

During my conversations with professor Jose Canciani (Catholic University) we agreed that in order to be able to improve the “acentamiento humano” situation, the intervention had to happen on the early stages of the development that meant I needed to find a settlement on stage 1 of development.

Mr. Canciani contact me with the architects from Cenca, a private organization that provides technical advice to the settlements in the district chosen.

Knowing that Cenca has already done projects in the San Juan de Lurigancho district; I asked architects in Cenca for a site which would comply with the “stage one” characteristics. Architect Carlos Escalante mentioned the settlement called “Cristo Rey“ (“Lord Christ”); a 3 year old settlement in stage 1 that needed some ideas in order to move ahead into their planing stages. After visiting the site, I confirmed Mr. Escalante’s suggestions, the settlement had all the typical characteristics of a “stage 1” and presented even more challenges (to be described on site analysis). Cristo Rey was selected for being one of the sites that thanks to its location allowed, the exploration of the main design challenges presented in residential housing. Some of the challenges are:

1. Topography: The slope is steep sometimes reaching 1:1. This condition controls the strategies that the designer can take in order to achieve a stable structure.

Figure 73. Aerial view of Cristo Rey
2. **Budget**: People inhabiting the site have limited or zero budget, therefore the structure will be created using the subsidies from the government and other private organizations. Adding up the sources they will still not exceed the amount of eight thousand dollars.

3. **Location/Services**: Due to its remote location the site currently has no access to water or electricity, in the future the lack of roads will be another problem to transport the materials for construction. For that reason, the settlement needs to be self sustained, creating alternatives for re-use of water, control electric use (or generate their own) and exploit the use of materials available in the area.

   If we mention the limitations of the site we also have to mention its potentials; one of the main characteristics observed among people living in the site was the interaction between neighbors. They understand that the success of a single neighbor is impossible without the collaboration of everyone as group. This quality is the one that made the researcher appreciate the site even more and to later select it for the thesis project. Many other “asentamientos humanos” were visited, and many had the same “intense” problems however they did not have the human factor that allows a possible/different solution.

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**Figure 74. Neighbors discussing events during their weekly meeting**

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On Friday 06/20/08 at 10am during the last visit to the site, I organized a short workshop with the help of the “community representatives” of the neighborhood: Damian, Fernando Gallozo and Gabriel.

As part of the workshop the following activities were done:

Introduction

I introduced myself to all the neighbors (about 29 of a total of 40 families) and thanked them for participating in the workshop. The neighbors welcomed us as friends, and thank us for collaborating with new ideas for the future development of their neighborhood.

An argument occurred between the neighbors of the East side and the residents of Cristo Rey. The east neighborhood decided to break relations with people in Cristo Rey and block one of the points of access to the project where future stairs were going to be built (red path on figure 77 and 78). This conflict could difficult the access to the site because neighbors have only one other access located 5 minutes away (green path on figure 77 and 78).
After the argument people on the east side decided to start the construction of their stairs, prohibiting its use to people in Cristo Rey. I asked the neighbors about some possible agreement but people in Cristo Rey expressed their discomfort with the east side people, saying that the problems came from years ago and that they were planning to develop each neighborhood separately as independent entities. A possible solution to the lack of access was proposed by a neighbor who suggested to buy one of the lots in the lower area of the mountain (figure 78). Obtaining that lot would provide direct pedestrian access from the main avenue to the center of our site the lot purchase would cost 2500 dollars.
2. Discussion about findings in the Elemental Iquique Project:

Once finished with the discussions about the connection access to the main avenue, I started sharing the ideas founded during visit to the Elemental projects in Chile. The project from Iquique was presented first, later we talked about the project from Antofagasta.

Figure 81. Elemental - Iquique

Discussion about project in Iquique

The ideas were focused on different aspects of the housing design:
- Organization: the Chilean project is shaped around a courtyard.
- Security: The entrances to the project were limited and gated. *
- Financing: It was explained that the project was financed by the government and the residents.
- Sharing of spaces: it was explained that neighborhoods were organized in order to share the payment of community elements such as gates and paved courtyards.
- Utilities: The transition from the informal to the formal/paid utilities was also explained.
- House floor plans: we explained the development of the program; from the basic unit provided by the government, to the addition built by the residents.
- Construction process: it was explained that residents were moved away for a year and then moved back to their “basic units”.

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The idea of moving out for a year produced certain discomfort among neighbors. For that reason the future program proposal will consider temporary shelters located on site; people whose houses are being built will live in the shelters until the units are ready to be inhabited. The “on-site” relocation idea was approved by the neighbors; they propose to use the community center space as the location of the shelters, so once all the houses are built, the space can use as classrooms.

![Figure 82. Temporary shelters located in lower area of the site](image)

After the reasons for the design of the Iquique project were explained, I decided to ask people’s opinions about the ideas presented. Some of the reactions arouse were:

- “We like the courtyard space, we could have a market there!”
- “How is the U-shaped organization going to work with our topography?”
- “We like the idea of adding in the future according to our needs”
- “I don’t like the idea of moving somewhere else for a years!”
- “We like the security”
- “We like the facts that some elements of common use are paid by the community”
- “the organization helps the neighbors to be in touch and keep us united!”

After the Iquique typology was presented, people started to get wonder about how many elements from the project can be implemented into their master plan.
I explained to the neighbors that the purpose of looking at other projects wasn’t to literally apply it on our site, but to learn from their good decisions and to see which ones can be integrated on the design of their community.

Discussion about the project in Antofagasta- Chile:

In order to get more feedback, I proceed to present the Elemental project in Antofagasta, which has more topographical similarities with Cristo Rey’s site. Once the project was explained; the expressions were:
- "Doesn't seem to have enough space for children to play"
- "It looks more like what we had in mind"
- "Where do we park?"

People felt more comfortable with the second project, not only because the site coincidences but because the height of the houses (3-2 floors) which matches what they “expect” of a house.

Figure 83. Project in Antofagasta-Chile

3. Discussion about the issues in the plans generated by the engineer

The fact that people were more comfortable with an “standard” distribution (linear housing) pushed me to challenge their reasoning. I laid the plans (existing engineer’s plans) on the ground and started mentioning different problems that the linear organization could present in the future such as narrow streets and long blocks. After that I proceeded to call out some mistakes in the plans, as a test to see how much people were informed of the plans and how many agreed with the design strategies. The first “mistakes from the plan” were:

a. Lack of pedestrian character on the main road because of its dimensions
b. There is no space for sidewalks

c. There were no “rest spaces” whenever the stairs touched the road
d. There was no distance between the road and the houses in the east.

Figure 84. Proposed vehicular road

The residents responded to these questions saying that they could always expand the road to one side. Their answer showed me that:

- They are able to change their mind in order to obtain more comfort and a safer place.
- They don’t have a clear understanding of the dimensions in the plan, and what they can build in the space they are claiming.
- They don’t have a strong respect to the mountain; they don’t mind changing the topography to their will as long as they can build their houses.
- Lack of respect for the neighbors in the lower area of the development, since expanding the road would reduce the green space and create a bigger retaining wall in the neighbors backyard.

4. Survey about programing and conformity with plans

As a final activity, the researcher ask 5 questions to the neighbors. The questions were related to space planning and possible uses. For the surveying, a piece of paper was given to all the neighbors and the questions were explained orally.
The questions were:

a) What spaces do you currently have in your house?

Comment: It must be understood that most of the time functions mentioned happen in 1 room. Usually the kitchen, living room, bedroom and dining room are inside the house. Some of the functions happening outside the house are:

Table 8. Response to question “a”

Figure 85. Latrine
Figure 86. Pet area
Figure 87. Laundry
Figure 88. Drying area
b) What activities would you like to develop within your community?

Table 9 Neighbor’s response to question “b”

Comment: Question “b” was asked to observe the relationship between neighbors and to establish different uses to the public spaces. These spaces will have to hold one or more of the desired neighbors activities.

c) If you have available budget, What areas would you add to your house?

Table 10 Neighbor’s response to question “c”

Comment: Question “c” was asked to understand the program needed by the neighbors.
d) What areas would you propose for your community?

Table 11 Neighbor’s response to question “d”

Comment: The answer demonstrates the need for workshops, it is interesting to observe a cultural need (workshops) over a recreation (soccer field.)

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CHAPTER SEVEN
SITE ANALYSIS

Macro Location: Peru

According to Wikipedia, Peru covers 1,285,220 km² (496,193 sq mi), making it approximately two-thirds the size of Mexico. It neighbors Ecuador and Colombia to the north, Brazil to the east, Bolivia to the southeast, Chile to the south, and the Pacific Ocean to the west. Historically, the country’s economic performance has been tied to exports, which provide hard currency to finance imports and external debt payments. The country is divided in 3 geographical areas: coast (0-500 meters above sea level), mountains or highlands (500-4800 meters above sea level and the jungle (0-1000 meters above sea level).
Macro Location: Lima

The capital of Peru has many attractions, some of these are:

Figure 90. Business center at night

Figure 91. Lima’s main plaza

Figure 92. Government palace

Figure 93. Palace of justice

Figure 94 Lima’s main avenues
San Juan de Lurigancho

The project is located in The Region of Lima, Province of Lima; The capital is formed by 49 districts. Cristo Rey is located in the mountains of the San Juan de Lurigancho.

Figure 95 shows the proximity between the middle/high class (lower half) and the lower class districts (top half). In this case they’re both fighting for the top of the mountain. It’s important to notice the lack of water expressed in the absence of vegetation in the top area. Each area started differently, while the bottom area was developed under a urban plan, the top areas were generated due to spontaneous immigrant settlements on empty land.

Figure 95. District limits

With a current population that might have exceeded a million people, it is the nation’s most populated district.

San Juan de Lurigancho is bordered by Comas, Independencia and Rímac on the west; and Lurigancho on the east. The Rímac River marks the district’s border with downtown Lima and El Agustino on the south. According to Wikipedia, the elevation of San Juan de Lurigancho is of 722 ft. but it reaches more than 2000 ft. in the border areas.

History of San Juan de Lurigancho

Figure 96 shows the Ceramic Temple (3000 B.C), as one of the first problem of human settlement in the dunes of San Juan de Lurigancho.
During these years adobe leveled pyramids were built they were accompanied by the ceremonial plazas.

During the “initial stage” the “U-Temple” was built about 1000 B.C. this settlement was formed by the pyramid and other rooms surrounding the main plaza, and the newest invention a water channel that brought water from close rivers and that served to irrigate the land for food production. These temples were built in honor to the mountains, that were considered supreme beings, close to Gods.

Figures 97 and 98 show the ruins left by the civilizations that settle in 600 A.D. who were dedicated to agriculture. These civilizations were later forced to join the most powerful empire of America: The Empire of the Incas.
According to the District’s website, during the XVII century some ranches started to develop. By the middle of the XVIII century they developed into big ranches occupying current districts, and subdivided in farms, the ones that were worked by slaves from the highlands. In 1780 the properties of San Juan de Lurigancho are counted, being an average of 23 ranches. These ranches were characterized by the unproductive expenses of their owners. The district was well known for the beauty and productivity of its lands. In the district the farms would produce: sweet potatoes, maiz, grapes, water melons, cotton. Besides agriculture the district “produced” cows and other farm animals.

During the military government though the “Agriculture-Reform” the government takes possession of the farms to gives it to the workers, who couldn’t keep the productivity mainly because lack of technical support. The ranch properties were slowly taken by old farmers and immigrants coming to Lima for jobs in the fishing industry. From these ranches only the name was left, the last building belonging to these age was replaced by some grocery stores.

Currently the district is among the most populated of south America these is consequence mainly of the “centralist” policy of the government.

[Images of historical ruins and first settlers]

District’s “standards”

The following images show typical streets, houses and neighborhoods that can be found in the district of San Juan de Lurigancho. Figure 101 shows the growth of the city next to the mountain. The new developments didn’t respect the “old mountain god” invading its surrounding areas and many times the mountain itself. Figure 102 shows the district at night. We can observe that the buildings are unusually low; in general they are 3 story height maximum.
Residents in the neighborhood accept the standard from other districts where each family owns a lot and build vertically. This “lot system” favored the horizontal growth of the city and the replacement of ranches by houses, living the district without space left to habitat. Figure 103 shows the “standard” 1 family three story height residence, after looking at the Chilean case study the questions remains: is this much space really needed for each family?
Figure 104. Typical public school.

Figure 105. Typical soccer fields in the area.

Figures 106. Typical residential street.
Approach to the site

As we mentioned before the site is located after the city fabric ends. It is surrounded by mountains of up to 700’ height. The Settlement of Cristo Rey is just one of the hundred of new settlements built on this side of San Juan de Lurigancho.

The pictures show the drastic change of the topography in the area which explains the difficulties to build on the site, and represents the consequences of a centralistic way of growth.

Figure 107. Aerial views of the mountains around the site

Cristo Rey- General Facts

The “Housing Association” Cristo Rey was formed in 2005 after the 40 families took “pacific” possession of the terrain where they are now located. The residents of Cristo Rey can not build permanent structures because they do not own the land (they just occupy it), however they are following all the legal procedures in order to obtain their property titles in the next years. The property will be theirs once they reach an agreement with the government or the private owner; the agreement can be a purchasing the land (shortest way) or established by a court after a trial (takes many years). The area occupied by Cristo Rey is about 9,570.09 m2 and is located on the side of the mountains called “devil’s mouth” (for the shape the surrounding mountains formed together) in the district of San Juan de Lurigancho, Lima-Peru. The neighborhood is surrounded by three other communities (north, east and west side) and the top of the mountain in the south side.
Weather

According to the Inei (National Institute of Estatistics), the relative humidity is very high, and produces brief morning fog from June to December and persistent low clouds from May to November. Sunny, less moist and warm summers follow from December to April and are followed by cloudy, damp and cool winters (June to October). Rainfall is almost unknown. The yearly average of 0.7 cm (0.3in) reported at the airport is the lowest of any large metropolitan area in the world. Inland locations receive 1 to 6 cm of rainfall, which accumulates mainly during the winter months. The peak of the ‘rainy season,’ which really does not apply, occurs during winter when late-night/morning drizzle events (locally called ‘garúa’, ‘llovizna’ or ‘camanchacas’) become frequent.

One thing to consider is that because of the coast, hills and valleys, there is no single climate for all of Lima. For example, in winter the Surco area of Lima, which is closer to the coast, will be cool and damp. In contrast, the more elevated next district, La Molina, will be warmer and drier.
Lima’s climate is quite mild, despite being located in the Tropics. Lima has a subtropical and desert climate, yet the micro climate also makes it very humid. The temperatures vary from mild to warm (neither very cold or hot). The average temperature is 18 °C to 19 °C (60–65 °F). The lowest temperatures vary from 12 °C (50 °F) to around 20 °C (68 °F) and the high average is around 25 °C (78 °F), with 30 °C (86 °F) in the warmest of days. Many people compare Lima’s weather with California’s standard weather.

Figure 109. Weather in Lima

Table 12. Temperature by season
Table 13 shows the number of rain days per month, they actually look normal however we must mention that the standard of rain is only 0.02 inches of rain per “rain day”.

Table 13. Average precipitations per month

Cristo Rey’s Topography

Figure 110 Topographic map of Cristo Rey
The topography of the area is really “extreme” with slopes of 20% . The mountains that shaped the area are formed by rocks and brown rocky soils with low presence of clay.
Plan proposed by the neighbors

In order to speed up the legalization process (get their property title) the residents of Cristo Rey develop (with the help of a local engineer) a master plan, which would reorganize the housing structures based on a main street and 3 stair access. The plan was presented to the municipality for reference however, the residents expressed their need for a better configuration, based on their particular goals.

Sectional diagrams

The goal of the following sections (to be used as diagrams) is to show the extreme conditions of the mountain, as well as some of the context in the area.
Section B-B shows the area of Cristo Rey from the future main road (of pedestrian and vehicular access) to the top of the mountain. It is good to mention that the site currently has no safe vertical circulation; all the areas and elements shown on the plan are proposed for future construction.

Real Organization

The neighborhood had to relocate according to the proposed plan (1 year ago), however the real conditions of the house structure is a little different that the ones show in the proposed plans. While the plans show “future lots” the present houses occupy only a 10’x10’ space somewhere in the area of their future lot. (see figure 116)
Figure Ground Diagrams

The following diagrams show the growth of the area during the last 3 years; it’s important to say that the 60% of the houses shown in the diagrams are temporary shelters just like the ones from Cristo Rey, they are still in the process of obtaining their property title.

The 70% of properties shown belong to immigrants coming from outside of Lima, the rest belong to poor people that couldn’t afford to live somewhere else.

Figure 117. Figure ground of site three years ago

Figure 118. Figure ground of site in current conditions (orange squares are new structures)
Formal Social Spaces

The spaces shown are spaces that are meant to be of public use, however people meet informally everywhere, especially along the main street because of the little grocery stores and the childcare.

Figure 119. Public spaces in the area

Access to the Site

The following diagram shows the main access roads (red) used for cars and the pedestrian access (yellow). The pedestrian access are mainly stairs that allow people to move vertically in the mountain.

Figure 120. Pedestrian and vehicular access to the site
It is important to mention that the main road (red) ends where it is shown in the diagram and the residential area also ends at that point. The slope of the mountain defines this end, not letting people circulate around due to the steep slope of that area. Then the main road becomes a dead end; it has no connection with other parts of the city, it is only meant to serve residents of the area providing access to their houses.

The main road hasn’t been paved yet, and the vertical circulation (stairs) in the area hasn’t been built of permanent materials either, this lack of definition allows residents to invade the “future sidewalks” with their houses creating a chaotic streetscape in the future.

Cristo Rey is currently accessible by foot and through 2 paths connected to the main road, one of them will become the vehicular road in the future, the other one will be shared with the neighboring community.
The following pictures show the current conditions of the “stairs” and the future “main road”. They both represent a hazard for the children and elderly residents of the area due to the instability of the land.

Figure 124. Framework for typical stairs
Figure 125. Future location for the main road

Functional Diagram

The following diagram shows the residential impact in the site and the lack of

Figure 126. Site functional diagram
Buildings from the area

Figure 127. Typical shelter
Figure 128. Typical neighborhood’s store

Figure 129. Cristo Rey’s only store
Figure 130. Site’s Childcare

Views from the site

All the pictures were taken from the top of the mountain facing different directions.

Figure 131. View facing west
Figure 132. View facing east
People

As we mentioned before the majority of people are immigrants. The majority of people are under 40 years old; there were only two elders residents who live with their families.

One main characteristic observed during the site visits is the presence of children in the neighborhood. There is a large amount of children that play on the streets because there are no playgrounds in the area.
Landscape

Due to the lack of water in the area, the only green landscape present is formed by different types of cacti. The rest of the landscape is formed by the retaining walls built by the neighbors.

Retaining walls

The retaining walls are the main structural requirement in order to build a house on this kind of site; the ones existing in the area are made out of rocks and some mortar, they are built by the owner of the house and require a constant maintenance (add more concrete every time it settles).

In order to obtain utility connections these walls need to be built from permanent materials and around all the neighborhood.
House structures

The current housing structures are improvised by the neighbors and built out of materials they either found or bought for very cheap prices.

The materials commonly used are recycled steel sheets, woven sugar cane sheets and plywood.

The structures are basically a 10’x10’ room that contains a bedroom and kitchen, the other activities happen outside of the main structure. The front and back of the house are used as laundry areas.
Utilities

There are no legal connections to utilities. The residents obtain electricity from a neighbor from the lower area who charges them every month. The only water access is through a series of pipes that run along the main stairs and that release water every two days; 20 minutes per family. The water is stored in big plastic containers that the residents keep outside the house. The water comes from a tower located in the higher areas of the mountain, this tower is refilled by a water truck every week.

Figure 143. Existing water connections

Figure 144. Existing electric connections
CHAPTER EIGHT
GOALS AND OBJECTIVES

Definition of a House
“1. a building in which people live; residence for human beings
2. to give shelter to; harbor; lodge”

Dictionary.com

Introduction
The purpose of every housing project is to provide shelter; a safe structure for people to live in. Even though houses are the basic elements of a neighborhood, safe structural houses don’t necessarily create safe neighborhoods or safe environments for the neighbors to enjoy.

Figure 145. High class and low class uses of the street.

When we look at “acentamientos humanos” one observes the lack of safety in both spaces; the house and the neighborhood. Observing the way these neighborhoods develop, we noticed that people first try to satisfy their needs for shelter, living, and at the end, the need for an organized neighborhood.

After observing the nature of these developments, I identified the following problems:
1. Unsafe/unsanitary shelters: The original units are made of recycled materials, many times rusted metals or dirty cardboard boxes. The units that use plywood have no stable foundations.
2. Lack of services: The neighborhood has no access to sewer, water or electric connections.
3. Lack of infrastructure: The neighborhood has no roads, streets, sidewalks, or stairs for circulation.
4. Lack of social spaces: The social spaces are usually not considered in their planning, or if they are considered they are not adequate for human use.
5. There is no consideration for land impact (sprawl development): besides being far from the city, the settlement spreads on site instead of densifying the space for a better use.
6. Lack of support spaces: Because of the spreading units; the land has no space for areas that can help the overall quality of the site, areas such as: water treatment, productive landscapes.

Goals and objectives:
a. Provide Safe Shelter:
   - Replace the existing “temporary shelters” with safe permanent structures: The permanent structures will contain the basic housing areas that can allow a people to live with all the services needed.
   - Provide infrastructure (utilities, stairs, roads, etc.): The roads will allow the reconnect ion of the site to the city, and the stairs will allow circulation within the neighborhood.

b. Create feasible framework:
   - Establishing a framework using basic units as it allows for future organized growth: The basic housing will leave spaces for future expansion. The spaces will be filled according to neighbor’s resources.
   - Use subsides and neighbor’s savings as the budgeting limits for the housing area (frame)

c. Keep and promote their positive social relationships:
   - Organize the housing units according to the public spaces.
   - Create multifunctional public spaces that can be used according to the neighbor’s changing needs.

d. Sustainable use of land:
   - Group neighboring communities in order to densify their built areas.
   - Create support spaces (productive landscape, green spaces, workshop areas) for public use.

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CHAPTER NINE
PROGRAMING OF THE HUMAN SETTLEMENT “CRISTO REY”

Problem Statement

One of the main characteristics/potentials of the members of “acentamientos humanos” is that people there have chosen who they will live with. From the beginning the immigrants form organizations that are composed of people with similar past goals and culture. This condition is hard to obtain when a regular person buys a house within an existing neighborhood. The main goal of this project is to create a housing organization that keeps and develops the social relations that from the beginning helped the formation of these neighborhoods. In order to achieve this goal the design program will include different types of social conditions for the neighbors to use on special occasion in addition to their everyday life. These spaces will be shaped through the organization of “necessary elements” such as the housing units, retaining walls, roads and utilities.

Purpose

Given the social focus of the project, the program will be highly influenced by the character of the people who will inhabit the neighborhood. Before describing the size and name of the spaces that are going to be part of the future neighborhood, the research will first describe the people who are going to inhabit the space. Only then we can understand the presence of certain spaces in the program such as “farms” and “productive landscapes”.

Immigrants

The unequal development in Peru has increased the differences between the coast and the other regions; between the urban and rural areas. Under this situation, Lima has become the political, economical, administrative, educational center of Peru.
From the 1970’s, Lima became the destination for people from other provinces, who come to the capital searching for better living conditions; education, jobs, and health services.

These groups of immigrants who have similar cultural background, formed temporary settlements at the limits of the city. Years later these settlements became permanent and Lima grew to its current size; now it holds 30% of the total population of Peru. Thirty years later the immigrant phenomenon hasn’t stopped, these migration keeps shaping the capital and using the few spaces left. If in the past the immigrants moved to the deserts, now they have to occupy the arid mountains.

Statistics describe the immigrant population as "people mostly between 15-34 years old- education: elementary sometimes high school- work: agriculture".

General use requirements

Existing master plan issues: As it was mentioned before the immigrants occupy the land illegally, they moved there because it is the only free space in the city. Eventually they get organized and formalize their situation by either buying the land or working on the transference from the owner (government or private) to them (longest process). Due to the initial-illegal nature of the occupation, these settlements lack of any formal master plan. The restrictions are only given by the extremely hard topographic conditions of the territory.
Existence within districts master plan

The new housing prototype will be located on the same site where the neighbors currently live. The land occupied is not part of the “formal” district master plan (these settlements appear suddenly in unexpected locations), for that reason one of the main goals is to create links that reconnect this area in order to integrate it back to the district’s urban fabric.

During the construction process there will not be any relocation, instead a major formalization process will be planned. Keeping the original location will create a sense of improvement as well as limit the impact on other areas as well as improving the surrounding one.

Joint community uses

The public spaces will be the elements that bring the neighbors and community together, for that reason the areas must be designed according to people’s current and future activities (meaning immigrants activities). In order to hold these activities in the same space, a schedule establishing times and functions will be created. As an example, a schedule for the main plaza in a neighborhood at stage 3 of development could be:
- Weekdays (8am-10pm) courtyard open for public + children to play
- Weekdays (10pm- 8am) parking or closed area for security.
- Weekend days (6am- 10pm) market/workshops/community meetings,

The scheduling is applied to the largest (main) social space, not to all the spaces. During the design stage, different types of social spaces will be developed; most of them will be accessible 24 hours a day.

The advantage of a community-based development compared to individual development are:
1. Economy: as mentioned in the Elemental Projects the neighbors collected money for each of the enhancements such as paving and security fences.
2. Time: it will be faster for 20 people to pay for one fence than for each neighbor to pay for their own fence.
Solid Waste

Because of its distance from the rest of the city; the garbage is picked up by trucks once a week. A weekly cycle was observed among the units visited; during this “garbage cycle” the waste is moved from the back patio to the front and later to the main entrance or corner where its picked up by the truck. This cycle informs the need for a space in the housing unit (1, 2) and another in the street, designated for garbage disposal and collection. The spaces main purpose is to maintain sanitation and keep up a good appearance for the neighborhood.

Utilities

The "double check system", one of the positive characteristics observed in the “Elemental” project was the setting of two meters to measure the electric and water utilities. One of the meters is located next to the unit’s door and the other one is located next to main gate inside a locked steel box. These meters measure each house’s consumption and are compared every month. In the event the readings don’t match, the neighborhood receives a penalty for stealing water or electricity. These checking systems will be applied on site in order to promote the legal use of services among immigrant communities (and diminish the illegal use).
Times of use

Residents will have 24 hour access to all public areas, and different design elements will be incorporated in order to provide security to the aforementioned places (for example house’s windows facing the public space). The dwelling units will be complemented with social spaces within its program, in order to engage resident’s everyday activities into social encounters of varying types.

In the elemental project, the courtyard only served as parking after 11pm. (winter) and midnight (summer) it is normally used by children as playground and for the neighbors to engage in social activities such as markets or dance events.

Special regulatory issues

During the investigations in Chile I noticed that there are people who bring/decide the character of the spaces; sometimes even modifying the space’s functions according to their needs. Two of the examples where people’s characteristics defined/influenced the space were:

1. Age: During my conversations with the residents of the Elemental project in Iquique they commented about the distribution of levels according to age. The government gave the lower apartments to “older couples” and the units on the second floor were given to the younger married couples. This “age-guided distribution” was also used in the “acentamiento” Cristo Rey in Lima, Peru; there the higher lots were given to younger families and the lower ones were taken by people with disabilities or the elderly.

The relation age/verticality avoids the extra stress for older people to circulate around the neighborhood and to their houses. People’s age not only
informed the organization, it will also dictate the areas needed; for example if 80% of people have children then we need to plan for a child care center or a playground area.

2. Profession/skills: People’s skills/customs will dictate the character of the spaces as well as inform the program about potential uses:
- When asked about their skills, women from Cristo Rey responded that 80% of them knew how to make clothes and the rest expressed the desired to learn that skill.

The resulting idea was to create a multifunctional space that could be used as a market as well as house other activities such as recreation and parking. The skills/professions observed in Cristo Rey are described in the survey chapter and will define the functions to be held in the main public spaces.

Housing existing conditions

<table>
<thead>
<tr>
<th>neighbor-A</th>
<th>neighbor-B</th>
<th>neighbor-C</th>
<th>neighbor-D</th>
</tr>
</thead>
</table>

Figure 153. Cristo rey existing housing conditions

Housing units observed on Cristo Rey: (all units are 3 years old)
neighbor - A: 10’x10’ wooden house
neighbor - B: 10’x15’ woven cane mat
neighbor - C: 10’x10’ plywood house
neighbor - D: 12’x18’ recycled steel and plywood

As is observed in the pictures above, there is no defined “pattern to follow in the design of the houses. The owner builds according to his possibilities instead of a planned ideal. The spontaneous design/growth is the consequence for lacking economic resources and technical support. The program changes often according to the owner’s needs and possibilities.

After observing the growth on similar sites, the study has identified different development stages among houses that started construction at the same time.
On these kind of neighborhoods a “Neighbor A” will add a second room or replace the wooden roof whenever he gets enough extra money to build it, therefore there is not an equal development; “neighbor D” could be the first one to change from steel to brick, while all the other ones are still living in the same conditions. This informal “phasing” is unique to the lower classes in Peru; the middle and high class have constructions that are built according to a plan prepared either by an engineer or an architect. In the upper classes the construction process is faster due to more access to financial resources.

Site use issues

The settlement where the project will be located; "Cristo Rey” is currently composed of 40 families: one housing unit per family, it was chosen for the following reasons:

1. Site’s location/characteristics: Located in the district of San Juan de Lurigancho (the most populated district in Lima Peru). The housing program will be designed to host low income people of the area who currently live in temporary shelters. Its location on the skirts of the mountain represents one of the most common conditions/challenges for the "acentamientos humanos" today. The topographical characteristics of the site demand special considerations in the structural aspect (retaining walls). These elements will be planned in the first stage of the development in order to provide a safe and sanitary setting for the houses to be built during stages 2 and 3.

2. Size: After analyzing similar projects in Chile (Elemental) and visiting similar sub-divisions in Peru it was observe that the "settlements” are usually formed by no more than 50 families.

3. Development Stage: The settlement is currently in the development "stage-1"; the inhabitants live in "temporary” wood shelters, do not have utilities or retaining walls. People have been living on the site for about 3 years.

4. Community “feeling”: The residents have known each other for more than 3 years; many belong to the same family and town.

Adjacency diagrams

Without getting into the detailed design of the spaces; the following adjacency diagrams show the spatial relationships between varying functions.
Diagram 1 shows the importance of the stairs as the only element of vertical circulation and as one of the connectors for the courtyards (main public spaces). The overlapping of commercial and green areas are caused by the degree of activity on these spaces (recreation and commercial).

- Diagram 2 shows the different layers of functions people have to cross in order to get to their housing units. The intersection between the stairs and each of the layers (functions) should be a different opportunity to engage in social activities.

Figure 154: Adjacency diagram 1

Figure 155: Adjacency diagram 2
- Diagram 3 shows the transition from the “public social space” (courtyard) to the “private social space” (patio). It also shows how the areas that define the housing unit (stage 3) will define the character of the patios.

Proposed Program

The new site program will have the same areas proposed by the neighbors on their early master plan (discussed on survey chapter), the areas proposed were: 40 housing units, green areas, one community center, stairs and access road. The final design will present changes in the location and dimension of the spaces, this changes are based in conclusion achieved during the research previously done.

Proposed Phasing

The realization of the project in Cristo Rey will depend on the financial support from the Peruvian government. In order to get subsidies from the government a comprehensive development plan has to be presented to the Ministry of Housing, if the project is approved, the authorities will assign a budget for the construction of the project’s infrastructure including housing and services. For this thesis project it is assumed that the master plan has already been approved by the government and the subsidies have been disbursed for the construction to begin.
The construction of the project will be completed in three phases:
Phase 1: The first stage consist in organizing the neighbors of Cristo Rey according to the new master plan. From the research done in similar communities this relocation can take up to a year to be completed.
Phase 2: Will consist in the beginning of the construction of the new structures, in order to start building in the mountain the terrain has to reinforced first. The reinforcing stage will be supervised by engineers and can use the neighbors labor to reduce costs.
Phase 3: Includes the process of modifying the basic unit according to the owner’s individual needs, as well as the formalization of the supporting areas. (public spaces, recreation and education).

Phase 2 of Construction- Staging

Stage 1: Stabilization of the site: This first stage is built by the neighbors under government supervision. Engineers hired by the government will have the role of calculating the need (quantity and materiality) for retaining walls in order to make the site ready to support the building’s structures. According to the master plan proposal the lower area of the mountain (steepest area of site where community center is located) will require taller and a greater number of retaining walls.

The engineer Jose Pelaez (FDOT) asked me to use the retaining walls employed by the Incas in Machu Picchu (Peru) as an example of how to deal with the site. The Incas built their terraces using stone walls 5’ tall (maximum). According to Mr. Pelaez, a taller retaining wall would need extra reinforcement in order to resist the load of the mountain on a seismic site.
The 5' tall walls were used as reference to design the terraces existing on the site, the housing for example has a 5 to 15 relationship, where the 15'long floor is raised on a 5' tall column. After the main retaining walls are built, the community can coordinate with the municipality to install the utilities (water and electricity). The water system will be explained in detail later and consist of a small variation on the standard water connections.

Stage 2: Construction of the buildings: The second stage consists of building the flat areas where the buildings are going to be located, these areas will be constructed with the use of concrete piles which will reduce the amount of dirt needed if compared to the conventional terraced system (figure 160).

The Community center will be built first because it is going to be used as temporary shelter for the neighbors whose homes are under construction. The order of development for the housing starts from the lower areas and ends at the peak of the mountain.

![Figure 160. Added dirt using conventional terraced system](image1)

![Figure 161. Order of development for Cristo Rey](image2)
Site’s master plan

The design of the master plan for Cristo Rey was influenced by the topographic contours of the mountain (figure 163) and the idea of creating a public space for each cluster (figure 164). There are four main streets on the site; they run along the contours of the mountain but separate from each other in the areas where housing front yard is located. The programing site functions presented required by the neighbors during the survey was kept in the new proposed master plan, these areas were relocated in order to achieve the goals of the project.

The site is divided in half by the main stairs. Figure 165 shows a diagram of the final site plan and the area that is going to be developed in detail.
Figure 165. Diagrammatic site plan

Figure 166 shows the projects site plan at the beginning of the phase 3; where all the planned structures are built and the water systems are irrigating the site creating some vegetation in the area.
The section above shows how the houses seat on the site and how they frame the front yard public space. As shown in the same figure the final proposal will only cut into the topography in order to build the water tower.
Figure 170. Section model of proposed development

Figure 171. Section model- Firs street area

Figure 172. View looking up from first street
Figure 173. Area between 4th street and the water tower

Figure 174. Section model- Area between second and third street

Figure 175. Area between third and fourth street

Figure 176. Water tower area
Site perspectives

The following perspectives show the end results of the development at stage 3.

Figure 177. Approach to the site from the main street

Figure 178. View to the project from the main street
Figure 179. Aerial view of project (using housing typology 001)

Figure 180. Perspective of 1st street
Figure 181. Aerial perspective looking at community fields.

“THE COURTYARD”

Figure 182. Perspective view of the front yard area
Public Spaces- Community Center

The community center is the main enclosed public space and plays an important role in the site development, the center’s program varies according to the time of development of the project:

Location
The Center is located in front of the site (lowest area). It functions as a gate to the project but also as a shared space with people of other housing projects. Its location also helps to control the maintenance of the community terraces located at both sides of the center.

Figure 183. Location of community center

Figure 184. Site section showing community center and other public space locations
At the beginning of phase 2 the community center is built by the neighbors and has two main areas: dining and housing. The kitchen/dining area is used by the mothers of the community to prepare meals for their children and the workers of the site, these meals are also part of the subsidy by the government. The housing area serves as shelter for people whose houses are under construction.

Figure 185. Community center with their initial program areas.

Figure 186. Typical public dining space.
At the end of phase 2 all the neighbors will be living in the housing units, therefore the temporary shelter area from the community center can be transformed into classrooms or workshops where the neighbors can learn new trades. During this time the neighbors can also start preparing the “community gardens”. These terraced gardens will provide bamboo and other alternative materials to be use in the house additions. The gardens will be irrigated using the reclaimed water from the houses.

Once the classrooms and the terraces are built people can add a meeting space to the building’s program. As it was mentioned on the site analysis the community has weekly meetings to discuss current activities of the neighborhood.
Materiality

The retaining walls where the center sits are made out of stones and concrete (method known by neighbors), the buildings will use concrete and wood as their main materials.
Public spaces- Commercial Areas

Location

The site is located in an area where there are no zoning restrictions, however if we consider the main circulation and the design of the house we can expect to have commercial activities happening along the main stairs. Grocery stores (bodegas) and small sandwich shops are popular around the site and don't need a major investment.
The location of the store in a small place between the streets will avoid big groups hanging out in the area where they would interrupt the circulation of the sidewalk and stairs. From the studies on social spaces we know that avoiding groups of men in the street motivates women and children to walk in the street specially at night. Group reunions should happen in the front yards where the activities can be observed and controlled by the neighbors.

Figure 194. Perspective of commercial area

Figure 195. People using the commercial area
Public spaces- the stairs

The stairs are the main circulation element on the site. The separation of the house by using the “living machine” tanks avoids blind intersections in the corners as typically happens in mountain housing projects.

Figure 196. Visibility along the stairs

Public spaces- Neighbor’s front yard

Location

The space is located between the street sidewalk and the back of the house from the lower levels. Its location between the houses allow the use from all the neighbors surrounding the space. The location will determine the slope of the area and therefore its possible functions.

Figure 197. Neighbor’s front yard location
Figure 198. Site section showing community center and other public space locations

Program

The space belongs to the neighbors that surrounds that area (people living on the same street) therefore they will be the ones in charge of maintaining it and designing it according to their selected functions.

The size of the front yard is approximately 1200 s.f. and its shape changes according to the topography of the mountain. Although it was left without program it was designed as an extension of the house’s patio area. The yard is visible from all the rooms of the house so children can play safely under the supervision of their parents.

From the water use diagram we know that the space is going to be irrigated with the reclaimed water from the houses, therefore if the neighbors don’t want to invest in building a structure in the area, the space can be left naturally as a garden.
As mentioned before thanks to the reuse of water the space can be left as a garden however people can use the irrigation system to design some productive terracing where edible plants can grow (figure 200).

It could also happen that some neighbors try to maximize their space and the yard, flattening it and using it as an extension of the house (figure 201).
Figure 201. Section of Yard Space design as a flat patio (expensive addition)

Figure 202. Elevation of yard space as recreation and garden terrace-model picture
Figure 203. Perspective of yard space designed for recreation and garden area

Water use

In order to calculate the dimension of the water tank that will supply the site, we need to calculate the amount of water used by the neighborhood.

<table>
<thead>
<tr>
<th>AVERAGE DAILY CONSUME OF WATER PER FAMILY (5 MEMBERS)</th>
<th>WINTER</th>
<th>SUMMER</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHOWERS</td>
<td>250 LITERS</td>
<td>350 LITERS</td>
</tr>
<tr>
<td>SINK</td>
<td>50 LITERS</td>
<td>75 LITERS</td>
</tr>
<tr>
<td>TOILET</td>
<td>300 LITERS</td>
<td>300 LITERS</td>
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<tr>
<td>COOKING AND WASHING DISHES</td>
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<tr>
<td>WATERING PLANTS</td>
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<td>165 LITERS</td>
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<tr>
<td>TOTAL</td>
<td>835 LITERS</td>
<td>1165 LITERS</td>
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<tr>
<td></td>
<td>25,000 LITERS</td>
<td>35,000 LITERS</td>
</tr>
</tbody>
</table>

8750 PER WEEK X 40 FAMILIES=35000 LITERS
35000 L = 1236.013 FT³
25FTX25FTX25FT=15625FT³

WATER TANK NEED TO BE FILLED WEEKLY

Figure 204. Consumption of water per week¹
According to the calculations the neighborhood will need a total of 123,013 cubic feet of water per week. The water tower proposed will have a total volume of 15,625 cubic feet and not only serves as water storage but as look out point for the neighbors.

The design of the tower incorporates the religious symbol that we find in this kind of neighborhoods and that was requested by the residents during the initial community survey.
Figure 207. View down the mountain from the top of the tower
Water cycle proposal

In order to reduce the waste of water on the site the conventional water utilities will be modified.

The water will be supplied using a gravity fed system from the tower located on top of the mountain to the houses in the lower areas. Inside the house the water is treated, separating the disposed water into two pipes; waste water and gray water.

The waste water will run along each the street (under the sidewalk) into the “living machines” located at both sides of the main stairs, this system helps by filtering the water not clean enough for human consumption but adequate for irrigation of the community fields located at the bottom of the mountain.

The gray water will be drained into the public space located in front of the houses. From this point it will drain down to the stair area where it will then be filtered with the waste water using the “living machine”. This water will finally be drained into the community fields as irrigation.

Figure 208. Water cycle on Cristo Rey
As figure 109 shows, the water is drained into the public spaces through the use of a stone made drainage canal located between the low area of the courtyard and the back of the house. This system was modeled after the Incas method (figure 210) to distribute the used water throughout their cities.
Living Machines

This system consists of a combination of indigenous plants and mulch enclosed in collecting tanks that can be built out of stone. The site will have a total of 3 filtering tanks (one at the end of each street), its maintenance and construction will be done by the neighbors from Cristo Rey.
Figure 213. Location of filtering systems along the site

Figure 214. Section through the planter containing the filtering plants
The water that has been filtered throughout the site is re-used in the irrigation of community fields, on these fields the neighborhood grows material such as sugar cane and bamboo, materials to be use in the assemblage of panels for the walls of their house additions.
Housing

In order to build on such a sloped mountain we need to understand how to create flat levels that are large enough to host a living space.

As we see in figure 216 when we build in the mountains we have an area of the house that can be built without problems (yellow region) however there is another area that penetrates the mountain (pink area). The pink area of the house can be built removing that same volume of dirt from the mountain however that implies a large amount of dirt movement and the need for many retaining walls that translate into an expensive investment.

The second solution is to create flat areas on top of the mountain. Conventionally the flat areas are formed by retaining walls that are filled with dirt and leveled forming a flat terrace that support the floor of the house. The second system requires acquisition of dirt to fill the terraces and the construction of solid walls to retain it.
A third system using concrete piles that go deep into the mountain (30% of the building height) doesn’t need any dirt movement or acquisition and leaves spaces under the floor that can be used to build septic tanks or storage space.

The pile system was recommended to me by the engineer Jose Pelaez from the Florida Department of Transportation, Mr. Pelaez is originally from Colombia and is familiar with the site conditions. According to the Mr. Pelaez the piling system is the most stable in seismic regions.

The pile system creates a foundation where the columns of the house can sit. The flat area will be framed using a concrete post and lintel system.

The design of the houses in Cristo Rey will need a floor area of 15 feet x 31 feet, in order to achieve this we need to raise the slab 5.3’ from the ground level. This height has been calculated according to the average slope angle taken from the sections of the site (average slope is 23.37).

The program for the houses proposed is based on the functions observed during the site analysis, the size of the areas in the house are based on an average between size of the existing spaces and the size of a middle class house in the city.

The program will be arrange in order to obtained a good transition between public, semi-public and private spaces. Keeping in mind that the project aims to improve the social relationships of the neighbors, there will be a priority given to the spaces that engage social encounters such as the living room, outside patio and kitchen.
Beginning with a simple square floor plan, the units will be shaped according to the location where the main functions will occur. These locations depend on the illumination needs and privacy issues.
The areas that need more illumination are the laundry and the patio. Inside the house the kitchen and the living room will be the main areas to be provided with natural illumination.

Figure 221. First functions located in the house

The areas that need less illumination are the latrine and the “pet” space, however these are the areas that need more ventilation. The mentioned areas will also shape the volume of the house creating a void on the south east side of the house.

Figure 222. House shaped by 2 main design moves
This first house was designed thinking of people from The Cristo Rey community:

It was designed for the young couple that just moved from the mountains to the city and want to save some money for their future, now this couple can open a little store or rent an extra room. It was designed for the mom who stays all day at home taking care of the children and wants to check on them while they play in the outside spaces (she can see them from the kitchen or other areas).

It is designed for the elderly who can't climb the main stairs but likes sitting in the semi-public space of the house while reading the newspaper and watching people in the streets. It is designed for the people who want to keep growing animals (chickens, guinea pigs, etc.) and now can do it in the back space.

The building methods include the participation of the owners so they can develop a strong sense of ownership and accomplishment.

The house was thought of as a simple structure that can suit the resident’s various needs and provide them with multiple opportunities. The house provides spaces so people from Cristo Rey don’t lose sight of their cultural background.
House program

The housing typology 001 has two bedrooms; one on the first floor and one on the level between first floor and second floor that can be used as future store (level will be called “store level”). The house also has a kitchen, a bathroom and a living room. On the front of the house a space is provided for seating, this space is visually connected with the street and public spaces. On the back an empty space is meant to host the structure for the future additions but until that time; the space can be used as a back yard.

Figure 224. Typology 001- First floor plan

Figure 225. Typology 001-Store level floor plan
The provided house doesn’t have any initial rooms in the second floor however this level will serve as the future floor for the additions built by the owner.

It is recommended to leave the stairs from the store area to the new addition without a roof; this will allow all the rooms to have natural illumination and ventilation. Figure 227 shows the mentioned “ventilation” idea however the final decision depends on the owner of the house.
The first housing typology was developed after talking to the engineer Jose Pelaez from the DOT department, who explained the structural need for a house with such a program as the one developed in chapter 5. According to the engineer, the “post and beam” system should be preferred over the popular practice of building retaining walls and filling them with dirt to create a base for the floors. The system proposed reduce the amount of dirt to be moved (that can increase the budget) and provides more seismic resistance.

Figure 228. Typical retaining wall creating a terrace for the house floors.

Figure 229. Post and Beam system used for Typology 001

The provided structure will serve as “base-support” for the future additions that the owner may build, therefore it is required that the initial building provides a structure strong enough to support these potential loads. This part of the structure can be built by the neighbors under the supervision of an engineer.

Figure 230. Concrete columns create leveled space for the house
Once the concrete structure has been erected, the wood framing can be installed. The second framing will support the “Eternit” panels; these are temporary panels made out of fiberglass which will be provided by the government. This stage of construction can also be done by the future owners under the supervision of an engineer hired by local authorities.

Finally the panels are attached to the wood framing. These panels can be replaced in the future by stronger materials such as brick or wood; the main concrete structure is designed to hold the weight of those materials.
Having the first floor raised 5.3 feet from the street level creates a boundary between the house and the street; this boundary provides security and privacy to residents inside the house. As shown in figure 233 people walking in the street can’t see inside the house however people inside the house have good visibility to the outside from all the rooms.

Figure 233. Typology 001- Cross Section 1

Figure 234. Typology 001- Longitudinal section
Figure 235 shows the advantage of having the main stairs between the rooms; it allows independent access in case the owner wants to rent the second room.
Thanks to its flexibility, the proposed house can be built anywhere on the site. As shown in figure 236 the house would change its orientation towards the public space (kitchen and living room areas always have visible access to public area).

Figure 236. Housing 001 surrounding the main public space

Figure 237. Housing seating on the mountain
Materiality

As mentioned before, the structural materials will be wood and concrete. These materials were selected in order to guarantee the safety of the house. Once the structure has been built the wall will be covered with the corrugated “eternit”; this panels are usually donated by the government to the immigrant settlements. The addition that is going to be built by the owners can use cheaper and more accessible materials. As mentioned before in the Community Center chapter, some of these materials can be produce in the “community fields” located next to the community Center. Producing their own materials will not only reduce the cost of the additions but can integrate the typically segregated members of the neighborhood, such as women. Since men leave to the city everyday, women can be in charge of building these new panels for their future addition; this activity will not only generate some profit to the household but will reinvigorate the role of women as a productive member of the community.

The alternative materials proposed are the ones neighbors currently use on their shelters:

a) Woven cane mats: produce on site (community fields)
b) Recycled wood: collected from close by factories
c) Recycled steel: collected from close by factories
As we can see in figure 239 the bamboo canes produced on site can not only be used for the panels but also for the structure of the second floor addition.

Figure 239. Bamboo used as a structure

Figure 240 shows an exploded axonometric of the house where the “eternit” panels are combined with panels made of “alternative materials”. Using different materials in the initial unit will teach their potential to the owners and promote their use for the additions.

Figure 240. Exploded axonometric
Other additions

The owners of the houses lack economic resources so it could be many years until they can afford to build an addition to their houses, meanwhile new functions can be incorporated to the house using little investment. The front spaces left open by the concrete structure can be used as storage for the garbage, and the front patio can also develop into a small garden. The back space can be used as garden and if it is leveled it can also be used as playground for the children of the house.

Figure 241. Possible uses for front spaces

Figure 242. Possible use of the back space as playground
Figure 242. Possible use of the back space as playground

Figure 243. Possible back garden addition - model picture

Figure 244. Possible front storage and garden additions
Figure 245. Area of the courtyard left natural

Figure 246. Terraced area of the courtyard used as sitting area
Commercial Expansion

The transition room of this typology allows the owner to connect the house to the main circulation; this connection happens in case the owner would like to open a space with commercial functions such as a grocery store which are popular in the area of Cristo Rey.

Once the second floor addition is built, the “commercial room” can be accessed from the first (existing) and second floor (future addition) independently. The “store” can be owned by the residents of the first floor or the future residents of the second floor, in the event the owner decides to rent the second floor.

The flexibility of the room is allowed thanks to the materiality of the wall located between the house and the stairs; this wall is filled using the standard fiber glass panels, that can be replaced or cut in order to open the future store window.

Figure 247. House using the extra room as store.
Potential additions

Once the house typology is built, the owner can change its structure adding new rooms according to his needs.

Being that owner is the person who will be designing the addition, I decided to invite my friend Eric Holtgard (who was familiar with the project) to design the additions assuming it was his house. Before giving him the project I explained to him the economic, social, and cultural context of the project.

The purpose of the addition assignment wasn’t to see the look of the final house, but to observe the design path the owner follows once he has an existing structure. It was also my interest to see if the semi-public spaces of the house were going to be left open and if the materials provided were going to be used or replaced by other materials.

After finishing designing the additions, Eric’s comments were:

“My goals was to make independent floor so I can rent them, get some money to keep building”. “The location of the stairs helped me achieve independent access to each floor”. “Because I learned how to make and use the alternative materials during the construction of the typology 001 I continue using them throughout the whole house.”

Figure 248. Aerial view of house with additions

Figure 249. Street view of house and additions
Water cycles in the house

The cost to bring water from the city into the site is very high, therefore a system that re-use the water is incorporated into the house.

This system consist of using different pipes to separate the gray water (water from sinks and shower) from the waste water (water from the toilet). The gray water will be drained into the front yard and later into the public areas, while the waste water runs on the sewer line along the street to be finally treated in the “living machine” areas located along the main stairs.

Figure 250. Water separation system

Figure 251. Water re-distribution
Typology 002

The main intention with the design of house 002 is to take advantage of the government's subsidy and build as many structural elements as we may need now and in future expansions.

The housing typology 002 was designed in order to establish stronger restrictions to the additions that may be built by the owner. In this typology the future addition will mainly occupy the first floor; therefore, if the second floor is provided, we are also providing the structural framework for the living areas in the first floor.

The housing design consists of one master bedroom, a kitchen, dining room, a bathroom, and living room, all located on the second floor. The first floor consists of an open space that can be used as a garden or seating area, before the additions are not built yet.
Figure 253. First level floor plan

Figure 254. Second level floor plan
As seen in the second level floor plan; the kitchen is also oriented towards the street, this was a requirement expressed by the mothers in Cristo Rey; they wanted to be able to observe their children playing in the street from inside the house.

The front outside space presented in typology 001 was also integrated into this new design, the outside space located next to the living room can be used as a seating area for older people, or as an extension of the living room.

Figure 255 presents a possible layout for the addition on the first floor; this addition uses the columns of the provided second floor as the main structure.

The electric and water services will also be easier to install in the lower level since the equipment (pipes and valves) has been already supplied for the second floor, the owner just has to keep his plumbing features aligned vertically with the ones in the second floor.
The model 002 doesn’t need any foundation for a “store level”, therefore the concrete piles that support the house go from the terrain up to the second floor; framing the first and second floor.

These members should be built out of concrete by the neighbors under the supervision of an engineer hired by the local authorities. Once the concrete frame is in place the framing for the interior partitions can be installed, this framing will hold the panels which will be either donated by the government or produced by the community using alternative materials.

Figure 256. Diagram of typology 002 on site

Figure 257. Concrete columns built on site
Figure 258. Concrete and wood structure used

Figure 259. Location for possible future additions
Having the living space on the second level leaves the first level free (at least until additions are built). This space can be enjoyed by women who seat and do their laundry everyday while their children play in the open spaces in front of the houses. The space can also develop into a workshop or a store that is closer to the main street instead of being connected to the main stairs as proposed in house 001.

Figure 260 shows the 5.3’ boundary between the first floor and the street level on the front of the house, however the back of the house matches the level of the rear open space, so if the owner desires, there could be another access point from that area.
Figure 261. Section through living room and kitchen

Figure 262. Section through bedroom and kitchen
Materiality

This typology will require more concrete than the house 001 due to the taller columns to be built, however the frame for the roof on the second floor can be built using wood beams since the roof won’t support any future additions.

For the interior and exterior walls the house uses a combination of panels made out of “alternative materials” or “eternit” panels donated by the local authorities.

Figure 263. Exploded axonometric of possible materials for typology 002
Figure 264 shows a form of using the bamboo as material for the partition walls (interior and exterior).

Potential Additions

As mentioned before the first floor of the house can be used as a garden/seating area (figure 265),

This feature requires an erosion control system that can be built using recycled wood as its shown in figure 266 where a terraced garden was created inside the house in the mountains of Japan.

The private garden can be irrigated with the gray water from the second floor serving as a filter before this water drains into the public spaces that can grow edible plants for the community.
Figure 266. First floor used as productive garden

Figure 267. First floor used as patio-model picture

Figure 268. Street condition-model picture
Potential additions

The “addition assignment” was applied to the second typology as well, and the final design of the house was sent to my friend Alex Coronado, and architecture student that lives in Peru. Alex developed two additions using the typology 002 as a framework:

Addition 1 was developed using the space left on the first floor, he added living spaces to be rented by the owner. Some stairs were also added to create an independent access to the new living spaces.

Addition 2 consists of two additions, one on the empty first floor, and one on a new third floor. As mentioned before the addition on the first floor will not require a major budget however the third floor will imply a major investment in order to create a new concrete framework for the extra living space.
Water redistribution

Prototype 2 also uses a separate plumbing system for the waste and gray water. The system uses the private garden as a filter for the gray water so it can be later drained into the public spaces.

Figure 271 shows a possible location for a septic tank that can be located on the back of the first floor. The tank can ease the filtering process of the water, holding the solid waste from the toilets.
CHAPTER ELEVEN
CONCLUSION

Project Accomplishments

At the end of the thesis project I defined a housing master plan for the Community of Cristo Rey, this master plan explained the construction phasing to be followed in order to achieve the public spaces desired. The master plan also proposed two housing typologies that can be set on the site in order to create an organized neighborhood. Although this system was designed for the Cristo Rey site it is my intention that the organizational structure can become a typology for low income mountainous housing that promotes the use of public spaces and social relations between neighbors. The project also describes systems to be use during the construction of the houses, community center and retaining walls. Methods were also design to incorporate the re use of waste and gray water to irrigate the site.

Main challenges

Through out the process of this thesis some of the designed buildings, (house and water tower) and elements on the site (retaining walls and roads) were not able to be explained in more detail because of a general lack of construction experience. During the design some assumptions about construction methods were taken from a general knowledge obtained by looking at precedent studies. It should be noted, however that this thesis was more oriented towards the design and use of various spaces through out the neighborhood and not limited to the methods of construction. An additional issue that manifested in this thesis is the difficulty in finding the main architectural needs of clients who lack almost everything. In addition to the design challenges having clients of a lower economic status create issues with the financing of such a project. Because it is assumed that the client has little to no money to contribute, they are depending completely on uncertain financing by the government.
Project limitations
Perhaps because the majority of the design focus was on the master planning the project did not address a deeper exploration of materiality. The building strategies proposed use standard construction materials and methods that are familiar to the neighbors such as concrete, wood and “eternit” panels. The project could have benefited from further explorations in an effort to lower the cost of the project and involve the neighbors during the construction process.

Future suggestions
For the preliminary analysis and design a great advantage was that I’m originally from Peru and I’m familiar with the local way of life, this is an important facto when designing a project abroad, as the architect has to become very familiar with all the elements that affect the site and the people living in it. Without appropriate knowledge of local customs and needs the proposal will not be relatable to the end user.

Given a project of this magnitude that has such a significant impact on the future residents, it is very important to maintain constant contact with both the client and local authorities familiar with the project and its challenges.

Figure 272. Conceptual model
References


Zolezzi,Mario and Tokeshi Juan, *Densificacion Habitacional; Un Propuesta de Crecimiento para la Ciudad Popular, Alternativas de Desarrollo* (Lima: Centro de Estudios y Promocion del Desarrollo, 2005)