

# **Sustainable housing for the poor facilitated by NGOs in Costa Rica and Nicaragua**

**- Possibilities of introducing multi-story buildings**



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## **Abstract**

The bachelor thesis contains a presentation of three NGOs working for sustainable housing and infrastructure development for the low-income families in Costa Rica and Nicaragua and the future prospect of introducing a wider range of multi-storey buildings.

A high number of the Central American population live in densely populated slums in urban areas with harsh living conditions far below the poverty line. They lack access to basic needs such as clean water, electricity and sanitation which makes their daily life a struggle. The need of improvement is obvious but it requires commitment from both public and private institutions.

The financial capacities of the Costa Rican and Nicaraguan governments are diverse which directly influence their capacity to help the impoverished population with housing development. Costa Rican welfare is unambiguously higher than the Nicaraguan, which is clearly reflected in the countries poverty rate and its ongoing housing development projects.

The governments of some industrial countries are contributing to the improvement of the housing situation in the developing countries by education and financial aid. Thanks to their contribution in Costa Rica and Nicaragua, the countries have established organisations that aim at helping the poor population to rise to a higher social level, inter alia through housing and infrastructure development and social education programs.

Rapid horizontal growth of the cities harvest the surrounding rural landscapes and is environmentally and economically unsustainable. The conservative mentality of the housing developers and their lack of knowledge make it difficult to introduce new building techniques such as multi-storied buildings, although a high share of the population could imagine themselves living in the vertical plane. A change in the cities architectural structure could solve many of the growing urban problems and guarantee more people the right to dignified housing conditions.

**Keywords:** slums, housing development, NGO, multi-storey buildings, Costa Rica, Nicaragua

# Sammanfattning

Detta examensarbete består av en presentation av tre organisationer som arbetar med hållbar bostads- och infrastruktur utveckling för fattiga familjer och individer i Costa Rica och Nicaragua samt framtidens möjlighet att införa flerfamiljehus i dessa länder.

En stor del av den centralamerikanska befolkningen bor i de tätbefolkade slumområdena i städer med hårda livsvillkor långt under godkända levnadsvillkor. De saknar tillgång till grundläggande behov såsom rent vatten, elektricitet och sanitet, vilket gör vardagen en kamp. Behovet av förbättringar är självklart, men det kräver engagemang från både offentliga och privata institutioner.

Den finansiella kapaciteten av Costa Ricanska och Nicaraguanska myndigheter skiljer sig något från varandra vilket påverkar deras möjlighet att hjälpa de fattiga med bostadsutveckling. Costa Ricas välfärd är entydigt högre än i Nicaragua, vilket tydligt avspeglas i fattigdomen och i de pågående bostadsprojekten.

Regeringarna i vissa industriella länder bidrar till att förbättra bostadssituationen i utvecklingsländerna genom utbildning och ekonomiskt stöd. Tack vare deras bidrag till Costa Rica och Nicaragua, har länderna etablerat organisationer med syfte att hjälpa den fattiga befolkningen att stiga till en högre social nivå, bland annat genom bostäder och utveckling av infrastruktur och sociala utbildningsprogram.

Den snabba tillväxten till storstäder påverkar den omgivande landsbygden och är miljömässigt och ekonomiskt ohållbar. Den konservativa mentaliteten av bostadsbyggande och eventuellt deras brist på kunskap gör det svårt att införa nya byggnadstekniker så som flervåningshus, detta trots att en stor del av befolkningen kan tänka sig att bo i det vertikala planet. En förändring i den urbana arkitektoniska strukturen skulle kunna lösa många av de växande städernas problem och se till att fler människor får rätten till en värdig bostad i ett gott skick.

Nyckelord: slumområden, bostadsutveckling, flervåningshus, flerfamiljehus, Costa Rica, Nicaragua

## Foreword

This essay is a part of our bachelor degree in Civil Engineering, specializing in Architecture, at LTH School of Engineering. This thesis corresponds to 22.5 Swedish credits which is equivalent to 15 weeks of full time study.

After seeing the interesting work of HDM (Housing Development and Management) and their contribution to the developing countries, we decided to try it in practice. Thanks to Maria Rasmussen, Erik Johansson and Johnny Åstrand and their benevolence to help us, we were given the opportunity to travel to Costa Rica and Nicaragua to study the work of three housing development organizations and to write our degree project there.

This opportunity turned out to be an amazing experience that will not be forgotten until the end of our lives. The four weeks in Costa Rica and two weeks in Nicaragua taught us not only much about the internal framework of our field of work, but also the importance of solidarity, compassion and dedication to those in the world that live under worse conditions. The people that we met working for the housing development organizations are dedicated to help others and the result of their devotion is remarkable.

We want to show special gratitude to Mario Rodriguez, who helped us with all the important contacts in both Costa Rica and Nicaragua and gave us an office where we worked during our time in San José. We also show a lot of gratitude to Federico Granados Brenes in Fundacion Costa Rica-Canada who dedicated a lot of time to helping us with our project. He gave us quantities of information, showed us their projects and guided us around Costa Rica.

We want to give heartfelt thanks Veronica Fonseca from FUPROVI, Johan Acevedo Mayorga and Jose Flores Madrigal from Fundacion Costa Rica-Canada and Hilda Delgado from PRODEL. Thank You for the guidance and information during the visits of the projects and for Your willingness to help us with everything we needed. We would also like to thank everyone that we have not mentioned that has contributed to the final result of our essay.

Finally we want to express our gratitude to all those mentioned above for receiving us so warmly. We will always remember our time together; both during the working hours as well as the time we had outside the schedule, which we are sure has shaped new everlasting friendships.

Kristian Bergier & Josefine Törnquist, Nicaragua, May 2010



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## **Abbreviations**

AYA	Acueductos Y Alcantarillados (Public Water Company)
BANHVI	Banco Hipotecario de la Vivienda (Mortgage Bank of Housing)
ICE	Instituto Costarricense de Electricidad (Public Company of Electricity)
FCRC	Fundación Costa Rica – Canada (The Costa Rican – Canadian Foundation)
FUPROVI	Fundación Promotora de Vivienda (Foundation for Promotion of Housing)
PRODEL	Fundación para la Promoción al Desarrollo Local (Foundation for the Promotion of Local Development)
Sida	Swedish International Development Cooperation Agency
CIDA	Canada International Development Agency



# 1 Introduction

## 1.1 Background

During our previous travels to Latin America we observed that the architectural structure in most of the cities is scattered in the horizontal plane and a vast majority of the houses are built with a maximum of two levels. We also discovered that the small share of the houses that are built with multiple stories are normally located in the center of the cities and are particularly exploited by companies or the upper social classes. Meanwhile a considerable proportion of the population urgently requires house improvement since stern poverty is widespread.

The growing cities induce economic and environmental problems which the municipalities find hard to handle. One way to reduce the problems is to increase population density by introducing multi-storey buildings. This method is common in other parts of the world, not least in Sweden where 55 per cent of the housing market consist of apartment buildings. Since the poor populations housing situation is our primary concern in this essay, we can add the fact that approximately 75 per cent of the low-income population in Sweden live in apartment buildings. This data can lead to the conclusion that multi-storey buildings can be a possible solution to decree the urban horizontal growth and to sate the considerable demand for accommodation (Boverket, 2010).

The governments and several both domestic and international organizations in Latin America are working with housing development for the low-income population. To be able to investigate the interest in alternative building techniques, such as multi-storey buildings, it is important to first understand the local housing sector. Only by studying the local housing developers and learning to comprehend the market can it be possible to determine the future prospect of establishing multi-storey settlements.

We chose to travel to Costa Rica and Nicaragua to undertake our investigation. Although the neighboring countries share the same language, the history has set its footprints and made the differences between the countries quite severe. These differences are clearly reflected in the work of the governments and the housing organizations which provide an interesting contrast into the study.

## **1.2 Problem Definition**

“Poverty deprives people of the freedom to decide over and shape their own lives. Absence of economic margins and limited opportunities means that poor people are vulnerable.” (Tannerfeldt & Ljung, 2006)

The high quantity of poor people in the rural areas of Costa Rica and Nicaragua provokes urbanization which is an economic phenomenon in the sense that the prime driving force is the search for a better income. The urban municipalities do not have sufficient resources to handle the increasing population which results in growing urban slum areas. The poor people’s standard of living is far below the level of acceptance, especially when seen from a Swedish perspective. Crime, violence, fire, traffic accidents, flooding, earthquakes, landslides, diseases, drug abuse and alcoholism are only a few of all risks that have particularly devastating effects for the urban poor. (Tannerfeldt & Ljung, 2006)

The poor housing condition and the lack of basic services in the slums do not only cause human suffering but reduces both productivity and income. This is because the house is often more than a home, it is also a workplace. The individual dwelling requires indispensable complements such as water, sanitation, electricity, access roads, lighting and transportation. Besides the improvement of houses it is important to develop the basic infrastructure of the neighborhood as well as schools, sports grounds, clinics, religious buildings and other amenities. This process is expensive and requires commitment from the municipalities, which unfortunately do not always possess the adequate resources or political will to improve the housing condition for the urban poor. Meanwhile the poor people have neither the means to improve the situation by their own efforts nor the power to influence the responsible authorities (Tannerfeldt & Ljung, 2006).

The increase of the urban population in Costa Rica and Nicaragua results in a horizontal growth of the cities. It consumes the neighboring rural areas that could instead be exploited for agricultural purposes or left alone for its biological qualities. Urban expansion in the horizontal plane lowers the cities density which, except for high use of land, causes many administrative and financial problems. Low densities may increase per capita costs of land, infrastructure and services, affecting the sustainability of human settlement and producing urban environments that constrain social interaction (Acioly & Davidson, 1996).

### **1.3 Objective**

The main intention of this essay is to investigate the housing condition of urban poor in Costa Rica and Nicaragua, examine how local municipalities and NGOs are handling the housing issues for the urban poor, find a solution that could possibly improve their present standard of living and finally evaluate the possibility of implementing the improvement into the local housing sector.

To be able to proceed with the main objectives, it is important to first understand the reasons that have caused the current housing situation of the low-income population. The historian David Crabtree from the McKenzie study center stated: “History does matter. Our view of history shapes the way we view the present, and therefore it dictates what answers we offer for existing problems.” (McKenzie study center, 2010) Thus, the essay will cursory treat the history of the countries as well as the economy, social condition, education system, geography and climate, with the intention that the reader gain a better understanding of further presented topics.

Three local NGOs that are mainly working with housing and infrastructure development for the impoverished population will be closely examined and compared with each other. The aim is primarily to investigate their administration, resources, project management, interested parties, strategy, building technology, present and earlier projects and above all, their results. The NGOs and the housing development process will also occasionally be compared to Swedish norms.

The rapid growth of the cities and slums and the lack of adequate accommodation for a substantial share of the populations calls for vigorous measures. As it is alleged that building in the vertical plane raises the urban density which brings certain benefits, an evaluation of the implementation of multistory buildings for the urban poor will be presented at the end of this essay.

## 1.4 Method

On account of the disparity of topics treated in this essay, the method of collecting information is adjusted to the particular subject that were investigated as well as to the different phases of the investigation. The structure of this essay reflects the order of our studies, which can be divided in three phases.

The first phase was to become acquainted with Costa Rica and Nicaragua and the field of study, which is urban poverty and the housing sector. We used literature to collect the needed facts and to deepen our knowledge of the subject. We mainly used various Swedish and English travel guides to collect information about the concerned countries. The book “More Urban Less Poor” (Tannerfeldt & Ljung, 2006), has been very useful during our preparation. It has equipped us with a better understanding of the reasons and consequences of urban poverty and it has created a foundation for our further investigations.

We visited Costa Rica and Nicaragua for six weeks in the spring of 2010. That is where we performed the second phase of our thesis work. We spent the first four weeks studying the work of the housing and infrastructure development organizations FUPROVI (Fundación Promotora de Vivienda) and FCRC (Fundación Costa Rica – Canada) in Costa Rica. Then we traveled to Nicaragua and spent two weeks studying the work of PRODEL (Fundación para la Promoción al Desarrollo Local), a similar organization to those of Costa Rica. During the whole stay we were in close contact with the engineers, architects and other staff of the organizations with various responsibilities. They showed us drawings, supplied us with all essential documents, explained their projects, told us the reasons for the design, explained their recourses and they answered all of our questions. They also guided us personally through their projects which enabled us to perform important field studies. We visited the projects of Puerto Limón on the Costa Rican Atlantic coast, which are constantly exposed to flooding. We also visited the projects El Beneficio and Bethel located around the city of Cartago and the vast slums of Mandarinas outside San José. In Nicaragua we visited eight small individual projects in Managua and Masaya, though we have chosen to only show four of the projects in this essay which we consider most essential. We have also performed a survey in which we asked 50 randomly chosen people in Costa Rica and Nicaragua to answer a questionnaire, to evaluate their attitude towards living in multistory buildings. All the people that we met during our stay in Central America and our personal observations are the primary source of information in most of this thesis.

The third phase of the study was to gather all the information that we have collected during our stay in Costa Rica and Nicaragua and finalize the thesis.

## 2 Regional Background of Costa Rica and Nicaragua

### 2.1 Introduction

To mend the understanding of the subsequent topics of this essay, it is useful to first study the concerned countries. The intention of this chapter is to equip the reader with fundamental knowledge about Costa Rica and Nicaragua that will facilitate the comprehension of the countries present condition, not least the housing sector and poverty quantity.

### 2.2 Costa Rica

#### 2.2.1 Quick Facts

National population:	Approx. 4.6 million
Capital:	San José
Population of the capital:	Approx. 1.4 million
Area:	51 100 km <sup>2</sup>
Population growth:	1.3 %
Language:	Spanish official and Creole English around the area of Puerto Limón
Religion:	Catholicism (75%), Protestantism (15%)
Currency:	Colón (CRC)
GDP (PPP):	10 400 US dollars

(Utrikesdepartementet, 2010)



Figure 1. Map of Costa Rica

### 2.2.2 History

When the Spanish “Conquistadores” reached the coast of Costa Rica the 18th of September 1502, the land was populated by a succession of bad organized autonomous tribes that seemed to live a relatively prosperous life. During that time the land was inhabited by no more than 200,000 indigenous people that were living in the midst of two areas of great civilizations, the Mesoamerica and the Andes.

When Christopher Columbus anchored his vessels in the bay of Cariari on the Caribbean coast in 1502, he was welcomed by the indigenous people who had never seen European white men before and treated them with great hospitality. The Indian dignitaries appeared wearing much gold and gave some to Columbus, not anticipating the Dark Age awaiting them. Columbus wrote in his journal records, “I saw more signs of gold in the first two days than I saw in Espanola during four years”, and called the region La Huerta, which is Spanish for The Garden.

Four years after Columbus arrival the Spanish government sent a new expedition to colonize the Atlantic coast of the isthmus, with the governor Diego de Nicuesa in command. His experience distinguished much from that of his predecessor, Columbus. He ran ashore at the coast of Panama, but as a result of badly damaged vessels he was forced to march north where hostile antagonistic Indian warbands attacked and slaughtered most of his men using guerrilla tactics.

In 1522 an expedition under Gil Gonzales Davila set off from the coast of Panama to settle the region, which he named Costa Rica, the “Rich Coast”. He reaped quantities of gold that was sent back to Spain and his priests managed to convert many Indians to Christianity with cross and cutlass. But like many others at that time and later, his expedition reportedly lost more than 1000 men as a result of sickness and starvation.

A new governor arrived in 1562, Juan Vasquez de Coronado, also known as “the true conquistador of Costa Rica”. He changed the policy of the area and moved the Spanish settlers into the Cartago Valley, where the rich volcanic soils and the temperate climate offered the promise of crop cultivation and Cartago was established as the first national capital of Spanish Costa Rica. He also changed the attitude towards the surviving Indians and treated them more humanly. For instance he never made use of the system encomiendas, which granted the Spanish settlers the right to strained Indian labor, thru which he gained their sympathy and in response the Indians willingly subjugated themselves so Spanish rule. Unfortunately Coronado`s successors went back to the old system, enslaving the Indians, resulting in the eradication of almost



all Indians in the region. Without Indians to work the crops the colonists had to work the land by themselves. Export of crops decreased rapidly and all of the gold was soon shipped to Spain. It led to a terrible downfall in the Costa Rican economy which soon forced the settler to revert to the Indian method of using cacao beans as currency.

The population rapidly decreased and in 1723 the volcano Irazu erupted and buried the capital Cartago. Brighter days did not emerge until much later when exports of wheat and tobacco placed the colonial economy on a sounder economic basis which encouraged new intensive settlement in the area.

The development grew in the direction of an individualistic and egalitarian country which was removing itself from the mainstream of Spanish culture. The number of families with the use of the benefits from the labor of encomienda Indians decreased and so did the quantity of despotic criollo landowners, which directed the country towards a rural democracy without an oppressed mestizo class.

The cacao plantations and later tobacco plantations were the most profitable activities of the colonial time. The shipment to Europe attracted English piracy which Spain responded to by closing the Costa Rican ports and thereby cutting off seaborne sources of legal trade. As a result smuggling started to flourish and the Caribbean coast granted a safe haven for buccaneers and smugglers. The illicit trade helped weaken central authority which began to dissolve the illusion of a colonial Central American unity and the rigid administrative structure declined.

The liberation of Central America from Spanish rule came on 15 September 1821. Although for Costa Rica it did not make much of a difference, sense it has been walking its own path for a long time. All of the new independent nations in Central America now voted for accession to Mexico and proclaimed the united provinces of Central America, with their capital in Guatemala City. But the political alignment did not last for long. Disputes soon emerged between the different cities in Costa Rica with leaders either endeavoring conservative and aristocratic way of rule or a republican one. A civil war was unavoidable and in 1823 a brief battle ended with the victorious republican forces of San Jose taking power. They rejected Mexico and Costa Rica joined the federation with full autonomy for its domestic affairs. An early modernization of the economy brought the nation out of poverty and laid the foundation of democracy much earlier than the other countries in the isthmus.

The first chief of state was elected in 1824, Juan Mora Fernandez. He established a sound juridical system, founded the nation's first newspaper and

extended public education. He also encouraged coffee cultivation and gave free land grants to coffee growers, which later came to have a big impact on the structure and politics of Costa Rica. Coffee became the main export product which in the end of 19th century accounted more than 90% of all exports and 80% of foreign-currency earnings. A new elite appeared, the coffee barons, whose new prosperity led to struggle for political dominance between the wealthiest families. Majority of the countries strongest and most influential personalities, including the presidents, were soon a part of the coffee aristocracy followed by many different military regimes (Baker, 1996).

### **2.2.3 Economy**

Already in the 18th century, coffee and bananas were important parts of Costa Rica's economy. Costa Rica was the major exporter of these goods and laid the foundation for the country's welfare. During the 1930s the country was effected by economic and social problems that led to an increased number of reforms, this contributed to the current welfare state. In the 1940s President RA Calderón Guardia put forward a system of social security in which he had the support from the communists and from the Catholic Church.

Costa Rica's economy is based on inter alia, electronic exports, agriculture and ecotourism. In the 1960s the state spent money on industrialization, which made the economy more diverse. Costa Rica has been a major exporter of bananas and coffee, but during the 1990s exports of electronic components and tourism were the main sources of revenue. As mentioned above, ecotourism is an important source of income; the country has a lot of national parks that attract people from all over the world, mainly from the United States. The growing tourism sector has contributed positively to the increasing number of jobs in the country. The growing technology industry also benefits the inflow of foreign capital. The microprocessor manufacturer Intel U.S. has started a factory in the country who has contributed very positively to the economic situation in Costa Rica. After Intel was launched, export growth has increased.

Despite good export potential, the country's national debt grew and the government has been forced to borrow money to maintain the prosperity of the country such as free health care, pension and free education. The indigenous city debt was about 45 per cent of GDP (2009), but is expected to raise foreign debt was about 30 per cent of GDP. The global financial crisis has affected many countries around the world and did strike Costa Rica hard as the country is dependent on exports and growth fell to minus 1.5 percent in 2009. Costa Rica's export value is about 9.5 billion dollars and import about 15.4 billion dollars. The things that Costa Rica imports are raw materials, machinery,

transport equipment and consumer items. The main trading partners are the United States, China, European Union countries, Mexico and Japan (Lindahl, 2010).

During this period, Oscar Arias was in power and made a trade agreement, DR-CAFTA, which is an agreement between the Dominican Republic, U.S. and CA-5. However, the agreement resulted in strong opposition and the contract was not signed until after a referendum. Costa Rica was one of the last countries that approved the free trade agreement. The idea of the agreement is to increase access to U.S. markets for Costa Rican exports (Utrikesdepartementet, 2009).

#### **2.2.4 Social Condition**

Many Costa Ricans, so-called Ticos, are working in the service sector and one of three work in the tourism industry. About one in eight Costa Ricans work in agriculture, while the rest are employed in the industry. Unemployment is about 8 percent. It is estimated that approximately every third person working in the official system also earn money on the side. There are unions in the country considered to be quite influential and many in the public sector are members of this.

All employees in Costa Rica and their families are covered by the welfare system, which includes health and accident insurance and a pension scheme. However, one in five Costa Ricans are considered poor (Lindahl, 2010).

#### **2.2.5 Education System**

The school system in Costa Rica is well developed in comparison to neighboring countries. Already in 1869 it introduced an education system that has evolved ever since. Since Costa Rica has no army, the government has given priority to education and the state spends a relatively high proportion of gross domestic product on education. Schools are compulsory, which the State finances. Formally, it is one year in kindergarten and then the required six years in primary school. In practice school is six years plus five years, from kindergarten to high school together. Each level is divided into two cycles, after each cycle, students perform a test to study further. The "most important" test is called "Bachillerato Tests", which is obligatory for the students to pass to get a degree and be able to continue studying at university.\*

Some families cannot afford education due to school uniforms and the books that are necessary are a big expense. The families who struggle with costs can get financial assistance from the state. Costa Rica is a country that takes

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\* Source: Education in Costa Rica, <http://www.stayreality.com>, visited 2010-05-26

Pride in education and literacy rates are very high, about 93 per cent. Some argue that the figure is around 96 per cent. Costa Ricans are very proud of their education system and many believe that education is the key to good life.\*

The most popular university is the Universidad de Costa Rica (UCR). It is the oldest and largest university and it is located in the capital San José. The university is not free but it is possible to receive a scholarship. The university gets money from the government that they in turn pay as grants to those that have applied and passed the test. The entrance examination that you have to take to get into university also doubles as a scholarship qualification test. The higher score you get, the higher the scholarship can be (Pupo, 2010).

### 2.2.6 Geography

The country has a great diversity of flora and fauna, and has a lot of rainforest. In 1997, approximately 14 per cent of Costa Rica was nature reserve. Another 10 per cent was called “protected areas” but is mainly reserved for forest production (Nationalencyklopedin, 2010).

Costa Rica is divided into six different regions depending on geographic location. Buildings are designed differently depending on in which region they are in, both climate-change and conditions vary.

The capital, San Jose is located in a valley in the Central Highlands and is surrounded by mountains on both sides (O’Leary & Spaul, 2001).



Figure 2. Classification of zones in Costa Rica

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\* Source: 1. Education in Costa Rica, <http://jrscience.wcp.muohio.edu>, visited 2010-05-26  
2. Lindahl, 2010

### The Central Highland

This part is dominated by volcanoes and a broad valley, the central plateau lies at an altitude of 1000 meters. This part has a green landscape and the climate is refreshing, two-thirds of the population live in this region (O'Leary & Spaul, 2001).

### The Central Pacific and Southern Nicoya

The southern Nicoya consists mostly of beaches while the central Pacific coast has small parts of forest. This region is a transition between two ecosystems and the flora and fauna from the two systems. At the south coast are now large plantations of oil palms, which is an important product for export (O'Leary & Spaul, 2001).

### Guanacaste and Northern Nicoya

This part consists mostly of agricultural land but also has a large coastline and many beaches. The dominant culture is the cowboy culture, but many people own fishing supplies (O'Leary & Spaul, 2001).

### The Northern Zone

This province is most like a landscape of orchards, pastures and a humid rainforest. The southern part consists of very dense forest with a large national park while the north is bordering to Nicaragua. The big attraction in this region is Volcan Arenal (O'Leary & Spaul, 2001).

### The Caribbean

This section has an old Afro Caribbean culture. The villages are old and have a very relaxed charm. This region has a Caribbean coastline of 200 kilometers between Nicaragua and Panama. The beach merges with rainforest and lagoons in the north, but rise into the mountains to the south. The Jamaican culture dominates here because of the people from Jamaica who came to the region to build railways and work on the banana plantations. There is only one city of the region, Puerto Limón, this city is in the middle of the coastline. Even in this region there is a national park (O'Leary & Spaul, 2001).

### The Southern Zone

This region has a wide variety of resources, ranging from fishing and hiking to scuba diving. This part has the best wildlife in Costa Rica. The Spanish conquistadors searched in vain for gold in this part but now it is the best banana plantation. The northern part of this region consists of beaches which are insulated by thick rainforest (O'Leary & Spaul, 2001).

### **2.2.7 Climate Analysis and General Recommendations for New Constructions in San José**

*The following information is based on the Mahoney tables. The Mahoney tables are a set of reference tables used as a guide to climate-appropriate design (See appendix 6.2 Koenigsberger O H, 1973).*

Costa Rica is located approximately 10 degrees north of the equator and belongs to the tropical climate zone. The capital, San José is located 939 meters above sea level. The temperature varies between 17.9-28.8 degrees Celsius and sunshine varies between 4-6 hours per day throughout the year. The precipitations are from 24 mm to 262 mm per month. The rainy season is usually from May to November and the dry season from December to April. However, this varies a lot depending on the position in the country. The building constructions are slightly different depending on the region.

The relative humidity is very high since the country, as mentioned above, lies in the tropical zone. During the rainy season the relative humidity is on average between 79-88 per cent and during the dry season 65-73 per cent. This means that moisture is rarely a major problem in building constructions and by avoiding organic materials in the parts that cannot dry out the construction will remain protected from mold and rot. The wind varies between 2.7-6.7 meters per second.

The Mahoney tables recommend the following. The long axis should be oriented east-west. There should be a compact layout of estates. The rooms should be single banked with permanent provision for air movement. The openings are supposed to be large, 40-80 per cent in the north and south parts of the walls and the size should be at body height on windward side. The walls should be light with short time lag and the roof should also be light and insulated. The openings should exclude direct sunlight. The walls and floors should have low thermal capacity. As it is mentioned above it is necessary to have drainage, given there is a rainy season.

## 2.3 Nicaragua

### 2.3.1 Quick Facts

National population:	Approx. 5.4 million
Capital:	Managua
Population of the capital:	Approx. 1.4 million
Land size:	120 254 km <sup>2</sup>
Population growth:	1.9 %
Language:	Spanish official and Creole English along the Atlantic coast
Religion:	Catholic (85%), Protestantism (10%)
Currency:	Córdoba (C\$)
GDP (PPP):	2655 US dollars

(Utrikesdepartementet, 2010)



Figure 3. Map of Nicaragua

### 2.3.2 History

Nicaragua has an influence of Mayan culture but the strongest influence is from the Mesoamerican culture that arrived a couple of hundred years before the Spanish colonization.

The Spaniards conquered Nicaragua in the 1520s, but from 1570 Nicaragua was ruled from Guatemala. In the late 15th century Nicaragua's Atlantic coast became vulnerable to attacks of English buccaneers. The Mosquito Coast was under British control from 1740 to 1786.

The Nicaraguan break with Spain occurred in 1821. After a brief union with Mexico in 1822-1823, Nicaragua became a part of the newly formed Central American Union. Nicaragua was declared independent in 1838.

In 1893 the Liberals, led by Jose Santos Zelaya, took control over Nicaragua. Zelaya was a supporter of a Central American Union, but his involvement in the neighboring republic of political development in 1906 led to war between Guatemala, El Salvador and Honduras.

After that Nicaragua had a serious dispute with the United States regarding the right to build a canal between the Atlantic and Pacific Ocean, this resulted in a decline of Zelaya. In 1912 a long period of American involvement began in Nicaragua's politics. In 1916 the U.S. military built bases in Nicaragua but in 1928 César Augusto Sandino began a guerrilla war against the U.S. Marine Corps. Sandino was assassinated in 1934 on the orders of Anastasio ("Tacho") Somoza, head of the U.S. formed National Guard.

In 1936, the President Juan Bautista Sacasa deposed and Somoza took over the control. This was the beginning of the Somoza family's power, which lasted until 1979. In the early 1960s various opposition groups were formed, the FSLN (Frente Sandinista de Liberación Nacional), known as the Sandinistas, who launched an increasingly successful guerrilla war against the regime. In the 1970s the opposition was extended and UDEL (Unión Democrática de Liberación) was formed.

Strikes and the FSLN's were involved in substantial wars and were finally forced to leave the country in July 1979. The fighting against the Somoza dynasty had cost more than 30,000 lives and the country's economy was really bad. After a provisional government the Sandinistas was formed. In 1980, Daniel Ortega was elected as the government's coordinator and was later re-elected as the new president of the country. Sandinistas ran a radical left politics. A land reform, nationalization of large parts of the economy led to violent resistance and change in the country. A military resistance, which is supported by the United States, from 1981 directed against the Sandinistas and a new war with tens of thousands of victims made the poor country even poorer.



The opposition against the Sandinistas was peaceful. Violeta Chamorr defeated the Sandinistas in the 1990 presidential election, her government based a policy with compromise with the Sandinistas. The government introduced austerity measures and free market policy failure to break the Sandinista political influence. Presidential elections in 2001 were won by Enrique Bolaños of the PLC (Party Liberal Constitucionalista) (Utrikesdepartementet, 2010).

### **2.3.3 Economy**

Nicaragua's economy is based on agriculture and industry. In the 1980s, the country's economy was hit hard by the civil war. After the 1990s, industry was restructured and a lot of public lands were privately owned. Much of Nicaragua's economy is based on revenues from international assistance.

The country has high unemployment rates but also a large informal sector, half of Managua population is active in this. Nicaragua's economy consists mainly of the production of tobacco, cement, sugar, beer, ice cream and chemical products. The major export earnings are from coffee, meat, seafood, sugar and bananas. Handcraft is concentrated in Masaya, but unfortunately it is a small proportion of exports.

Both the production and the export earnings declined after the 1979 revolution. Imports consist mainly of machinery, oil and foodstuffs. Imports are paid with aid money. Nicaraguan exports mainly to USA, El Salvador and Mexico and imports from mainly the U.S., Costa Rica and Venezuela.

Before 1990, the port city of Corinto played an important role but it has lost more and more standing. Now the truck traffic from Honduras and Costa Rica has almost completely taken over all imports of goods into the country. The road network is extensive in the country's western parts. To the city of Bluefields in eastern Nicaragua there are only air and boat connections (Utrikesdepartementet, 2009).

### **2.3.4 Social Conditions**

Nicaragua is one of the continent's poorest countries, which resulted in low standard of living and widespread malnutrition. In the 1990s the social sector for the privately-owned affected the economy based on private initiative. The reform was not as great as expected because of the civil war but the gap between rich and poor has increased. There is a theoretical system of health insurance and pensions, but in practice very few are part of the benefits and the amounts are small. The country's poor economy has meant that almost half

of all people of working age are unemployed.

Many women are single parents to their children, there are many working children and poverty is widespread. Women's position was strengthened during the 1980s and they have as much right as men to acquire land, to become independent members of the cooperative and equal pay for equal work.

In 1991, the population consisted of 17 per cent whites who mainly lived in cities, 69 per cent Mestizos, 9 per cent African Americans and 5 per cent Native Americans.

In 2008, Nicaragua had an average population density of 44 inhabitants per square kilometer. Managua is the most densely populated area as are the lowlands in the west, while the Atlantic coast is sparsely populated. In Nicaragua 38 per cent of people are under the age of 15 and only 4 per cent are 65 or older. Life expectancy is estimated at 68 years for men and 74 for women. 59 per cent of the population lived in urban areas in 2008. The dominant city is the capital, Managua.

After the Sandinistas lost the 1990 elections Nicaragua stabilized. The country is starting to move from revolution to democracy, from planned economy to capitalism. Sweden's contribution was raised for health, research, state-building, rural development and human rights, but this has not alleviated poverty. The Sandinistas won elections in 2007 and tried to reduce poverty and increase social action (Utrikesdepartementet, 2010).

### **2.3.5 Education System**

The Sandinista revolution in 1979 marked a new direction of the country's education with greater emphasis on self-determination and national identity. The influence of Cuba led to Nicaragua trying to overcome illiteracy in the country.

School structure consists of six levels and the latter part of three years, which is equivalent to high school. After these three years a test is carried out to qualify for the university. The dropout rate from school is high, almost half of the students drop out. A one year education for adults has now been introduced and a 3 year or 4 year education directly related to the work experience. This is an attempt to try to eradicate illiteracy, which in the mid-1990s amounted to about 34 per cent. (Utrikesdepartementet, 2010)

### **2.3.6 Geography**

The eastern coastal region of Nicaragua is wide, low and swampy. The western coastal region is composed of volcanoes, some of them still active. Volcanic eruptions and earthquakes are a constant threat to this country while the volcanic ash provides a fertile breeding ground. In southwestern Nicaragua you find the Great Lakes Managua and Lake Nicaragua and the largest river is Río Grande de Matagalpa.

Eastern Nicaragua has a tropical rainforest climate, and an average temperature of 26 degrees Celsius but in the mountains it is around 18 degrees Celsius. The rainy season is between May and November and the average rainfall is around 3800 millimeters. In the western parts of Nicaragua the rainfall is around 1900 millimeters per year (Utrikesdepartementet, 2010).

### **2.3.7 Climate Analysis and General Recommendations for New Constructions in Managua**

*The following information is based on Mahoney tables. The Mahoney tables are a set of reference tables used by architects as a guide to climate-appropriate design (See appendix 6.2 Koenigsberger O H, 1973).*

Nicaragua is located approximately 12 degrees north of the equator and belongs to the tropical climate zone. The capital, Managua is located 50 meters above sea level. The temperature varies between 21.8-34.5 degrees Celsius and sunshine varies between 5-8 hours per day throughout the year. The precipitations are from 0 mm to 265 mm / month. The relative humidity is very high since the country as mentioned above lies in the tropical zone. The relative humidity is between 41-94 per cent. The wind speed varies between 1.5-3.4 meters per second.

The Mahoney tables recommend the following. The long axis should be oriented east-west. The rooms are recommended to be single banked with permanent provision for air movements. The houses should have medium openings 20-40 per cent. The walls are recommended to be light external and internal, the roof suggested being light and well insulated. Detailed recommendation, the sizes of the opening are recommended to be medium, 25-40 per cent. The position of the opening should be placed in the north and south walls and at body height on the windward sides. The openings should be protected from direct sunlight. It is important with adequate rainwater drainage.

## 2.4 Comparison of Costa Rica and Nicaragua

The table below shows the general statistics for Costa Rica, Nicaragua and Sweden, in order to get an overview of the different national welfare situations. The welfare of each country affects the housing improvement for low income earners, which is presented in chapter 3. The statistics for Sweden are included for comparison.

*List of General Statistics*

<b>Indicator</b>	<b>Year</b>	<b>Costa Rica</b>	<b>Nicaragua</b>	<b>Sweden</b>
<i>Adult literacy rate %<sup>1</sup></i>	1999- 2007	95,9	78	99
<i>Annual population growth rate %<sup>2</sup></i>	2006	1,6	1,3	0,7
<i>Children underweight for age , % under age 5<sup>1</sup></i>	2000- 2006	5	10	-
<i>GDP growth rate %<sup>2</sup></i>	2006	8,2	3,7	4,2
<i>GDP per capita PPP US dollars<sup>1</sup></i>	2007	10,842	2,570	36,712
<i>Life expectancy at birth years<sup>1</sup></i>	2007	78,8	72,7	80,8
<i>Mortality rate per 1000 live birth<sup>3</sup></i>	2008	7	13	2
<i>Population living below \$ 2 a day 5 %<sup>1</sup></i>	2000- 2007	8,6	31,1	-
<i>Population living below \$1.25 a day<sup>1</sup> %</i>	2000- 2007	2,4	15,8	-
<i>Population living below the national poverty line<sup>1</sup> %</i>	2000- 2006	23,9	47,9	-
<i>Population living in urban areas<sup>3</sup> %</i>	2008	63,3	56,7	84,5
<i>Population millions<sup>1</sup></i>	2007	4,5	5,6	9,2
<i>Proportion of population using improved sanitations facilities<sup>3</sup> %</i>	2008	95	52	100
<i>Proportion of population using improved drinking-water sources<sup>3</sup> %</i>	2008	97	85	100

<i>Total expenditure on health as % of GDP</i> <sup>3</sup>	2006	7	7,8	8,9
<i>Total fertility rate, births per woman</i> <sup>1</sup>	2005-2010	2	2,8	1,9

## References

<sup>1</sup> UNDP, 2010

<sup>2</sup> UNESCO, 2010

<sup>3</sup> WHO, 2010

— No statistic are available

Generally, the figures do not differ significantly from each other in terms of literacy, the annual population growth, number of children per woman, life expectancy, access to clean drinking water, nor what the percentage effort of GDP on health.

In the case of children who are malnourished, this difference is twice as large between the two countries. This probably reflects the difference between the countries' welfare, access to free health care is possible in Costa Rica but not in Nicaragua, which may affect these figures. Access to and use of good sanitation facilities differ markedly between countries, perhaps it's because more and more people in Nicaragua live in rural areas, or that the asset is less. Government or other actors might not "help" in the slums that are built illegally, but where many thousands of lives in the current situation. In Costa Rica, the government has recognized the problem and therefore they have demanded action from various actors. Accesses to the above mentioned criteria are very important for human health and children are probably especially vulnerable.

GDP per capita PPP shows the total value of the country's consumption in terms of products, services, investments, value of exports, but less the value of imports, everything is divided by the total population. GDP in this case takes into account many factors, including inflation and cost of living. Generally, one can measure and compare different countries' standard of living in this way with a bracket system that has often been criticized. Costa Rica's and Nicaragua's GDP differs quite markedly from each other, and therefore the standard of living in the country, this was also observed clearly after the visit. As previously mentioned, possibly the major difference lies in that Costa Rica exports more goods than Nicaragua has the opportunity to, also Nicaragua has more challenges, depending on inter alia the civil war,

earthquakes and corruption which could explain these figures. It is worth mentioning that Costa Rica has liquidated their entire army which saves them high expenditures. The government in each country invests its financial resources in various areas which may be reflected in the respective countries. A concrete example of this will be mentioned in Chapter 3 concerning housing for low income earners and the measures taken.

The figures on mortality at birth is about twice as high in Nicaragua as in Costa Rica, this may depend on access to free health care and accessibility. When it comes to the amount of people that live below the amount of 2 US Dollars a day, or 1,25 US Dollars which is the national poverty limit, the numbers clearly speak for themselves and there is also a clear difference between the two countries. This may be due to or as a result of GDP as commented above. Why there are no figures for Sweden is because officially they do not exist as in practice people cannot go below them.

With regards to the figures for the percentage of people living in urban and rural areas that are working you will see that the majority live in big cities. In Nicaragua, however, the difference between the population in rural areas and in cities was not as large as the difference was in Costa Rica were it was much more prominent. But in theory, more and more will move into the big cities in a short a period of time (see chapter 1) which will lead to adjustment problems (see chapter 4).

Nicaragua is far behind Costa Rica and the need for development is necessary. Although the country's GDP is very different and Costa Rica is much wealthier than Nicaragua, there are people in both countries who are living under unacceptable circumstances. Because of the outside world and the governments' commitment to co-operation with a number of aid organizations they have developed goals to improve people's lives.

## **3 The NGO's and their Projects**

### **3.1 Introduction**

Both the Costa Rican and the Nicaraguan governments are cooperating with local NGOs (Non-Governmental Organizations) to handle the poverty matters related to housing. Most of the NGOs are so called NPOs (Non Profitable Organizations), which means that their main intention is not financial growth. The NPOs are rewarded many different privileges from their governments, such as tax reduction and financial aid. They specialize in various branches but their mutual key assignment is the development of their country.

This chapter looks at three NGOs that work with sustainable housing and infrastructure development for the impoverished population. The main focus of this essay is on housing issues, so the description of the NGOs work will be demarcated to the essential field, although the organizations field of work is as mentioned earlier, wider. Two of the organizations, FUPROVI and FCRC, operate in Costa Rica and the third organization, PRODEL, operate in Nicaragua. The financial differences between those two countries are rather remarkable which is clearly reflected in their resources, method of working and results.

The intention of this chapter is to allow the reader to become acquainted with the NGOs, their projects and their applied construction methods. The chapter ends with a discussion in which various aspects of the organizations are presented and analyzed. It contains most of the information that was gathered during the field studies and interviews. The aim of the discussion is to supply the reader with a better insight in the three NGOs diverse work and their pros and cons.

FUPROVI and PRODEL have been financially and technically supported by the Swedish governmental organization Sida. The Swedish aid had a fundamental influence on the two NGOs development and helped them to become today's authoritative institutions. A short description of Sida is presented below.

### **3.1.1 Sida Supported Housing Programs in Central America**

Since the late 80s, Sida (Swedish International Development Cooperation Agency) has contributed financially and technically to various projects around the world. Sida has advocated microfinance for mortgages and Housing Microfinance. Generally microfinance is a small financial loan with a short payback time. The guidelines for the loan are based on the income level, geographic location, employment and gender.

Since 1988, Sida has financed housing and local development programs in Central America with total resources of 50 million US dollars. At the end of 2003, the programs have helped about 80,000 low-income families in the main urban areas of the region to improve their habitat conditions (Stein & Castillo, 2003)

The programs that Sida supported are based on giving credit to low-income families to improve their housing situation. The economic impetus is to give financial support to the organizations so they can act like a bank and investigate who qualifies for loans or/and subsidy.



### 3.1.2 Map of Costa Rica and Nicaragua with the Locations of all treated Projects



Figure 4. Map of Costa Rica and Nicaragua with the location of all studied projects



### 3.1.3 Characteristics of the Organizations

This is a list of the most essential characteristics of the three studied organizations.

*Characteristics of the Organizations*

<i>Characteristics</i>	<i>FUPROVI</i>	<i>PRODEL</i>	<i>FCRC</i>
<i>Country of operation</i>	Costa Rica	Nicaragua	Costa Rica
<i>Year programme started</i>	1988	1994	1988
<i>Supported by the foreign organization</i>	Sida	Sida	Cida
<i>Type of organization</i>	NGO	NGO	NGO
<i>Type of programmes executed</i>	New housing Infrastructure Basic services Housing improvement	Housing improvement Infrastructure Basic services	New housing Infrastructure
<i>Fund intermediation</i>	Loans and subsidies are distributed from the state fund to the clients by the organization	Micro-loans are distributed from the NGO:s revolving fund to the clients by the organization	Loans and subsidies are distributed from the state fund to the clients by the organization
<i>Terms of the loans</i>	Up to 15 years for new constructions  Up to 8 years for improvement	Maximum four years for housing improvement  Minimum 70 % of the loan (inclusive the inters rate) has to be paid back before a new loan is offered	Up to 15 years for new construction  The clients have the obligation to live in their new house for 10 years, until than they are not formal owners of the property
<i>Constuction technology</i>	Housing constructions and improvements are executed by the clients with assistance from the organization	Self-helped housing improvement with assistance from the organization	The organization hires a contractor to perform the construction

## **3.2 The Organizations operating in Costa Rica**

### **3.2.1 FUPROVI - Fundación Promotora de Vivienda**

#### **3.2.1.1 Profile of the Organization**

FUPROVI is an organization that works with housing development and infrastructure. The organization started its work during the 1980s with the support from Swedish Sida. FUPROVI see themselves as an organization with the task of improving quality of life for low income earners and to improve social housing situation in the country.

In 1988 Sida began providing FUPROVI with financial support so that the organization could help those families who needed financial and technical assistance to improve their living situation. The refund would for instance support renovations and improvements. In the current situation, the organization has no contribution from Sida but is independent. This is because Sweden can no longer give aid to the country but also due to FUPROVI has been managing the money they received in the investment funds which means that there is still money for development.

FUPROVI lend money to specific audiences, both individuals and groups. Mainly for those who own their own land, want to buy land, renovate or improve their homes. FUPROVI also has contact with a specific bank, which in turn can lend to FUPROVI's customers. The organization promotes the area around the capital San José and in particular households where women are the main breadwinner and have full financial responsibility. The repayment period is 15 years for new buildings and eight years for the repair and improvements (Daphnis & Faulhaber, 2004).

FUPROVI's purpose is to contribute to housing improvement. Their role is to coordinate organized self-help housing construction. The organization is accountable for technical support and assistance but it is mainly the people who will be living in the houses that are building it. It is also their way of paying for their loans. All houses follow the organization's design style. The goal of the organization is to try to be proactive in identifying the problems that can occur in a residential area and from there see if the residents of the region themselves have the skills to solve the problems.

FUPROVI focuses on "The social production of habitat, supported by the union for people in communities who seek the welfare of their families, this means training, participation, responsibility and solidarity for the people involved. It contributes to the protection of the environment, better communication between families, greater equality between men and women

and a more organized and united neighborhood. The method promotes active citizen participation in political power and the goal is to achieve a society with better quality of life and it launches innovative processes of profound social and transformative impact.” (FUPROVI, 2010)

### 3.2.1.2 The Housing Development Project “El Beneficio”



*Figure 5. The project “El Beneficio”, located in the rural areas outside the city of Cartago, Costa Rica. (2010-04-29)*

#### **Background**

The project is located in the district of Santiago, region of Paraiso in the Cartago province. 60 per cent of the families are headed by a woman, 30 per cent of household income is 300 US dollars per month.

#### **Project Description**

The project is a development of 82 residential and two commercial lots and corresponds to a first stage, leaving a remainder of approximately 19 000 square meters estate, which may be developed in the future or used by the El Beneficio Association for development production projects, employment and income. The project design consists of two access roads that will give continuity and both approaches allow branching of the side streets that lead to the lots. The salable area is divided into 82 lots that have an average head of 8 meters and an area of 130 square meters. Nine of the lots have their front to the public street. Housing will be constructed in masonry with a ground slab foundation and a building area of 42 square meters. The architectural distribution was obtained as a result of the Design Validation Workshop held with members of the Association for Integrated Development of Santiago de Paraiso Cartago, according to the regulations.



## Projects Investment

The project was developed using the assisted self and mutual help housing methodology. The Project is part of a government program known as ABC (Ahorro, Bono, Crédito - Saving, Subsidy, Credit) which means that the client will save a part of the cost of the house, receive the state subsidy and will have a long term credit with a financial institution. The families provide workforce of 30 hours a week for the constructive process. The project cost is estimated to 2,500,000 US dollars. (Fonseca, 2010)



*Figure 6. Preparatory work to lay the house foundation. The ground consists of dirt mixed with big rocks, which makes it solid but difficult to treat*



*Figure 7. The construction workers, that later will be living in the same neighborhood they now build, on their way to eat lunch.*





*Figure 8. Preparation for plumbing and septic tank, people who work here will later move into the new houses that they have built themselves (2010-04-29)*

### **3.2.1.3 The Housing Development Project “Bethel”**



*Figure 9. The building site is divided into nine separate zones. The division makes the construction more efficient and facilitates its management.*

#### **Background**

The project is located between the districts of San Rafael and San Diego de Tres Rios. 52 per cent of the families are headed by a man and 60 per cent is rented housing.

#### **Project Description**

The property has direct access to two public streets and neighboring properties in west and south. The ground level has a land area of 29,525 square meters. The project consists of 115 lots to be distributed throughout the field. The road



design has only one primary access which branch the side streets that lead to the lots. The salable area is divided into five blocks with average lots that have a front of seven meters and an area of 120 square meters. Children`s play areas and community facilities are located in areas close to the protection zone and in areas where families do not have to make long journeys. The forest, sewage and road expansion represents 18 per cent of the total property. The houses are constructed in masonry with a ground slab foundation and a building area of 42 square meters. Architectural description was obtained as a result of the Validation of Design Workshop held with the Tethel Association in accordance with the regulations.

### **Project Investment**

The project was developed using the assisted self and mutual help housing methodology. The project is part of the governmental program ABC and the cost is estimated to 4,000,000 US dollars. (Fonseca, 2010)



*Figure 10. From left: some of the almost-completed houses, a bricklayer during the work, work of officials. All participating based on their abilities and knowledge. (2010-04-29)*



*Figure 11. Everyone helps out with the construction. The women in the left image are working with the reinforcement and the women in the right image are working in the storage room. (2010-04-29)*

## 3.2.2 FCRC – Fundación Costa Rica – Canadá

### 3.2.2.1 Profile of the Organization

The foundation was established in 1988 after a 10 million dollars aid package was donated by CIDA (Canadian International Development Agency). The main purpose of the foundation is to reduce the urbanization and support the development in rural areas for the poor population in Costa Rica. This is achieved through projects based on financing the construction of houses, social infrastructure and other complementary works through which they are trying to improve the quality of life of those in need. The organization is also creating and executing programs and projects for economic and social development of the people. Thanks to an amazing management of the Canadian donation, which was reinvested into a revolving fund, the foundation has by the end of 2009 already built more than 35,000 houses and approximately 200,000 people have the advantage of durable housing. Michaëlle Jean, the Governor General of Canada stated: “Decent housing is essential for a society to function properly. We admire Costa Rica’s commitment to providing housing that is accessible to citizens, as reflected in the work of the foundation. This is a genuine success story of our bilateral co-operation.” (Brenes, 2010)

### 3.2.2.2 The Housing Development Project “Mandarinas”



*Figure 12. Mandarinas is a large, partially illegal settlement. The picture illustrates the slum areas that are surrounding the newly built neighborhood that is a project of FCRC. (2010-05-01)*

## **Background**

The settlement Mandarinás was established in 1994 and is located in the canton of Abandoned, Patarrá district in the province of San José. In the beginning it comprised of approximately 80 families. The slum Mandarinás was formerly known as fig trees, but the first families that inhabited the place changed the name because of the large number of mandarin trees that grew in the area. The slum was formed after families from Guadalupe and surrounding areas in Los Guidos moved in there. The families had a fledgling organization that had goals to raise funds to buy a farm, but for various reason it was not possible.

The government decided to improve the housing and infrastructure of the slum and gave the assignment to FUPROVI. But the project did not provide the expected results and in 1998 the government decided to stop the progressive construction. FCRC undertook the assignment in 2007 and started the construction in 2009.

## **Project Description**

The project consists of 208 houses, which are divided into two types:

- 76 horizontal one-story condominiums with an area of 44 square meters, built in concrete blocks.
- 132 vertical two-storey condominiums with an area of 44 square meters of each apartment, built in concrete blocks, floors on concrete slab and a module of steps for every two units on the second floors.

The infrastructure will be rebuilt with a road linking all the houses with only one exit connected to the main road. A wall will be built around the neighborhood for security reasons. An agreement has been made with AYA (Acueductos Y Alcantarillados) and ICE (Instituto Costarricense de Electricidad) regarding the water and electricity supply. Common ground and children's playground is designed.

## **Project Investment**

The estimated investment to realize the project is 3,406,055 US dollars, of which 1,270,055 US dollars is for the construction and improvement of infrastructure and 2,136,000 US dollars for the construction of 208 new homes. The average value per settlement is 16,375 US dollars. (Brenes, 2010)





*Figure 13. The slum Mandarininas is one of the poorest and most dangerous areas in San Jose. Two of FCRCs officials have been robbed during fieldwork in the area.*



*Figure 14. Single houses, indoor area is 42 square meters, the families are free to decide what they want to do with this little patio. (2010-05-01)*



*Figure 15. The new area consists of both single storey houses and two-storey houses. The families are enjoying the close relationship with their neighbors. (2010-05-01)*



*Figure 16. The sharp contrast between the newly built neighborhood and the surrounding old slum areas is a good illustration of the improvements for the poor people. (2010-05-01)*

### **3.2.2.3 The Housing Development Project “July 25”**

#### **Background**

The settlement July 25 is located in the district of Hatillo, in the province of San José. It consists of 386 families. July 25 dates back to 1968, to the first immigration. According to the leading members of the community, this was considered one of the first slums that developed in the capital San José.

Most houses were built in lots of an average area of 135 square meters. The frontage of the lots is seven to eight meters and the topography is regularly flat. The houses have an average area of 50 square meters and are badly damaged. Electrical and mechanical facilities do not meet current regulations. In some cases families have proceeded to take on reconstructions or extensions, which in most cases mean using traditional methods without supervision of professional engineers.

#### **Project Description**

295 families have qualified for subsidy and assistance that will be distributed as follows:

- 58 families receive new one-storey houses.
- 48 families will be living in 24 new two-storey buildings.
- 39 families will be living in 14 new three-storey buildings.
- 96 families will be living in 4 new four-storey buildings that are called “the Bath Workshop”, in which all stories contain 6 apartments.
- 54 families will have their existing house repaired, improved or extended.

#### **Project Investment**

The estimated investment to develop the project amounts to 3,408,000 US dollars, of which 1,782,000 US dollars will be invested in serving families located in the residential area called July 25 and 1,620,000 US dollars will be spent on building condominiums located in the Batch Workshops. Investing in development is thus divided: repair of existing infrastructure costs 177,000 US dollars, construction and home repair costs 1,605,000 US dollars. The investment in the condominiums consists of: Construction of infrastructure for the Condominiums 300,000 US dollars and construction of 100 condominium apartments with four-stories 1,320,000 US dollars. With this scenario the average value per solution is 11,400 US dollars (Brenes, 2010).



### 3.2.2.4 The Housing Development Project “Puerto Limón”



*Figure 17. The project consists of six individual houses that are first demolished, then rebuilt. Above is an illustration of the possible changes.*

#### **Background**

Six different families in the rural areas outside Puerto Limón have been approved subsidy and loans. After a four years process the FCRC began the construction of five houses with an area of 42 square meters and one house with an area of 60 square meters. The reason of one house being bigger is that one family consists of eight members. The families needed a new house urgently as their existing house was small, built in wood and on the edge of collapse. The terrain is mostly flat in the coastal area by the Atlantic sea. The lowlands suffer from regular flooding during the rainy seasons and it is important to prevent water from entering the houses.

#### **Project Description**

The houses are constructed on concrete piles that prevent the inside to be flooded. The foundation is made of steel beams covered with reinforced concrete and on it rests the shell made of fiber cement plates. The roof consists of galvanized aluminum plate that rest on steel frameworks. The construction is led by FCRC but performed by a contractor from Cartago (Brenes, 2010).

#### **Project Investment**

The cost of one individual house is approximately 10,000 US dollars. The total cost of this project is approximately 60,000 US dollars.



*Figure 18. The houses are built on concrete pillars to protect the house from regular flooding. The height of the pillars depends on the amount of water that strikes the area. (2010-04-23)*

### **3.2.3 Construction Technologies applied by FUPROVI and FCRC**

#### **Foundations**

The most common foundation type is flat on the ground. During excavation the earth is cleared from large stones and shaped so that the concrete can be poured directly on the soil mass. Since no absorbing material is applied no drainage systems and no drainage pipes are used. The moisture content in the concrete is often high but due to high temperatures and open space in the rooms the concrete in the ground dries more quickly. All of the houses are construction with a ground slab, in which a lot of reinforcement is used and the concrete cures and dries the same day as it is cast. In houses standing on pillars the earth is excavated in the parts where the pillars are to be installed. Each pillar has a concrete footing on which the reinforcement and the pillar itself is mounted. Steel beams are placed on the pillars and on the steel beams reinforced concrete is being cast for the foundation. Among other houses in the neighborhood pillars of wood are more common. With wood there is a risk that the part of the pillar that is in the soil decomposes and gives way to pressure from the weight of the house (Brenes, 2010).





*Figure 19. A commonly applied technique for the foundation is ground slab. Large amounts of reinforcements are installed to prevent possible collapse. (2010-04-29)*

## **Frameworks**

The two organizations make use of three different materials to build house frames, blocks of expanded clay, concrete and fiber cement panels. The concrete walls are usually used prefabricated wall elements mounted in place, although concrete blocks are also commonly used. Blocks of expanded clay constructions begin with a reinforced concrete column in each corner where the reinforcement is linked to the foundation reinforcement. Between the columns blocks of expanded clay are placed and assembled with the help of mortar. Both structures are highly stable and the high porosity of the materials insulate the house from heat.

The material structures are capillary-sucking which results in high moisture content. The outside of the framework is usually not treated with anything else than water permeable color. The engineers who work with this kind of frame construction has no objection to the material, except that a wrong mix of concrete or larger earthquakes may result in cracks occurring in the concrete walls which will lead to esthetic consequences.

Fiber cement boards are a new material for the organizations engineers. It is easy to work with and the constructions total weight is lighter than that of concrete or blocks of expanded clay and thus more appropriate for houses on pillars. Fiber cement is heat-insulating and fireproof. The boards are mounted on a concrete base plate and are reinforced in the corners and in the context of doors and windows with additional fiber-cement boards (Brenes, 2010).



*Figure 20. Left picture: framework made of fiber-cement boards in Puerto Limón. Right picture: framework made of concrete hollow blocks in the project Bethel.*

## **Roofs**

All roofs built by the organizations are composed of galvanized steel sheets. The sheets are light and water tight. In the projects where the customers are adding parts of the house or renovating an existing roof, it is common that the roof rests directly on the frame, creating a very warm indoor climate. During new house productions the sheets are resting on steel beams or a steel framework with a slope so that water can run off and be taken up by the gutter. A slit of about 30-50 centimeters in height is left between the frame and the roof so that the heat that is generated by the sun heating up the steel sheets can be ventilated away. By the wall ridge a ceiling is mounted of surface treated mineral wool discs that create a pleasant indoor environment by concealing installations and insulate interior spaces from the heat generated by the roof sheets (Brenes, 2010).





*Figure 21. The roof of a house in Puerto Limón, with galvanized steel sheets mounted on the framework.*

### **3.3 The Organization operating in Nicaragua**

#### **3.3.1 PRODEL - Fundación para la Promoción al Desarrollo Local**

##### **3.3.1.1 Profile of the Organization**

For over 30 years Sweden has provided assistance to Nicaragua. The Swedish aid support began before the 1979 revolution, in order to help the refugees in the neighboring countries. During the 1980s, the assistance was mainly to rebuild the country but this was impeded due to the civil war. Sweden has during the 30 years of cooperation with Nicaragua paid approximately 870 billion US dollars in aid. But in 2007 the government decided to end its cooperation with Nicaragua (Öström & Lewin, 2009).

PRODEL is an organization that promotes community development in Nicaragua. The organization started in 1993 as a government program with the help of financial support from Sida and in 2003 it became a private institution. The organization distributes loans from seven different MFIs (Micro Finance Institution) to the clients, so that they can improve their housing situation. As well as loans PRODEL also provide their clients with technical support by supplying engineers and architects who design the projects and supervise the construction. PRODEL also provide loans to the local municipalities and support them with technical assistance for development and maintenance of infrastructure (PRODEL, 2010).

In Nicaragua the families that are in need of a new house or need to carry out repair work receive a micro loan from the organization. They do not get any subsidy from the state. The interest rate of the loans is modified in comparison to the market rate to lessen the financial burden on people. In 2009 the interest

rate was 17 per cent for repayment within one year. When families have repaid 70 per cent of the first loan, they can receive their second loan to continue the renovation or construction (Delgado, 2010).

Those who are poorest of the poor are not qualified to get loans, but the families who already have some money or income can be approved for the loan and thus be in organization programs. The economy for PRODEL is not so good at the moment, after Sida has blocked their aid to Nicaragua, the organization has been badly afflicted. Some PRODEL offices around the country had to shut down because of the lack of financial resources. To enable the organization to continue its work they lend money to the slightly richer people that are in need of loans. This leads to a reduction of provided aid to those truly in need due to occupied resources.

In Nicaragua, there is no direct competition from different banks and demand for loans to highly paid workers is much greater than the supplies, which results in some MFIs wanting to add on a 15 percent commission. MFIs accept a variety of bonds as security, this is very good as the low income households can get loans to improve their housing situation even if they have a low monthly income. The average income is between 100-500 US dollars. The households receive loans even if they do not have any legal paper for land occupation and possession. In Nicaragua, the MFI has worked together with PRODEL to sign an agreement which is a similar collective agreement for small businesses, ministries of health and education to pay for housing improvement loans that can be deducted from monthly salaries (PRODEL, 2010).

### **3.3.1.2 The Housing Development Projects in Managua**

#### **3.3.1.2.1 Introduction to the Managua Projects**

##### **Background**

There is a high quantity of poor people in the capital of Nicaragua. We have visited some of the cities slum areas where we went accompanied by PRODEL officials. We had some meetings with slum citizens that have used the services of PRODEL. They showed us their houses which gave us an impression of the possible improvements.

##### **Project Description**

Depending on the clients need, the dimensions of the projects were various. All of PRODELs housing projects are financed with microloans and executed by the clients themselves. The improvements could stretch from constructing a simple storage room to rebuilding the whole house. We have chosen two



families whose projects were of a more interesting nature and which we considered essential to describe in pictures and words.

### **Project Investments**

The size of the microloan given to the families depends on their total annual income. The Alfonso family had a loan credibility of 500 US dollars and the Hernandez family 800 US dollars. Once they receive the loan they have to wait until 70 per cent of the loan is paid back before they can receive the next loan. Usually the loan is paid off over a twelve months period and an interest rate is added, which at the time was 17 per cent per annum.

#### **3.3.1.2.2 The Housing Project of family Alfonso**



*Figure 22. Señora Antonietta Afonso standing in the front door of her house.*

Before the family decided to use the assistance from PRODEL, their house consisted of a small living room and a kitchen. The roof was flat without any slope so rain water gathered on it and leaked into the room. They did not have a bathroom except for an outdoor earth toilet located in the garden.

The family wished to improve their living conditions by the following developments:

- Extending the living room
- Raise the roof and create a slope
- Build a bathroom
- Build a small bedroom
- Extend and renovate the kitchen



*Figure 22. The left side of the room is the newly built extension. It is possible to see the old structure of the house by the white color on the wall in the right room. Previously there was no slope on the roof which prevented the rainwater from running off.*



*Figure 23. Pictures taken from various angles of the apartment. Common in PRODEL projects is that the clients prefer to add new constructions instead of improving present ones, which is clearly presented in the simplicity of the houses. Notice for example the absence of an under-roof that has a heat isolating effect and prevents the indoor climate to reach extremely high temperatures due to the strong Managuan sun.*

### 3.3.1.2.3 The Housing Project for the Hernandez family



Figure 24. Left picture: The grocery shop owned by the Hernandez family. They are forced to have bars on the windows because of the high crime rate in the neighborhood. Right picture: Señora Eugénia Hernandez.

The family owns a small grocery shop and they live at the back of the shop. Originally the family, which consists of eight members, lived in one room. Due to an expected increase of family members, twelve people presently, they decided to extend the size of the house and at the same time, their business. They have performed the following developments:

- Significantly enlarged the size of the house
- Extended the size of the shop
- Renovated the shop
- Build an additional storage room for grocery products

In the future they are planning to perform following changes:

- Extend the house by one more level
- Divide the big room into smaller rooms
- Build a bathroom
- Build a kitchen





*Figure 25. The family lives at the back of their shop. The reinforcement is sticking out from the joist prepared for the next addition that the family is planning to perform as soon as they receive the next loan from PRODEL.*

### **3.3.1.3 The Housing Development Projects in Masaya**

#### **3.3.1.3.1 Introduction to the Masaya Projects**

##### **Background**

PRODEL has one of their main offices located in Masaya which is responsible for the development of housing and infrastructure inside the Masaya district.

##### **Project Description**

We visited some of PRODELs customers who have changed our apprehension of the organizations policy. The difference of the social and economic welfare between the clients was stupendous. To illustrate the difference we will in the following paragraph describe two of the clients with the lowest and highest annual incomes respectively.

##### **Project Investments**

Unfortunately we do not possess the details of project investments of the families from Masaya.

### 3.3.1.3.2 The Housing Project of the Furio Molina family



*Figure 26. Left picture: Señor Berenguer Furio Molina standing by the new extension of his storage room. Right picture: The family lives a simple rural life in the city of Masaya. Their dogs are resting in the shade and their hens walk freely on the pavement.*

The family derives from the native tribe of the Mayangna Indians and they live in a neighborhood on the outskirts of Masaya that is exclusively inhabited by the Mayangnas. They pursue a simple life style more similar to a rural way of life than urban, where they for example cultivate, breed and grow their own vegetables, fruit and cattle. The family needed a simple storage room and used the services of PRODEL to make the financing possible.



*Figure 27. The new storage room is built with blocks of concrete. It is a big difference between the new and the old storage room, which can be seen clearly on the right picture.*



### 3.3.1.3.3 The Housing Project of the De Las Heras Dominguez family



*Figure 28. Left picture: Señor Carlos De Las Heras Domingues is pointing out parts of the construction that remains to modify. Right picture: The new swimming pool will be wonderful for cooling down in the tiresome Masayan heat.*

This project is one of few projects that PRODEL is forced to work with as a result of SIDAs withdrawal of financial aid. By assisting clients with a high annual income the organization finances its activity and secures its survival. The family is a wealthy owner of three luxury properties and PRODEL has assisted with loans and designs in all of them.

The organization has designed the following:

- The houses
- Internal and external design
- Pools
- Gardens
- Patios
- Walls around the properties
- Security systems



*Figure 29. The interior and exterior design with its extensive handicraft clearly deviates from most of the other projects of PRODEL.*

### **3.3.2 Construction Technologies applied by PRODEL**

On account of the high diversity of projects and the need to adjust each project to the client's individual needs, it is hard to determine a characteristic method of construction that is applied by PRODEL. The engineers and architects hired by PRODEL are working closely with their clients, which enables them to elaborate a plan of construction which makes the best use of the client's financial capacity. The projects generally treat improvements and extensions of already existing houses which makes every single project unique. Various factors influence the final outcome of the projects, such as the choice of materials, which need to be carefully selected so that the new part of the building resembles the old. The general conclusion of the construction technologies applied by PRODEL is that they are sustainable in quality and cost.

## **3.4 Discussion of the NGOs and their Projects**

### **3.4.1 The Economic Aspects of the NGOs**

FUPROVI, FCRC and PRODEL have all begun their organizations with economic aid from the governments of either Sweden or Canada. The aid has helped build the organizations so that they became capable of assisting the poor population with housing and infrastructure development. Offices were built, computers, cars, furniture and other necessary equipment was bought and staff was hired. The organizations have invested a large part of the contributions in revolving funds with high returns, which has enabled long term investment of the money.

Nowadays the organizations function as the state's right hand. In Costa Rica they cooperate continuously with BANHVI which is the country's central bank, where they apply for loans and subsidies for projects. Infrastructure

projects and building construction projects are distinguishable from where the infrastructure is financed entirely by the state while the construction of housing is mostly paid for by the customers who receive loans which they pay back monthly during a specified number of years. The organizations have a marginal profit per project which, in combination with the dividends from the revolving funds, enables them to stay completely self-sufficient.

Sweden stopped assisting PRODEL in Nicaragua financially in 2007, which has led to negative consequences for the organization. Downsizing has led to reduction of staff and offices around the country. PRODEL has also been forced to find an alternative source of income which has reduced the possibility of assisting the truly needy. At present they are co-operating with two banks, one public and one private, that both offer micro-loans for their clients. The co-operation with the public bank is similar to the one in Costa Rica, but with fewer resources. The bank provides micro-loans to customers but no subsidies. The customers cannot get a loan to build a whole new house. Instead they receive micro-loans which finance the construction or renovation in phases, where the first rate covers the first phase of the construction and then 70 percent of the loan amount must be repaid before the next quota will be given from the bank. The size of the loan is determined by the customer's total income, which should be relatively high for the approval of the minimum loan amount. The result is that society's lowest paid citizens do not qualify for a loan and are continuing to live a life in misery. The public bank also has a limit on the maximum acceptable wage. The clients that exceed the limit can still get a loan, but from PRODEL's second bank partner which is private. This service serves those already wealthy and is offered by PRODEL only to gain financial resources which guarantee the organization's existence. PRODEL works similarly with their counter-parts in Costa Rica, both as loan brokers and as city planners. They have an engineering department which is working with the design phase by producing drawings and managing the work during production, mainly through consultancy with the customers who do the work by themselves.

The building proprietor is either the client or the organization itself. It is important to keep the building costs low to optimize the client's financial capacity and to enable a higher amount of people to make use of the services offered by the organizations. Reduction of costs can be achieved by the building proprietor, who is frequently also the building contractor, through a variety of actions such as:

- Reduction of the house area (Net house area in Costa Rican housing projects is 42 square meters per house with a family of maximum six members)



- Using the families that will be living in the new houses as labor during the construction. (PRODEL always practices this method. FUPROVI propose the clients to work at the construction site for six hours a day until the house is finished, alternatively they need to cover the labor costs by themselves.)
- Procurement of all materials is done from one producer which facilitates volume discount negotiation
- The same architectural and constructional documents are reused in multiple projects (Practiced by FUPROVI and FCRC)

As part of the construction cost is covered by subsidy and the remainder by the loan in Costa Rica, it is essential to keep costs low when resources are limited and demand is high. The MIVHA (Ministry of Housing and Human Settlements) is responsible for implementing and operating Costa Rica's housing policy and for the subsidy program for low-income earners. In Nicaragua it is the loan granted by PRODEL that covers the cost which is occasionally complemented by the client's private savings.

### **3.4.2 The Consequences of Urban Expansion**

The rapid growth of cities is environmentally and economically unsustainable. It takes up more land area and it is more expensive to build long-term water and sanitation cables. The conservative mentality of the housing sector and perhaps the lack of knowledge makes it difficult to introduce new construction techniques such as multistory buildings. Both Costa Rican and Nicaraguan cities mainly consist of houses built with one or two stories. If it were possible to build more houses on top of each other in these countries it would mean that more people could live on a smaller space. A change in the urban architectural structure could solve many of the growing urban problems and would ensure more people the right to a dignified housing condition.

Urban activities contribute to economic development for a nation, but for this to be possible the design of the urban areas must be both functional and attractive. As mentioned earlier, more people are moving from the countryside into the cities, this leads to increased traffic and more vehicles in the city. As there will be more vehicles in a smaller area, this may imply that the city is overcrowded. These problems are affecting the urban planning, especially in developing countries. As more people move in to the cities from the rural areas the cities will expand in the horizontal plane. The distance from A to B becomes longer and transport will be more expensive. Transport often affect poor people negatively because they often live in the outskirts of the city and need to have access to reliable transportation to get to work. If this does not

function, these people do not take advantage of the city's supply and all that it implies (Örn, 2002).

### **3.4.3 Management of the NGOs and their Projects**

All of the three organizations FUPROVI, FCRC and PRODEL work with the ambition to improve the housing situation for those who are living in the urban and rural areas, particularly for low-income families. The organizations also work with improvement of infrastructure but in a smaller-scale.

The government in Costa Rica and Nicaragua want to bring order to the slums and improve the living standard of its inhabitants. They accomplish that inter alia by cooperating with housing development organizations that focus on housing and infrastructure development for the distressed population. The organizations have departments whose job it is to travel around the country and assess which areas need improvement. They interview people that have applied for housing assistance to evaluate their social condition and then decide whether they reach the established terms for provision. The provision comes in form of a help package, which is a loan and/or subsidy that is dedicated to the construction of a new house, renovation of existing house or addition. Unfortunately, only the Costa Rican government can afford to provide the impoverished people with subsidies. The department also works with training and supervision of the families that have received assistance, to assure that they are intellectually kept updated with the material evolution.

When the organizations decide to support a family or an entire district, after the government has granted their approval, they first initiate the construction planning phase and later the production itself. The families who receive a help package in Costa Rica may affect the final outcome, however, on a limited level. In most cases, it is the engineers and architects who decide the house plan design, choice of materials and location on the lot. But in unique cases, where for instance a new house is partly connected to an old or the families' profession requires a specific space, the product is tailored for the family's needs and wishes. This method differs from the Swedish construction method, mainly because of its limited budget and that the purpose is charitable and not as in Sweden, profitability. During Swedish construction projects, the customer normally has the ability to affect large parts of the final outcome, given that he can afford it. The city planning office in Sweden has a decisive say on whether a project will be implemented, with strict regulations to be followed. All projects in Sweden are applied for and have building permits at an early stage and are thoroughly examined by the entitled offices. In Central America, individuals and organizations have freer rein in terms of new construction projects, especially during rebuilding of neighborhoods that are already largely illegal.

The families who participate in FCRC and FUPROVI programs have relatively little influence at the outcome of their new house. It is the organization that is responsible for the entire building. This may in turn lead to the families never being really happy. A good example is the project Mandarinas, where the organization has built a large area and improved the living standards for many families, despite this, many people are not satisfied. If the families could influence the building then maybe that could be avoided. PRODEL works in a completely different way and there self-construction is the idea for the families to improve their housing situation. When families only receive the small microloans they are often required to have their own private savings in order to complete the projects. The organization is responsible for technical support during construction. The result is that families have a strong influence over their own housing.

When a decision is made by FCRC on a new project, an application is sent to BANHVI for funding. When the application is approved the design of the new project is performed by the organization's engineering department. Then a competition is launched for contractors who wish to carry out the production. Each subcontractor who registers for the competition and give bids is carefully examined by the organization so that the quality is not offset by the price. For smaller projects where single houses are to be built, the organization usually use already known subcontractors.

Normally when the organizations build new sites in the slums, the lack of resources stop them from covering the whole area with new houses. Even if they had the resources, there are thousands of people living in the slums but only a small amount of them qualifies for the help packages and a new house. Instead, the organizations work with gradual construction, that is, either to build or develop individual houses or tear down an existing district in the area and rebuild it completely with new houses and infrastructure. FCRCs project "Mandarinas" is an example of such a district where a total of 218 new houses were constructed in the suburbs of San José. The result was a new colorful district standing in the midst of a surrounding gray zone of hovels. The families who are living in the new district are envied by the people around them, but no serious conflicts have arisen. On the contrary, it motivates people to work hard and makes them driven by the knowledge that one day they may also be given the opportunity to qualify for a similar house.

That the production time is kept low is important in several aspects. Depending on what stage a project is in, it requires commitment from the organization's various departments. For example, the sociology department is engaged throughout the whole project when they investigate the necessity and

credibility of possible future assistance recipients and in some cases even follow up the families for a long time after the end of the project. The engineering department is responsible for the design before production. Later on they are present full time during the production phase in form of supervisors and organizers.

Time has a different meaning in Latin America than it has in Sweden. The mentality and traditions have shaped a time conception where accuracy deviates from the Swedish norm. Punctuality means to appear at specified place at an appointed time, but in Latin America, it is generally accepted to expect a time divergence which is of different size depending on the cause and is impossible to predict. This social phenomenon can have a releasing effect on people's everyday stress and can thus reduce the ratio stress-related illnesses, but it complicates the effective functionality of businesses. During the production the organizations usually have a central source of supply, but it can happen that they order materials from different suppliers. The diffuse sense of time and lack of practical consequences for suppliers for late deliveries leads to reduced efficiency of production and the finished product is as a result frequently several weeks behind schedule. During larger projects, parts of the materials are gifts from different companies for charitable purposes, which prevents the organizations from committing actions in case of delay. The duration of the project is difficult to determine and a time increase that is higher than in Sweden is made at all-times.

Another common time-delaying factor is the theft of materials at the construction site. Thefts occur more in urban slums than in rural settings, where people often steal the materials to build a new house or repair their existing ones. During larger projects it is normal to store the materials in temporary storage rooms or during smaller construction place it outdoors near the building site, where it is not easily accessible for theft. These losses are costly and time consuming for the organizations and force them to hire armed guards at the more vulnerable construction projects.

The administration, finance department and other departments are also involved in much of the projects implementation which entails higher costs the longer the production takes. As the quantity is of great importance for the humanitarian organizations, it is vital that the production time is kept down as much as possible for optimal use of resources. One way to illustrate this is the fact that in larger projects, where large parts of the workforce consists of customers themselves, one work week is composed of six working days and one working day in turn is composed of twelve hours. Another reason for minimizing the production time is the problem for families to find an alternative accommodation during the production period. Most of the construction projects are not built upon new virgin land, but the old houses

where people were living are demolished and replaced by new ones. The government wants to get rid of the slums and a way to achieve this is to replace existing slums with new better houses. When production has started families are often forced to find other temporary accommodation on their own. They move in with family, friends and neighbors, sometimes they rent a room and occasionally they build temporary sheds for shelter.

The quality of housing and infrastructure is in spite of the low cost very high. Emphasis is placed on sustainable construction in which the final product will last many years to come. It takes into account the climate and risks in form of fire, storm, earthquake, floods etc. The presence of the property developer during the production and that the property developer is responsible for all purchasing prevents any jerry-building and maintains a similar quality of all the organizations' projects.

The material used for production comes mainly from domestic producers, both for Costa Rica and Nicaragua which makes the price easier to negotiate, the products become more environmentally friendly and quality is known. The goal is to introduce consistent waste sorting during all projects, despite the lack of recycling facilities. While organizations are becoming more environmentally conscious, eco-labeling of goods is not followed as in Sweden.

The projects where the organizations FUPROVI and FCRC along with the Costa Rican government are the building proprietors differ markedly from the usual Swedish building proprietors' requirements. This comparison can nevertheless be misleading since while quantity is of great importance, the Central American organizations are emphasizing on the social consequences for the poor families. All projects are thoroughly thought through and both own experiences and lessons from similar organizations around the world are taken into consideration. Building proprietors in Sweden are usually issuing construction projects due to current housing shortage. Different properties dominate the priorities of various projects, dependent on inter alia the city planning office and the target audience. However, it is usually important that the final product fits in with the surroundings and the landscape, which is of high quality, appropriate from an environmental perspective, sustainable energy use and comfortable indoor and outdoor climate. There should be a demand for housing before the project reaches the production phase and the final product shall be designed in a way that it can be sold or rented. That the accommodation is cheap does not necessarily mean that it is more coveted. The consumers usually have a set of criteria which the accommodation first has to meet before they decide to buy or rent it. Thanks to the Swedish welfare system the consumers allow themselves to be more critical and discerning.

The target group that the Costa Rican and Nicaraguan organizations are working with has not the ability to allow themselves to be fastidious. They are often forced to wait for many years before they qualify for subsidy and loans to build a new house and however the house is constructed it is still better than where they lived previously. That the houses are generally of good quality is a commitment from the government and the organizations as part of the sustainable housing.

Large parts of FUPROVI's and PRODEL's workforce consists of the customers themselves who act as subcontractors to the organizations. The system has been proved effective from many aspects beyond the economical one. At FUPROVIS's larger projects where whole neighborhoods are built, families that are often completely unknown to each other spend many months in close proximity. Their common desire for a new home and the road to achieving it through joint and hard labor creates the foundation for a well-functioning community. Women and men work on equal terms and the supervisors ensure that tasks are equitably distributed and customized to the individual. The total time that the families dedicate to the project will be critical to the possibility for them to get the desired house after the production has been completed, namely the family with highest registered amount of time has head start during the house distribution.

The majority of the people have no previous experience in the construction industry and require training. For the smaller projects PRODEL produces brochures with detailed but easy to read instructions on how to gradually implement the construction. For the larger projects the organizations assist with group training in form of lectures and personal training for specific tasks. Knowledge is also shared between the workers. Thanks to the ever-present and qualified supervisors employed by the organization, good communication in the workplace, monitoring of the work process and the workers' sense of purpose, the final product is generally of high quality and its inhabitants build a lasting spirit of community. The education they received during the production may lead to future employment in the construction industry.

#### **3.4.4 Building in the Tropics**

The organizations seek quantitative improvement of people's housing situation which is clearly reflected in their building techniques. The houses are of a simple but durable construction that would not have been functional in Sweden, but has proven to be successful on the Central American housing market. The warm and humid climate throughout the year and the risk of natural strains that are of a different variety than in Sweden has resulted in a building technique that has developed differently from the Scandinavian. The relative humidity is more or less high all year round.

High humidity and the large amounts of rainfall make the moisture-proof or capillary breaking layers in the structure pointless. Instead of protection against the humidity, the high temperature and the high amount of sunshine helps the structural materials to dry quickly. By avoiding organic materials in the parts that cannot dry out the construction is being protected from mold and rot. Good ventilation in the houses helps the moist material to dry faster and lower the inside temperature.

The risk of earthquakes is high and therefore significantly greater amounts of reinforcement are used to reduce the risk of collapse. The reinforcement also stabilizes the house frame and strengthens the resistance against strong winds, which is essential when tropical storms and hurricanes occur. Lowlands near the coast are regularly stricken by periodic floods during the rainy season. There are houses constructed on pillars that raise the house up to two meters. The pillars are made of reinforced concrete that can withstand large quantities of water and strong water currents. During the dry season, the space under the house is used as an outdoor room that protects people and materials from the sun and rain.



## **4 Peoples attitude towards living in multi-storey buildings**

### **4.1 Introduction**

*Tradition and culture is a very powerful phenomenon that gives a nation its identity and keeps it united. It is a phenomenon that should be fondly cherished and its supremacy should never be underestimated*

This chapter covers the reasons of why the government in Costa Rica and Nicaragua, and their respective housing development organizations, are building houses on one or two levels. The aim of this chapter is to evaluate the future prospects of introducing a wider range of multistory buildings that are dedicated to the low income population in the concerned countries.

Multi-storey buildings are very rare in Costa Rica and Nicaragua; though transferring parts of the population into the vertical plane could probably reduce the rising problems of growing cities that are swallowing the surrounding rural areas. Increasing urbanization provokes rapid growth of cities which the municipalities cannot handle. One problem is that people find it hard to accept change and even if they are properly informed they do not realize the consequence of the change. The result of Costa Rican charity projects is a good illustration of this phenomenon and it gives an idea of how difficult it can be to introduce a new building concept, such as multi-storey buildings, into a country in Central America.

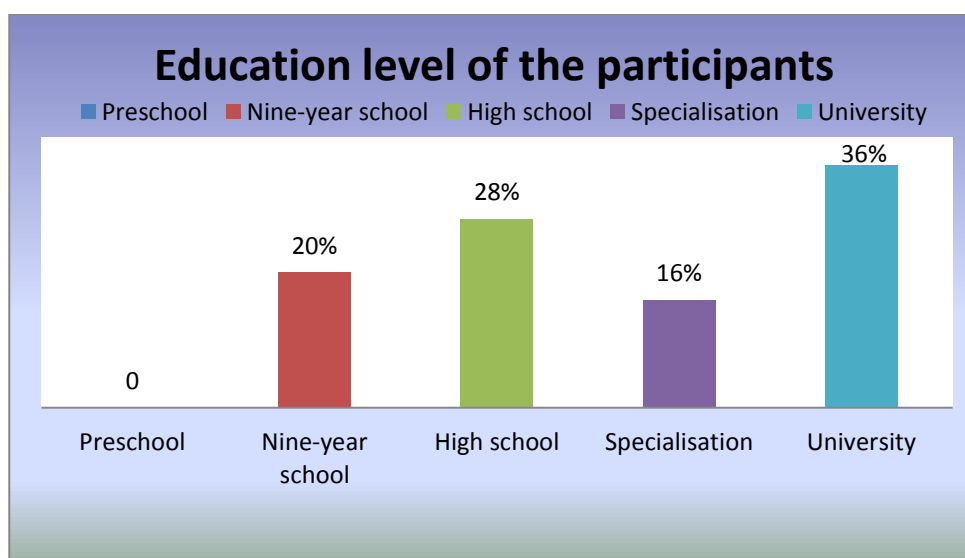
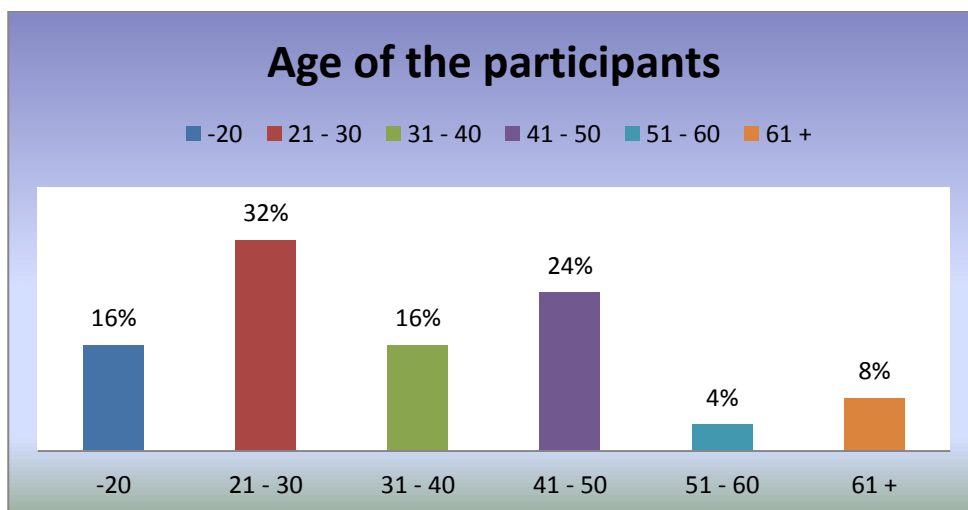
People cherish the spirit of community and the feeling of solidarity with fellow members. The need of possessing their own land and house and the need of having a healthy relationship with the members of family and community makes it difficult for the people to even imagine a change of lifestyle. The conservative way of living is deeply imprinted in their traditions which make it hard to modify. After seeing the new living conditions of the people that have been given a new house in Costa Rica and after comparing it with their old housing situation it seems obvious that the improvement is significant which should satisfy the clients. But the truth is slightly different. In many cases people complain about their new house and they even miss the old slum shuttle they had before, in spite of the fact that the improvements are pronounced. Beside the improvements, many aspects remain from the past including privacy, neighbors close by and the houses are built in one or two stories with a garden for each house. This change should logically be well received and appreciated by the clients but the tradition and conservative



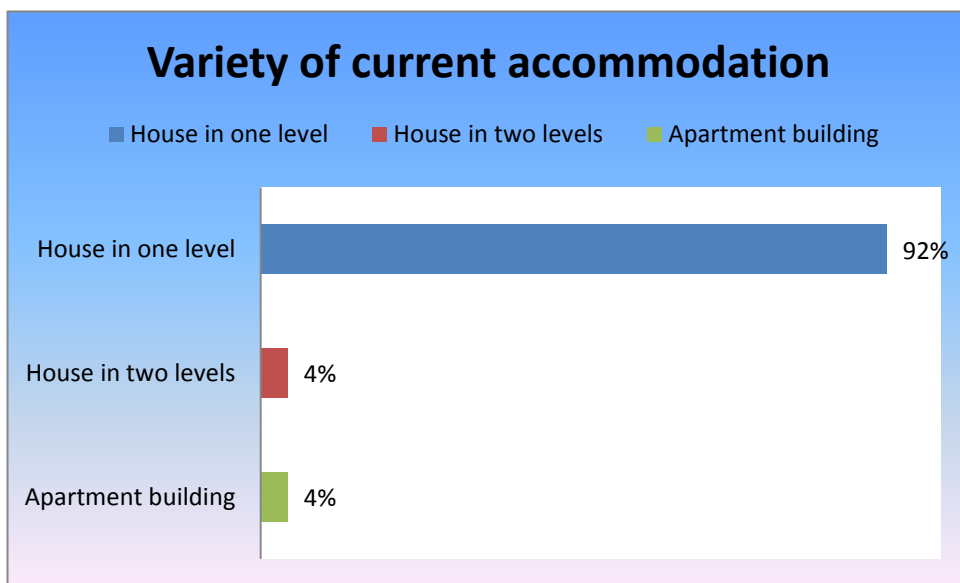
mentality of the community makes it more difficult than that. People are seeking a better life but on their own terms. When they applied for the governmental subsidy they knew what to expect, but knowing it in theory and living it in practice is apparently quite different.

## 4.2 Method of Survey

A total of 50 randomly chosen people (52 per cent male and 48 per cent female) have contributed to the final result of this survey. 50 per cent of those asked were living in generally poor neighborhoods of San Jose, Costa Rica; the rest lived in equivalent circumstances, though in Managua, Nicaragua. All of the participants were asked to answer 18 questions that consider their attitude towards housing on multiple levels (The survey can be seen in Appendix 6.1). The conclusion of this chapter is also partly influenced by individual conversations with the participants that have been performed during the investigation. The age and education diversity of the participants can be seen in the following diagrams:

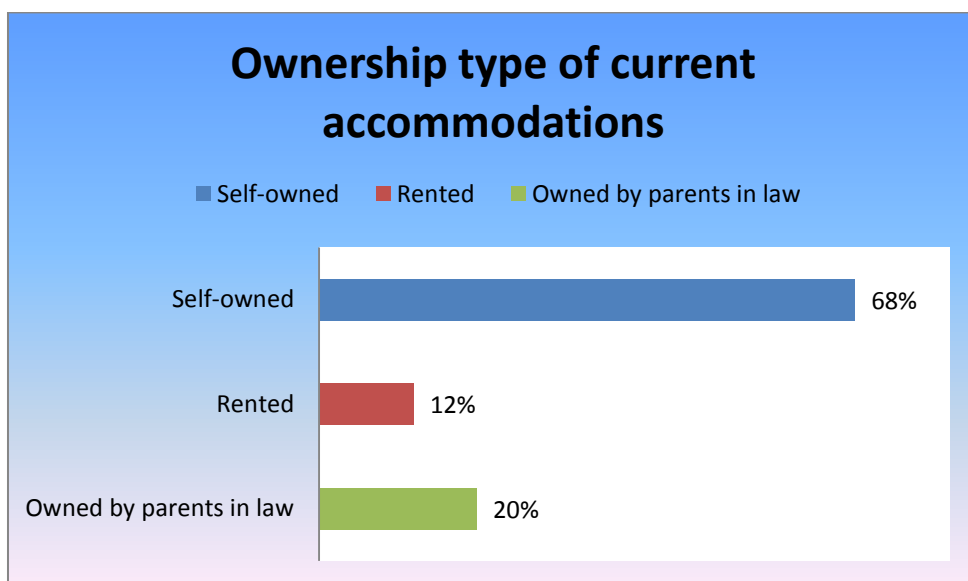


### 4.3 Result & Discussion

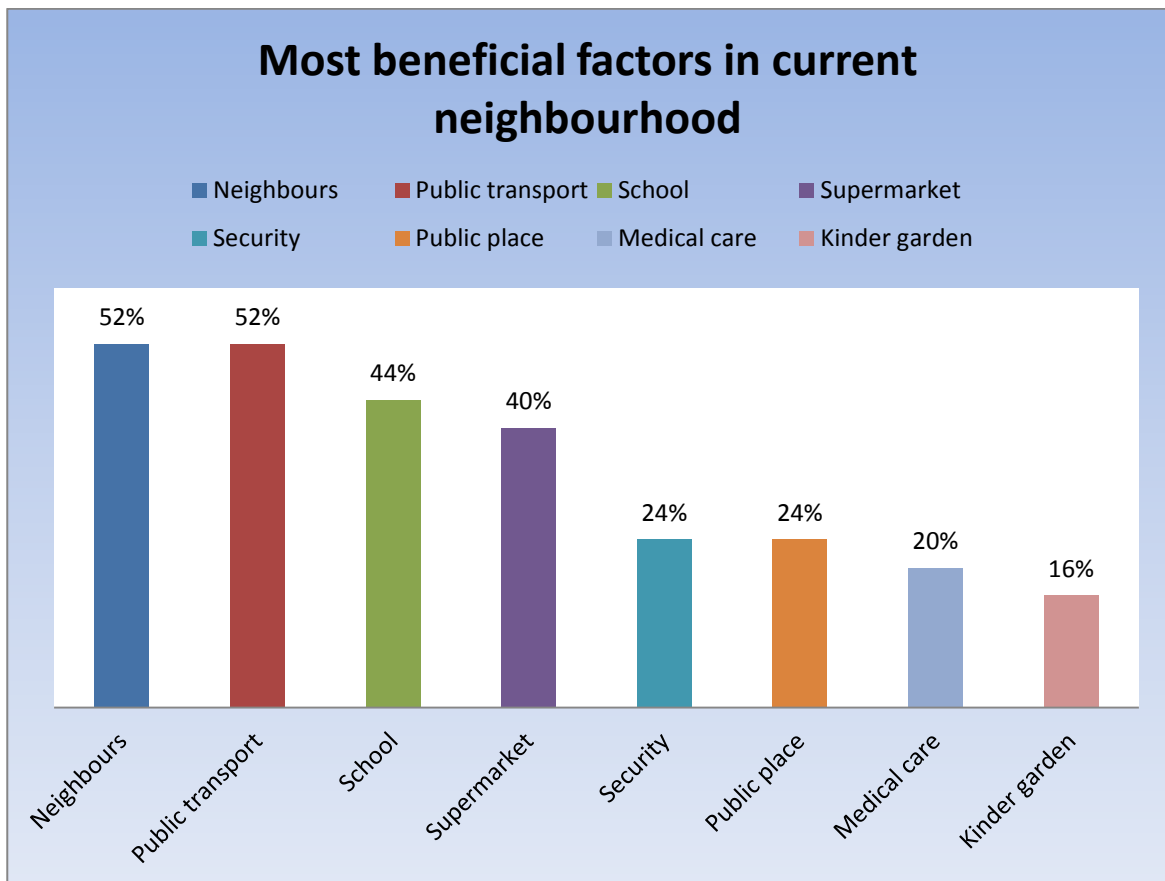


92 per cent of those participating in the survey live in one story houses. Lack of high rise buildings in their environment makes it impossible for those that have not travelled abroad to imagine the effect of living in an apartment. This has obstructed the credibility of our survey which meanwhile shows a positive attitude towards alternative housing.

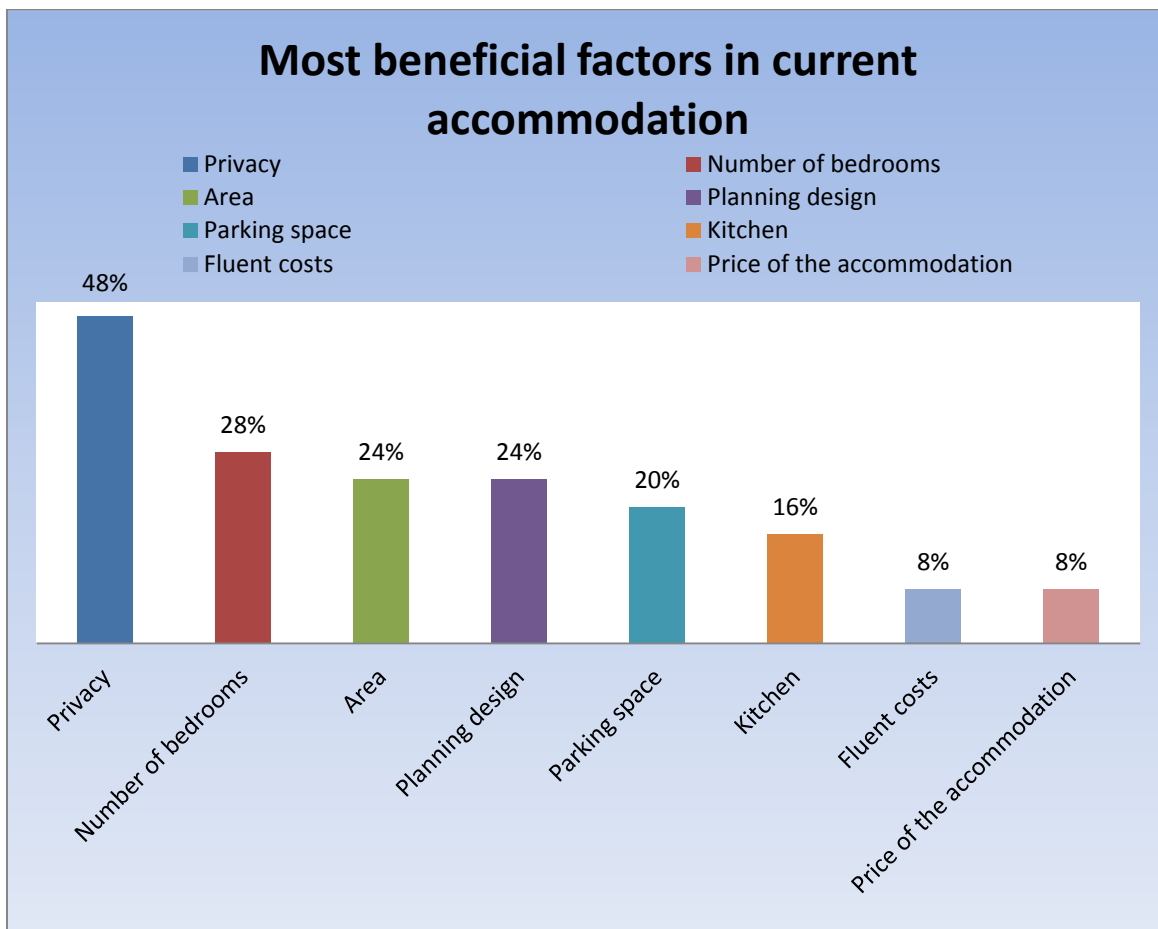
The survey shows that 48 per cent of the people could see themselves living in a multi-storey building, which is a surprisingly high number considering the negative attitude that the people have shown during previous interviews. Meanwhile 52 per cent say that their opinion is influenced by the lack of knowledge which again proves that the only way of gaining a credible survey is by primarily educating the people.



Only 12 per cent rent their dwelling and the remaining 88 per cent either owns it or live with their families that are the actual owners. This shows the importance of letting the apartments be available for privatization. Renting is a good short-term solution but over time it is basically wasting money that could instead be invested monthly through paying off a mortgage. This is even more important in the Central American countries where people often settle down in one place for many years and where inheritance of houses through generations is common.

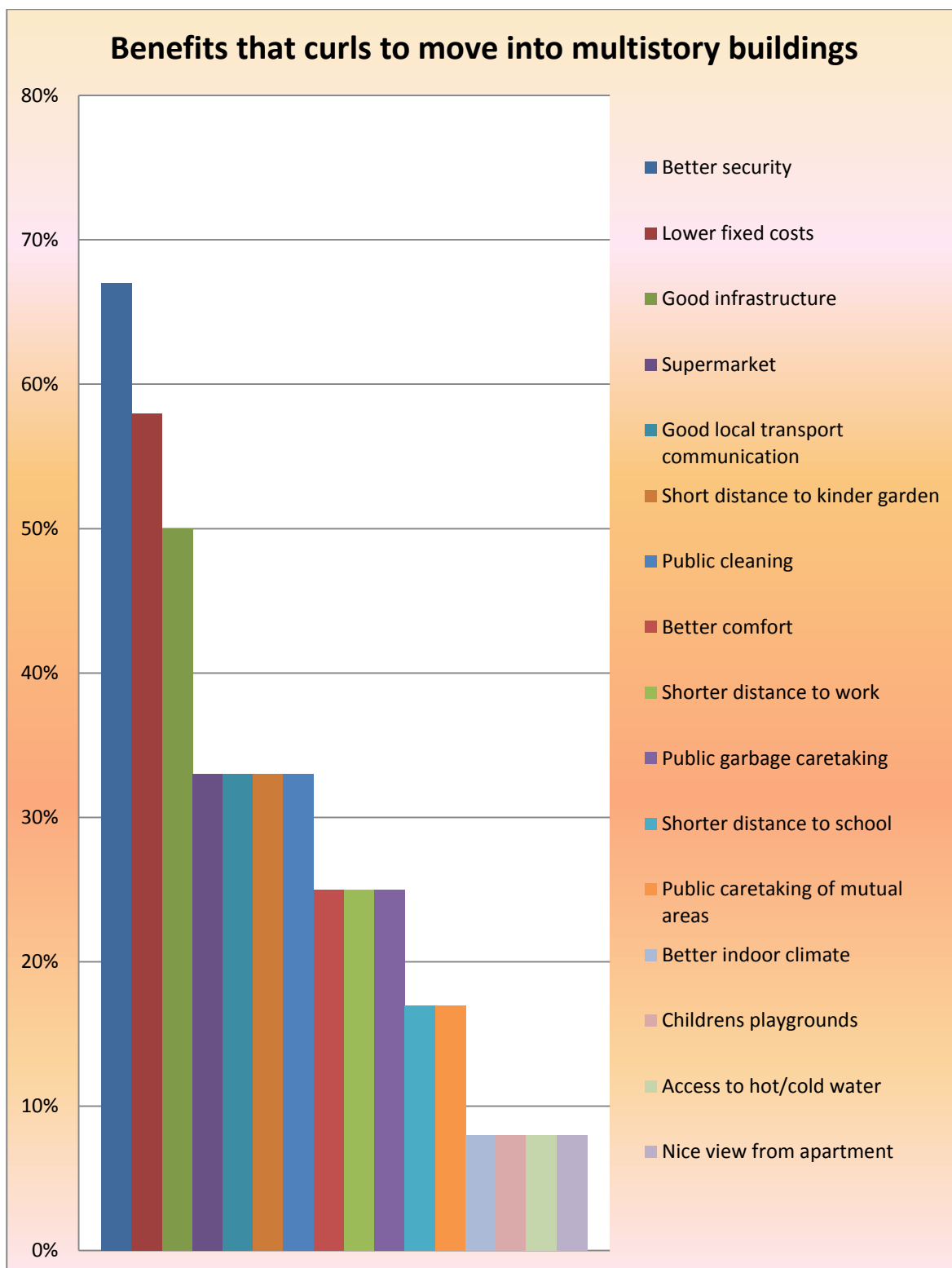


The importance of being part of a community and to have a good healthy relationship with the neighbors is a reason why people prefer to stay in one place. When we asked which factors are the most beneficial in people`s current neighborhood 52 per cent answered that it is the neighbors and the public transport. This share might seem low, but it is still the highest share of the eight possible answers. On second and third place with a share of 44 per cent and 40 per cent respectively, their answer were school and supermarket. The result can be interpreted in two ways, either they are satisfied or not satisfied with the current access to the benefits or they do not classify those benefits as important. Either way, the share of 52 per cent show that neighbors are vital and that the multi-storey building should be adjusted to cover the need of integrating people. Good connection to public transport and a supermarket nearby is also of high importance.



After asking which factors are the most essential in their current accommodation 48 per cent answered privacy. This means that parallel with the need for a close social relationship with the people surrounding them they are searching for privacy and seclusion. This requirement is natural and can be accomplished by multi-storey buildings where the apartments usually have good sound isolation and at the same time access to public spaces.

Parking space is another significant problem which could be solved by high rise buildings. Only 20 per cent believe that the parking space is a beneficial factor in their current accommodation. Car owners complain about lack of space for parking their cars and see it as a big advantage when their house has a parking space. Many houses in cities are built close to each other with a small backyard without free space for the vehicles, which forces the owners to find alternative parking. A common solution in Sweden is constructing underground parking garages, which is expensive but beneficial. A low-cost solution can be to construct parking lots on ground level and the apartments on top of it, which is common in Brazil.



67 per cent of those 48 per cent that can imagine moving to a multi-storey building say it is because of better security. Some of the population in Costa Rica and Nicaragua live in constant fear. Poverty provokes crime which makes people feel insecure in their house and neighborhood. Across the board, people try to protect themselves by installing iron bars on doors and windows or by building walls around the house with spikes or other obstacles on it to

prevent burglary. They are afraid of leaving their house after nightfall and the wealthier population hires armed guards as protection. Considering the security factors is of high priority for the future multi-storey projects to succeed. It has been popular in recent years in European countries to secure whole neighborhoods in new construction projects with multi-storey buildings. It has been accomplished by constructing a surrounding wall around the neighbourhood with an entrance guarded by security companies and CCTVs (Closed-Circuit Television) installed to guard the wall. The costs of such a security system are divided between the apartment owners/tenants and are kept relatively low thanks to the high density of inhabitants who shares the costs.

As mentioned before 52 per cent answered that the most beneficial factor in their current neighbourhood is the relationship with their neighbours. Meanwhile 48 per cent answered that the most beneficial factor of their current accommodation is privacy and 67 per cent of those that can imagine themselves moving to multi-storey buildings say that it is better security that attracts them. All of those three answers are linked by their distinguishing social qualities that can easily be taken to consideration during multi-storey projects. Common playgrounds, sport grounds and parks are a few examples of intergrading establishments that are worthy the investment due to its high yield in form of satisfaction. Transferring people into the vertical plane facilitates the supply of other highly valued benefits, such as good infrastructure and local transport communication, public cleaning, and short distance to supermarket and kindergarden. A higher density of people provides more end-users to every performed investment which makes it more profitable. This considers all of the mentioned benefits, inclusive the infrastructure to which is worth adding that the maintenance cost reduces as a result of shortened distances. The bottom floors of the multi-storey buildings can be used for commercial purposes, due to which its inhabitants will be able to perform all their basic necessities without leaving their neighbourhood.

## 4.4 Conclusion



*Figure 30. The houses on the mountainous terrain and its topography create a natural impression of buildings built in multiple levels, although the maximum height of the houses is two levels. The picture was taken at an illegal slum area in the outskirts of San Jose, Costa Rica. (2010-05-04)*

According to the survey people do not wish luxury but a decent life in decent conditions. Only 8.3 per cent wish a better indoor climate, access to hot water, pleasant view from the apartment or shorter distances to school and work. Meanwhile they do wish for high security, cheaper mortgages, good local transport communication and good infrastructure. This shows that the population only desire to raise their living standard to a level which enables them to cover their basic needs, a level that in many other countries is taken for granted.

We believe that the interest in multi-storey buildings can be provoked in people from a lower socio economic background. As we mentioned earlier in this thesis, world population is growing rapidly especially in urban areas. We cannot continue with cities spreading into the rural environment without



realizing the consequences for future generations. We need to be aware of the impact of our actions and opt for more sustainable solutions. Many problems could be solved by building high rise buildings but it requires expertise from countries that have established models. Numerous countries have years of experience and should help Costa Rica and Nicaragua by sharing their knowledge, which would speed up building developments and prevent known mistakes from being repeated.

A good way to enlighten the population is to present the result in practice. Only through building neighborhoods with high rise constructions would it be possible to teach the population this way of living and to investigate its long time effects on the community. It is then very important to consider the cultural aspects during the constructional planning and to adjust the multi-storied buildings to meet the needs of a Latin American population.

The questionnaire shows some interesting aspects of people's attitude that did not appear during conversations. Our primary impression was that multi-storey buildings are far beyond the cultural frame of Latin America and that any introduction would end with failure. Contrary arguments seemed infinite which led us to the conclusion that the population is not ready for any major structural changes to the cities' appearance. But to our astonishment the survey proved our expectations to be partially false as a high share of the participators showed an open mind and willingness to alter their housing environment. We believe that the concept of multi-storey buildings stands a good chance of being successful as long it is adjusted to the culture of the population and to the right target group.

## 5 General Conclusion of Essay

Neither Costa Rica nor Nicaragua lack people willing to dedicate their professional careers to help others towards a dignified life. The major obstacle for the organizations is primarily of a financial character which decides the dimensions of the projects and the aid that they are capable of providing. The Costa Rican organizations have more resources and better support from the government than PRODEL in Nicaragua, which is clearly reflected in the extension and quality of their projects. Nevertheless, all of the three organizations are working hard to develop their countries toward a more equalized society and provide hope to those that are sometimes forgotten. The importance of the existence of such organizations is inestimable in the countries whose governments cannot guaranty its population an adequate standard of living. It is a global duty to support those organizations and to jointly strive for the reduction of people living in degrading housing conditions. Most of the people that have received help from FUPROVI, FCRC and PRODEL have significantly improved their housing environment and furthermore, their social status. The alteration has facilitated their lives and brightened their future. This makes the organizations invaluable.

Population growth in the world is increasing which means that more and more people are in need of their own accommodation. More and more cities are spreading out on the horizontal plane, which leads to negative effects on everything from infrastructure to the economic effects. Good urban design is crucial as more and more people live on less space.

Multi-storey buildings are not common in Costa Rica nor in Nicaragua. The countries are sometimes affected by natural disasters such as earthquakes, which mean that some people are reserved when it comes to building multi-storey buildings because they are afraid of possible collapse. However, many people are positive towards living in apartment buildings in view of the survey. If you can provide information about what benefits there are to building this kind of multi-storey houses, that this is a phenomenon which is spreading successfully across many parts of the world and providing information and knowledge that this technique is useful and that it can help more people to achieve a better standard of living, you can probably construct this type of buildings in the future with great success.

## Concluding remarks:

- The study looked into the housing situation for low income families that live in Costa Rica and Nicaragua and what they have done to improve their housing situation.

*The low-income families who sought help and have been granted this, it seems that their housing situation in general has significantly improved along with their standard of living. A lot of families are involved in housing construction and building their own houses indirectly according to their own ability, which also resulted in good neighborhoods.*

*One parallel problem is that middle-class families in Costa Rica that wish to for example renovate their homes, do not have access to loans and subsidies and meanwhile the poorest families in Nicaragua with the lowest annual income do not qualify for loans. Chapter 3*

- This study will hopefully increase the knowledge about the organizations that work to improve housing and infrastructure in these countries.

*After visiting the three organizations and having seen their projects the conclusion is that all three are working to achieve a better housing situation for low- income people. Good results have also been achieved. Chapter 3*

- Hopefully, the sections concerning the attitude of living in multi-storey buildings contribute to an overview of what people's view is on this at present.

*According to the survey toward living in high rise buildings, it seems to be generally positive for this change of living, despite different opinion after interviews with officials. The problem today is perhaps a lack of knowledge. Chapter 4*

# 6 Appendix

## 6.1 Questionnaire

### CUESTIONARIO

1. Género  
 Masculino                       Femenino
  
2. Edad  
 Menos de 20       20-30       30-40       40-50       50-60       60 o más
  
3. Nivel de educación  
 Preescolar       Primaria                       Secundaria       Técnica                       Universitaria
  
4. ¿Cuál es su situación de vivienda en este momento?  
 Vivienda de un piso                       Vivienda de dos piso                       Vivienda adosada  
 Apartamento                       Otro, explique por favor: \_\_\_\_\_
  
5. ¿Cuántas personas viven en su casa con usted? \_\_\_\_\_
  
6. ¿Cuántos niños menores de 18 años? \_\_\_\_\_
  
7. ¿Cuántos son mayores de 18 años? \_\_\_\_\_
  
8. ¿Cuál es el área de su vivienda? \_\_\_\_\_
  
9. ¿De cuantas habitaciones está compuesta su vivienda? \_\_\_\_\_
  
10. ¿Qué tipo de vivienda es de acuerdo a la propiedad?  
 Vivienda propia       En renta       Otra, explique por favor: \_\_\_\_\_
  
11. ¿Cuáles son las mayores ventajas de su actual vivienda?  
 Área  Parqueaderos  Número de dormitorios  
 Cocina                       Privacidad                       Los gastos mensuales  
 La distribución de los espacios                       Precio de la renta  
 Otros, explique por favor: \_\_\_\_\_
  
12. ¿Cuáles son las mayores ventajas de su barrio?  
 Los vecinos                       Supermercado                       Seguro médico  
 Preescolar                       Escuela                       Transporte Público  
 Seguridad                       Espacio público  
 Otra, explique por favor: \_\_\_\_\_
  
13. ¿Podría considerar la posibilidad de mudarse a un edificio de apartamentos?  
 Si                       No

Nota! Si su respuesta en NO, por favor continúe con la pregunta 15.

14. Por favor escoja en el listado, lo que considera ventajas si decidiera moverse a un edificio de apartamentos:

- |  |   |
|--|---|
| <input type="checkbox"/> Confort                           | <input type="checkbox"/> Distancia corta a la escuela         |
| <input type="checkbox"/> Préstamos con Intereses más bajos | <input type="checkbox"/> Distancia corta al trabajo           |
| <input type="checkbox"/> Confort climático interior        | <input type="checkbox"/> Buena infraestructura                |
| <input type="checkbox"/> Acceso a agua caliente y fría     | <input type="checkbox"/> Buen transporte público local        |
| <input type="checkbox"/> Aseo público                      | <input type="checkbox"/> Mayor seguridad pública              |
| <input type="checkbox"/> Pública recolección de basura     | <input type="checkbox"/> Áreas comunes para juegos infantiles |
| <input type="checkbox"/> Cuidado publico de áreas verdes   | <input type="checkbox"/> Supermercados cercanos               |
| <input type="checkbox"/> Distancia corta al preescolar     | <input type="checkbox"/> Buena vista desde el apartamento     |

Otros, por favor explique: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

15. ¿Son los beneficios de su alojamiento actual y de su vecindario actual, las razones por las cuales usted no quiere mudarse a un edificio de varios pisos?

- Si
- No, por favor explique: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

16. ¿Cree usted que la falta de conocimiento tiene una influencia en decisión de si vivir en un edificio de varios pisos o no?

- Si                       No

17. ¿Dónde preferiría vivir usted?

- Área urbana/en la ciudad                       Área rural/en el campo                       En las afueras de una ciudad

18. ¿Cuántos pisos considera usted es recomendable al construir edificios de apartamentos?

- 2                       3-5                       6-10                       10-15                       15 o más

Muchas gracias por tomarse su tiempo y ayudarnos con nuestra investigación!

## 6.2 Climate Data San José, Costa Rica

Station:	San José, Costa Rica		
Source:		Latitude:	10 °
Data collected by:		Longitude:	-84
		Altitude:	939 m

### Solar radiation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Sunshine</b>	<i>hours/day</i>											
real	7,00	8,00	8,00	7,00	5,00	4,00	4,00	4,00	5,00	4,00	5,00	6,00
max.	11,48	11,68	11,95	12,24	12,47	12,58	12,52	12,32	12,05	11,76	11,53	11,42
	61%	68%	67%	57%	40%	32%	32%	32%	42%	34%	43%	53%
<b>Radiation</b>	<i>MJ/m<sup>2</sup>day</i>											
	19,60	20,10	20,30	22,10	19,30	17,30	17,90	18,00	17,10	16,60	16,20	18,10

### Temperature

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Extreme Max</b>												
Mean Max	27,1	27,8	28,8	28,8	27,4	26,2	26,9	26,8	25,6	25,7	25,7	26,7
Mean	22,8	23,4	23,9	24,0	23,4	22,4	23,0	22,7	21,8	22,0	21,9	22,7
Mean Min	18,4	18,9	19,0	19,3	19,4	18,6	19,1	18,8	17,9	18,2	18,0	18,7
<b>Extreme Min</b>												

### Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Maximum</b>												
Average	56	40	24	28	120	109	101	139	165	262	198	136
<b>Minimum</b>												

### Humidity

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Mean Max</b>	85	82	83	86	94	97	95	94	98	97	94	89
Average	67	65	65	67	79	85	80	81	88	87	82	73
<b>Mean Min</b>	49	48	46	47	64	73	65	68	77	76	69	56

### Wind

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Direction</b>	E	E	E	SE	E	E	E	E	E	S	E	E
<b>Speed</b>	6,3	6,7	5,7	5,2	3,8	3,0	3,7	3,5	2,7	2,7	3,5	5,2

## 6.3 Climate data Managua, Nicaragua

Station:	Managua, Nicaragua		
Source:		Latitude:	12 °
Data collected by:		Longitude:	-86
		Altitude:	50 m

### Solar radiation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Sunshine</b>	<i>hours/day</i>											
real	7,50	7,50	8,00	7,50	7,00	5,00	5,50	6,00	5,50	6,00	6,50	7,00
max.	11,37	11,61	11,94	12,29	12,57	12,70	12,63	12,39	12,06	11,71	11,43	11,30
	66%	65%	67%	61%	56%	39%	44%	48%	46%	51%	57%	62%
<b>Radiation</b>	<i>MJ/m<sup>2</sup>day</i>											
	17,70	19,90	21,90	21,70	19,20	17,20	18,10	18,10	16,80	16,90	15,90	16,30

### Temperature

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Extreme Max</b>												
Mean Max	32,0	32,8	34,0	34,5	33,5	30,8	31,3	31,5	30,4	30,4	30,4	31,7
Mean	26,9	27,6	28,8	29,6	29,4	27,3	27,7	27,7	26,9	26,8	26,4	27,0
Mean Min	21,8	22,4	23,5	24,7	25,2	23,7	24,0	23,8	23,4	23,1	22,3	22,2
<b>Extreme Min</b>												

### Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Maximum</b>												
Average	26	0	0	29	121	111	102	138	161	265	198	136
<b>Minimum</b>												

### Humidity

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Mean Max</b>	86	81	79	77	81	91	91	91	94	93	92	87
Average	66	62	60	59	66	78	76	77	82	80	77	69
<b>Mean Min</b>	45	42	41	41	51	64	61	62	69	67	61	50

### Wind

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Direction</b>	E	E	E	SE	E	E	E	E	E	S	E	E
<b>Speed</b>	2,8	3,2	3,4	3,4	2,6	1,9	2,1	2,1	1,6	1,5	1,8	2,5

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## **Other References**

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Veronica Fonseca, Journalist, FUPROVI

## **Images Not by Authors**

Figure 1. Federal Aviation Administration

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Figure 2. Buy Safe Costa Rica

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Figure 3. Federal Aviation Administration

<http://www.faa.gov>, 2010-05-26

Figure 4. Google Earth

<http://www.google.com/earth/download/ge/agree.html>