

Off the Shoebox Approach

Creating sustainable communities through affordable housing development



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In Ecuador, the identified deficit in housing solutions for underprivileged sectors of society has been used as a political advertisement for political campaigns. Worldwide, families identify the tenure of a home as a requirement for their development and stability, not as a commodity, regardless of their social or economic situation. In Ecuador, low-income families due to their lack of resources, education and unemployment, rely on the government to satisfy this requirement or to at least assist them in achieving this goal.

The housing projects launched by national or even local and city governments have only been concerned with providing easy numerous, fast and cheap solutions to the housing problem, addressing the issue of housing as a mere shoebox solution in which their goal is to provide just shelter, a “shoebox”, expected to house a family regardless of size, shape or culture.

The housing development dialogue in Ecuador needs to move off from the shoebox approach, for our communities to develop and to become and remain sustainable. An appropriate design process will warranty the projects prepared

become sustainable communities that benefit and improve the quality of life not only of their inhabitants but also of their neighboring communities.

1 Shelter Situation Analysis

1.1 Basic General Data

Geography and Administration

Ecuador is located at the North Western part of South America, bordering the Pacific Ocean at the Equator, between Colombia and Peru, at 2°S and 77°30°W. The country's location, within the Equatorial Tropical area, defines to great extent uniform climatic conditions year round.

Ecuador is composed of 24 provinces, including the Galapagos Islands. Ecuador has an extension of 283,561 km², with extreme altitude differences, thus diverse microclimates ranging from tropical humid to mountainous climate in the high Andes.

Ecuador has a democratic government. The president and a unicameral national congress are elected by popular vote for a four-year term. Each province has a provincial government authority and council elected by popular vote. All urban centers within provinces are ruled by a Municipal system, headed by the Mayor and city council. Despite the existence of city governments, these have a strong dependence on the central government, since it allocates the annual budget for the region and establishes the national policy for development. All municipal governments have planning control over their territory and define local urban development policies, land use and zoning and regulations.

Demography and Health

Ecuador has a population of 14'041, 117 as of Sept. 2009¹, with a population growth rate of 1.49%. The country's population is composed 31% of children under 14 years of age, 63% of people within a 15 to 65 years of age and 6% of

¹ INEC, Ecuador en Cifras, <http://www.ecuadorencifras.com/cifras-inec/mainecv.html>

people 65 years or older. The median age for the country is 25 years. The life expectancy at birth is 72 years for men and 78 years for women.²

By 2008 sixty six percent of the country's population already lived in urban areas. From the 2001 Census, there were 3'264, 866 households, it is estimated that households have 3.41 children³, there is not however a figure of average people per household or household size.

Economy

The Country's GDP estimated for 2008 was of \$106.993 billions, with a nominal GDP of \$52.572 billions, \$3,776 per capita GDP. The GDP annual growth is estimated at 6.5%. The GDP composition by sector is 7% agriculture, 34% industry and 59% services. Ecuador's economy is dependent on its oil resources, with agricultural production and trade such as flowers, bananas and cacao representing the other major sources of income. The Gini coefficient for Ecuador is 4.2 to 4.6, with 45% of the population living in poverty in 2006 according to the national statistics center, when using the NIB method of direct social indicators, which evaluates the access of people to basic services such as education, health, nutrition, housing, and urban services. When evaluating poverty from consumption sources place 38% of the population, 5.6 million people, living in poverty.⁴

1.2 Shelter Related Fact and Figures

Access to Shelter

In Ecuador more than 38% of the population, about 5 million people, live in poverty, from which 40%, 2 million people live under the national poverty line⁵, with income under. In such scenario, low-income families end up directing 50% or more of their combined income to inadequate housing. Everyone has access to shelter, either in slum areas, or urban peripheries, but the quality of it is of great concern. However, the current Shelter Incentive Program SIV recently re-activated by the government provides families in the lowest income ratchets with

² CIA World Fact Book, www.cia.gov/library/publications/the-world-factbook/geos/ec.html

³ Censo Poblacional y de Vivienda 2001, www.inec.gov.ec, Ecuador en Cifras

⁴ CIA World Fact Book, www.cia.gov/library/publications/the-world-factbook/geos/ec.html

the possibility of having access to improved shelter, assisting families with a \$5000 dollar bonus for housing units up to \$60000, with the commitment from the families to procure savings of 10% the value of the house prior to the incentive award. Despite the benefits the SIV provides, it required families to be subject to credit, and the poorest families depending on informal economies have very few possibilities to benefit through the program, recurring to slums and other forms of uncontrolled low quality shelter. It is expected in the following 4 years that 30000 families will benefit from the SIV program financed by a 100 million loan from the BID⁶.

Housing stock

National statistics from the 2001 census reveal a housing stock of 2'850000 units nation wide, compared to almost 13 million inhabitants. However, these do not account for 1 shelter per family, but reflect that several households own more than one dwelling. This multiple dwelling ownership occurs since families might use property rental as a source of income and in some cases families own properties in diverse geographical locations.

Housing deficit (quantitative and qualitative)

The quantitative housing deficit for 2009 reaches 1'500,000 (projection from 1'200,000 deficit from 2001 Census) while 57% of all housing lacks basic services (waste water collection, potable water and waste collection)⁷. This housing deficit along with economic and political scenarios presents it self as triggering factor for other social conditions

Occupancy

Housing occupancy conditions are a major health and safety issue when it comes to overcrowding and limited space availability. In Ecuador, in urban area, 17% of the households live in extreme overcrowding conditions, with more than 3 people per room (including as rooms, the kitchen, living room, dining room), and 36% of

⁵ CIA world fact book 2009

⁶ Banco Interamericano de Desarrollo BID, <http://www.iadb.org/comunicados-de-prensa/2009-12/spanish/familia...endran-acceso-a-viviendas-dignas-con-asistencia-del-bid-6146.html>

⁷ Source: SIISE, UNICEF, Organización Panamericana de la Salud, INEC.

the households live in overcrowding conditions, having 3 people per bedroom. In rural areas these figures have a 10 to 12 percent increase.⁸ Housing overcrowding conditions are common in low-income households with limited access to shelter or property and with extended families and uncontrolled family growth.

Housing standard

The housing standard by most local building codes is a minimum of 40m² for low-income housing units, consisting of two bedroom units with bathroom, dining-living area, kitchen and laundry space. There are restricted minimum room dimensions in most municipalities, such as 2.8m as minimum length or depth of a bedroom⁹. Most common housing units developed by private or public entities offer solutions within the current building codes.

Most housing units targeted for quintiles 1 thru 3 are single detached, semidetached or row houses. Apartments are a growing trend for households on the 4th and 5th quintiles.

Floor area per person

When considering an average family size of 5 people per household, and the building codes requirement of 40m² minimum, the average floor area per person is of 8m² as minimum for low-income housing projects.

Tenure of households

In Ecuador the most common form of tenure for households is ownership. National statistics show that 67% of households own their home, while 23% of the households rent their home. The remaining 10% of the households is composed of 6% of households that either received or occupy a shelter that was given for free, abandoned properties or lended, and the remaining 3-4% are households that receive their home as compensation for services they provide. In the 2000 census however, there is no information regarding the informal and formal sectors of home ownership or home rental. These figures have to be compared with the

⁸ Plaza de la Rosa, Frecia, Proyecto Urbanistico y de Vivienda de Interes Social, extraido del Ceso Poblacional y de Vivienda 2001

⁹ Normas de Arquitectura y Urbanismo 2008, Distrito Metropolitano de Quito

figures of informal shelter building, which in most urban areas in Ecuador can reach the 60% of all households.¹⁰

Housing construction and building materials

Currently the most common building materials for housing construction are reinforced concrete structures with masonry block walls. In remote rural areas, construction materials are still traditional building materials such as load bearing earth walls and mixed systems such a bareque. In the coast and rainforest areas other materials such as bamboo construction was the traditional building system, now being slowly replaced by more modern structures and materials. Even though traditional materials were the ones with the best response to local climate and comfort conditions, concrete is the most socially accepted system, and symbolize a higher status for most low-income families. Most housing developments leave aside other methods and materials that could present a better construction system for achieving comfort, sacrificing quality of environment for social acceptance.

Access to and cost of Basic Services/Infrastructure

National statistics from 2000 show that 52% of all dwellings do not have sewer and wastewater collection services while only 10% of dwellings have no on-grid electricity service. When considering water provision, 32% of all dwellings on national levels do not have access to improved water systems, and 52% do not have potable water within the dwelling. Wastewater collection is another issue of concern, having more than 35% of dwellings unserved by waste collection, as a result of inexistent roads and infrastructure. Telephone services exist only on 30% of all dwellings; this however with the development of the mobile network is not a good parameter to evaluate access to communication.

1.3 Housing Policy

The housing policy in Ecuador is restructured with each presidential period. However, the Sistema de Incentivo de Vivienda (SIV) or Housing Subsidy System has remained constant since its implementation in 1992, due to its success in best

¹⁰ INEC, Senso de Poblacion y vivienda 2001

targeting the issues of housing provision and providing benefits to both the individuals and the public sector.

Public spending on housing also increased significantly in 2008, compared to previous years. Between 1990 and 2004, public spending on housing averaged 0.2 percent of GDP. In 2008, this was increased to 0.94 percent of GDP, mainly geared towards providing subsidies for low-income families in both rural and urban areas to build new homes through the SIV program.¹¹

The SIV system provides families with subsidies for acquiring their own house, for all housing units under \$60,000. The SIV is based on the saving-subsidy-mortgage formula, in which families are required to have an adequate amount of savings in relation to the cost of the unit they desire to acquire, and receive a subsidy of \$5000 in urban areas and \$3600 in rural areas, independently of the price of the housing unit. Finally families must access a mortgage loan with an accredited financial institution to cover for the remainder of the price of the house not covered by the savings or the subsidy. Families must apply for the subsidy through the department of housing, and must be first time homeowners¹².

Other policies that regulate housing conditions are managed and established by the local governments or municipalities, which define minimum space usage, required spaces, required technical characteristics and urban and development policies in relation to housing development.

1.4 Actors in Shelter Delivery and their Roles

The actors in the shelter delivery vary according to location and scope.

- **POLICY AND DEVELOPMENT- NATIONAL**

The first and most important actor in shelter delivery is the central national government, which provides the subsidies for low-income housing development as a direct assistance to families in lack of housing or requiring housing improvement. Apart from policy, the national government, through the Housing department, also acts as

¹¹ Wiesbrot and Sandoval, Update on the Ecuadorian Economy, Center for Economic and Policy Research, 2009

¹² www.miduvi.gov.ec/Default.aspx?tabid=383

developer of large scale punctual housing projects through partnerships and tenders with private developers.

- **POLICY AND DEVELOPMENT REGIONAL-LOCAL**

Regional and local governments act on policy through local regulatory frameworks and also as developers of specific housing projects, tendering projects with local intermediaries such as local developers and homebuilders for the design and construction.

- **DEMAND GENERATORS**

Demand generators are institutions public or private working in generating the demand for the housing subsidy and projects, through identifying and creating a network between applicants to the SIV. Financial institutions and non-profits that provide technical and social assistance are among this group. These demand generators assist low-income groups to structure and form for “group” application to the SIV.

- **REGIONAL INTERMEDIARIES**

Regional intermediaries are the developers involved in the development of affordable housing projects, either on a private level or through public projects with national or local governments. These developers sell the housing units through government channels and the SIV system.

- **BENEFICIARIES**

The beneficiaries are the low-income groups who have access to the low-income housing projects developed throughout. The beneficiaries can be single families who have applied for the SIV or structured and organized social groups.

1.5 Shelter Design

1. Physical Planning

Physical planning in most housing development projects in Ecuador is based only on land availability, barely taking into consideration local and regional development plans, due to the lack of public land within city areas.

2. Land Use

There is an inherited unjust land distribution in most Latin American countries, including Ecuador, having great disparities between income groups. Land use in Ecuador is determined by the real state market, allowing for land speculation and further inequity in land distribution and availability.¹³ Speculators benefit from urban sprawl, not controlled nor guided by long-term city development plans.

City or local governments have limited access to land due to private ownership and lack of planning, thus cannot cover the housing or infrastructure deficits in city outskirts, recurring to expropriations and evictions. These take up great investments from the government, take several years to resolve and affect in most cases not speculating landowners but regular citizens.

3. Population Density

The estimate by the 2001 census put the population of Ecuador at almost 13,000,000 representing an increase of almost 26 percent over the nation's 1990 population of 10,260,000 and making the country the most densely populated in South America with 187 people per square kilometer. Population in 2009 reached 14,000,000 people increasing with a growth rate of 1.5%.

4. Shelter Quality

More than 60% of the housing stock in urban areas in Ecuador is self-built or informal housing, resulting in inadequate living conditions and poor shelter quality. The informal sector of the city grows on areas with lack of services and infrastructure, with low probability of the local government being able to provide such services on the short term. Even government generated housing programs do not warranty the access to services, these are more concerned with providing housing units even if the infrastructure conditions are not satisfactory, such is the case with the SIV. Shelter Incentive program financed by the BID, providing economic assistance for shelter development, however

in most cases without the counterpart from the government to provide and develop adequate infrastructure.

5. Function and comfort

In Ecuador government based shelter design is based on a fast short-term solution to the need for shelter, thus does not take into consideration the future needs of a household once its economy increases or once the family grows. Functional aspects of the shelter consider the minimum requirements for day to day, for sleeping, cooking and cleaning. The functionality of the housing units needs to be taken into consideration in order to satisfy the family's needs with the minimum space and cost.

Public or private housing development for low-income households does not take into consideration different climatic conditions and requirements, thus providing the same solution to all the diverse climatic regions, resulting in lack of comfort and unsuitable thermal and healthy conditions for the families.¹⁴

6. Safety

Safety is one of the main concerns in the development of low-income housing, especially in urban outskirts and urban areas. The perception of safety, determined to a great extent the materials and envelope a family would deem as acceptable. In such a light, many environmentally suitable building materials are discarded as a possibility, resulting in the use of inadequate materials that provide a perceived "increased security". However, security issues are rarely taken into consideration on the urban and public space development considerations in low-income projects

7. Social Inclusion

The development of low-income housing, particularly for government based projects, goes in hand with the development of areas destined only for low

¹⁴ Reed, "Thermal Comfort in Tropical Humid Climates", Arizona State University, 2004

income groups, and without diverse land uses, lacking services and decreasing the quality of life, where families are confined in areas separated from other locations by income and economic development. This contributes to rejection by other social and economical groups, which perceive as negative the presence of assisted or social housing, further contributing to this unproductive cycle.

8. Gender Issues

Gender Issues are not taken into consideration when designing or providing affordable housing. The early land tenure reforms, even in the early 1970's did not consider women and they were only landowners by inheritance. Gender equity was not included or discussed in the national laws and regulations for land and property distribution and tenure until the mid 1990's¹⁵. However the Shelter incentive program SIV, implemented in 1998 until today does provide assistance to low-income households taking into consideration gender and dependents. However, gender issues are certainly not taken into consideration in the actual design or housing projects, infrastructure, urban and public space or even architectural planning and space use.

9. Sustainable Development

Environmental and social sustainability is not an issue discussed or taken into consideration in any type of development, despite the income group that is being targeted or the architectural or urban typology. Awareness of the impact of the built environment is not yet attained and must be brought to scene particularly in low-income groups, which are more likely to be affected by natural disasters and lack of resources.

¹⁵ Hernandez, "Consulta Regional Sobre Mujer y Vivienda Adecuada", Habitat International Coalition, 2003

10. Norms and Codes

Only few local governments have norms and codes for the development of affordable housing. In most cities and suburban areas, low-cost housing projects are forced to follow regular architectural and building codes, resulting in increased costs for the house and in solutions that do not satisfy needs and spatial requirements of low-income groups. However, the national and local governments through the department of housing and municipalities, have the capability to give certain projects the character of “special developments” and apply to those specific norms and codes for these developments. This is done in most cases in large-scale government developed projects but rarely attained by private developers.¹⁶

2 Organization

The institute for urban and regional planning, Instituto de Planificación Urbana y Regional, IPUR, is a research center within the Catholic University of Guayaquil, working on research, consultancy services and continuing education on issues related with habitat, environment, urban development and architecture. Through its activities IPUR seeks to contribute in improving quality of life in Ecuador, by promoting sustainable development on both local and regional level. IPUR provides consultancy and research services to public and private institutions, and promotes continuing education programs and academic events parallel to the university’s academic programs. IPUR is currently developing a postgraduate study program for professionals interested in sustainable design and planning.

Sustainable Design Studio, SDS, is an architecture studio based in Quito, Ecuador, working on research and design of sustainable projects of urban and architectural scale. SDS provides consultancy services on sustainability, project development, sustainable architecture, energy efficiency and climate responsive architecture. One of the main areas of work within SDS, is the development and design of affordable housing projects in Ecuador, with several projects established through partnerships with local and international non-profits and institutions.

¹⁶ Experience from Colina del Rosal and Treboles del Sur projects, in both Quito and Latacunga city governments or municipalities

3 Shelter Problem

For almost 40 years of democratic government in Ecuador, the identified deficit in housing solutions for underprivileged sectors of society has been used as a political advertisement for political campaigns. Worldwide, families identify the tenure of a home as a requirement for their development and stability, not as a commodity, regardless of their social or economic situation. In Ecuador, low-income families due to their lack of resources, education and unemployment, rely on the government to satisfy this requirement or to at least assist them in achieving this goal. This right to claim governmental assistance, usually translates in demagoguery through housing offers during election campaigns to lure families and groups in need to favor a political trend, party or even an individual, offers that almost never present a real and lasting solution but rather a quick-fix approach.¹⁷

The housing projects launched by national or even local and city governments have only been concerned with providing easy numerous, fast and cheap solutions to the housing problem, addressing the issue of housing as a mere shoebox solution in which their goal is to provide just shelter, a “shoebox”, expected to house a family regardless of size, shape or culture. Shoebox houses, lacking identity, are thus incapable of adapting or satisfying cultural and social requirements and aspirations, and do not represent a real solution to the urban problem in our cities. Private sector developments of low-income housing tend to follow the same approach, using government developments as benchmarks for improvement, setting a low bar for the design of livable communities. These housing projects built by public or private contractors do not improve the situation, but rather focus on temporary political benefits for the government or economical benefit for the developers.

Of an even greater concern are the urban environments we create around our cities with such approaches. The repetition of such housing units and their sprawl is overwhelming and alarming, resulting in poor quality of life and deficient living conditions. This poorly designed and cheaply built housing approach that targets short-term results in affordability, results in greater cost for families in making

their homes adapt to their incremental improvement and spatial needs.

Furthermore they result in vast communities with no identity, lacking services, with little or inexistent public places that do not promote a sense of belonging and pride.

Based in the “shoebox” approach, housing policies usually lack continuance and are implemented only for particular periods, thus do not touch on issues such as land use, land tenure and speculation, which must be addressed in order to control the housing crises.

In Guayaquil only, for the past few years, the current national government of President Rafael Correa, has been competing with Guayaquil’s local government of Mayor Jaime Nebot for political power and support, using housing as the main strategy to collect public acceptance. As a result, both the Department of housing and the Municipality of Guayaquil have launched massive housing schemes competing for the fastest and cheapest development of housing units to see who can cover the largest portion of the housing deficit in the region. Both projects combined, will create a community of aprox. 27000 households, housing 135000 people. When taken into perspective, the impact of such projects, housing larger number of people than several provinces in the country, is alarming and should question and challenge the approach given to housing development on a government level.

The most affected by such shoebox projects are the low-income families occupying them. The approach of a single unit design or application without taking into account the local climate, results in thermal discomfort, increasing the resources required by the family to make their living space adequate to protect them from weather conditions and suitable for their needs.¹⁸ Furthermore, the inability of the family to modify their structure, does not give families the possibility to grow or modify their space as their economy grows or as the family itself grows, making way to overcrowding conditions. Families who cannot cover their housing needs with the provided unit, in the middle or long term will eventually have to move out if their home in search of other possibilities, thus not solving the housing requirement for all.

¹⁷ <http://www.hoy.com.ec/Suplemen/blan486/negro2.htm>

4 Proposal for Change and Improvement

The housing development dialogue in Ecuador needs to move off from the shoebox approach, for our communities to develop and to become and remain sustainable. The need for a structured planning and design process is visible. A design process and focus that takes into consideration the stakeholders and addresses the future impact of massive housing development in its surroundings, is greatly required. Such design process will create sustainable communities through housing development and will to an extent assist local and regional governments to maintain continuation of housing policies. An appropriate design process will warranty the projects prepared become sustainable communities that benefit and improve the quality of life not only of their inhabitants but also of their neighboring communities.

The proposal for improvement of the housing sector in Ecuador takes this DESIGN PROCESS and its application as the main tool for improvement of housing conditions, leveraging on personal professional experience in the design and development of affordable housing projects and the scope of influence and outreach of IPUR. By incorporating knowledge gained from the SIDA Shelter Design and Development Programme, a well structured design process to create sustainable communities will be developed and implemented for its application in the design of low-income projects of large and medium scale, to have a positive impact on various levels and time frames.

The “Design Process” will be based on these 10 key areas for the development of sustainable communities¹⁹:

1. Community participation – engaging communities in the design of their own environments
2. People and Culture – taking into consideration cultural heritage
3. Place and environment – creating places and neighborhoods
4. Environmental quality – considering environmental impact and

¹⁸ Reed, “Thermal Comfort in Tropical Humid Climates”, Arizona State University, 2004

- improvement
5. Connectivity – analyzing connectivity and possible alternatives
 6. Life cycle – creation of buildings that adapt to changing needs and extend their life cycle
 7. Embedded energy – use of local resources and materials
 8. Residues and contamination – reducing ecological footprint
 9. Renewable resources – incorporating alternative experimental technologies that could be developed by the community
 10. Energy Efficiency – reducing energy consumption through adequate indoor comfort

The design process developed²⁰ will be applied from two areas of influence, on an academic study and on the actual application on a housing program to be developed in 2010. The process will be applied on an academic study and evaluation of government based projects, using an identified cluster within an existing project as a pilot study for evaluation and redesign. The process will compare government-based projects with a private project “Colina del Rosal”²¹, targeting the same income group, based on best environmental and social practices. The design process developed and applied in Colina del Rosal²² will be applied and used in the actual design and development of the “treboles del Sur” project in Quito, a pilot project for sustainable community in Ecuador. The Treboles del Sur project is a project for 800 families, as a pilot initiative between private developers, SDS and the local city government of Quito.

Both pilot projects, the government based project and “Treboles del Sur” themselves are the intermediate goal. The long term objective of this proposal will be the “design process” as end product, to be a structure applicable by other developers, non-profits, private and public institutions for development of sustainable communities.

¹⁹ Reed, design process used for development of two on-going projects to be completed 2011-2015

²⁰ Design Process applied in Colina del Rosal Project, refer to Annex 1

²¹ Colina del Rosal, formerly named Sierra Flor, low-income housing project for low-income flower farm workers, sponsored by Fundacion Bien-Estar, and Mutualista Pichincha with collaboration from Arizona State University’s Stardust Center for Affordable Homes and the Family.

The design process to be created and applied will:

1. Through the academic and actual study of pilot projects above mentioned, evaluate conditions and identify key issues that have a negative impact on a social and urban level.
2. List possible areas of intervention applicable to the projects within a design and planning intervention
3. Identify criteria of sustainable communities which can be addressed from urban design and architecture in the development of housing projects
4. List expected housing project outcomes and conditions expected as IDEAL after application of design process
5. Identify and to a suitable extent address the adequate involvement of stakeholders, propose forms of interaction for project development
6. Identify logical design steps going from an urban to architectural scale of intervention that would result in expected outcomes
7. Incorporate to design process sustainable principles and concepts, on both urban and architectural scales, on environmental and climate adaptability, adequate use of resources, use of local resources and materials and overall reduction of ecological footprint and impact on environment to as to promote sustainable development
8. Gather and document processes used and identified as suitable and successful throughout the design evaluation, proposal for redesign and intervention on the pilot projects, to incorporate them in the description of the “design process” and its guidelines
9. Evaluate the outcome of the application of the Design Process on the “Treboles del Sur” project on actual design and development, comparing obtained results with expected outcomes.

²² Refer to Annex 2 “SierraFlorProjectOverview.pdf”

The design process and its application and study will influence three areas as defined by changes in the stakeholders responsible for affordable housing development. These also represent the short, medium and long-term goals of the proposal. The impact on this proposal through the design process developed is:

- **THROUGH IPUR** – Assessment to national government and the department of housing in the creation of sustainable communities through the low-cost housing projects it has already launched, making these sustainable, affordable, and the roots for community development, empowerment and improvement of living conditions (academic evaluation and re-design of a mega block area within the existing planning scheme for Socio Vivienda project)
- **THROUGH IPUR – SDS** – Partnerships with other local and regional educational institutions and universities to address in the classrooms the role of architects in the development of sustainable communities. Educate future professionals on the importance of the design process as an intricate and inclusive approach to satisfy the need for shelter. The creation of Urban Studios that would allow students to take part in experimental urban housing projects for improving of slum dwells by introduction of innovative principles and technologies on a real environment. Design-build approach. (Application on academic and study projects and diffusion of design process developed, address issues of sustainable development through process)
- **THROUGH SDS** – From the private sector, provide with good practices examples of affordable housing and community development, that prove b both to private and public sectors that housing development, when properly planned and focused can provide good results for all stakeholders, and most important for the families who will inhabit the spaces and the communities that will be created through the process. (Application of design process in the design and development of Treboles del Sur project)

ANNEX 1

Colina del Rosal Project

10 Key Areas for Sustainable Communities Through Affordable Housing

Mulalo, Cotopaxi

Ecuador

2009

ANNEX 2

Sierra Flor Project Overview

Status Report

Stardust Center for Affordable Homes and the Family

2006

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3. Wiesbrot and Sandoval, Update on the Ecuadorian Economy, Center for Economic and Policy Research, 2009
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ANNEX 1

Colina del Rosal Project

- Project area: 2.7 hectares
- Number of families benefited through project: 136
- Lot size: 90m²
- Initial housing unit: 52m², 27m² in ground floor, 25m² second floor
- Target Group: low-income farm workers, within the 2nd and 3rd quintiles, earning from the minimum monthly income to 3 minimum monthly incomes on monthly basis. Families' income ranging from \$250 to \$750.
- Housing unit cost: \$14000 (non-profit project sponsored by Fundacion Bien-Estar and Mutualista Pichincha)
- Accessibility: \$5000 government bonus, \$1400 family's down payment collected through 12 months of planned savings from project inclusion to project completion, \$7600 in mortgage plan with Mutualista Pichincha at preferential interest rate of 11%, for a 15 year period, monthly instalments of \$70, within family's 30% of monthly income

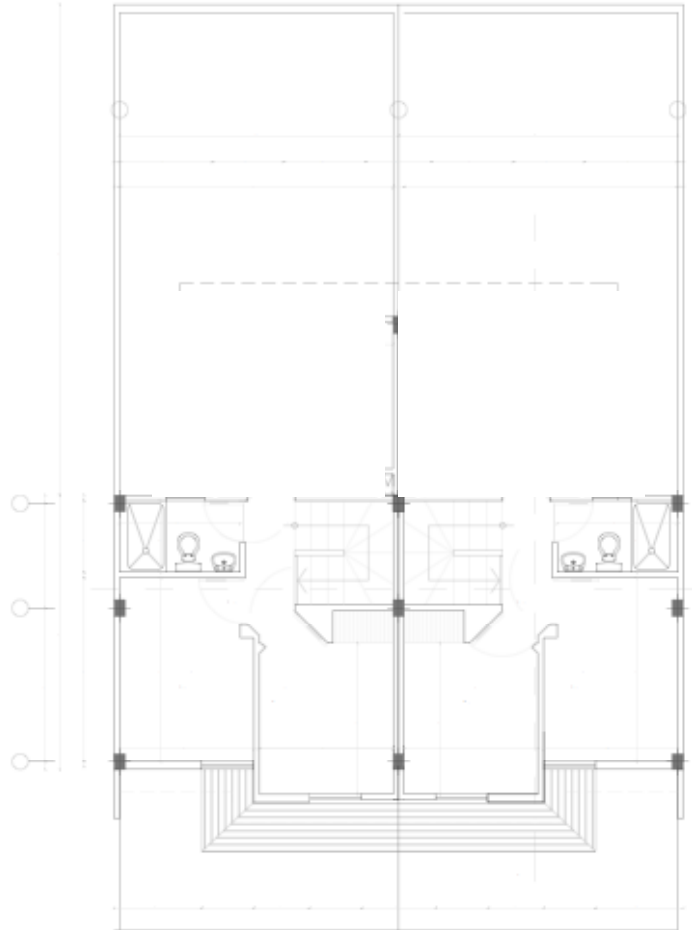
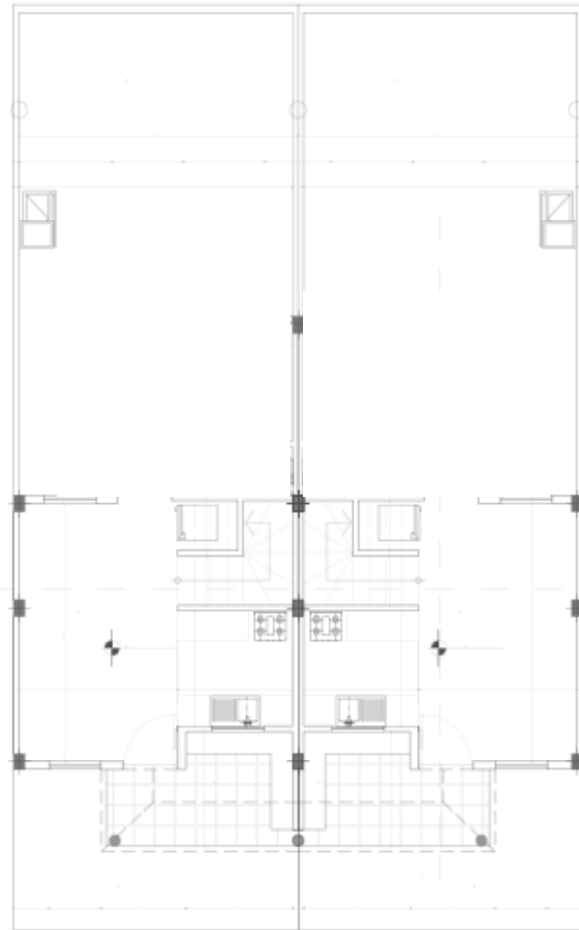
PROJECT CHARACTERISTICS

10. **Community participation** – engaging communities in the design of their own environments

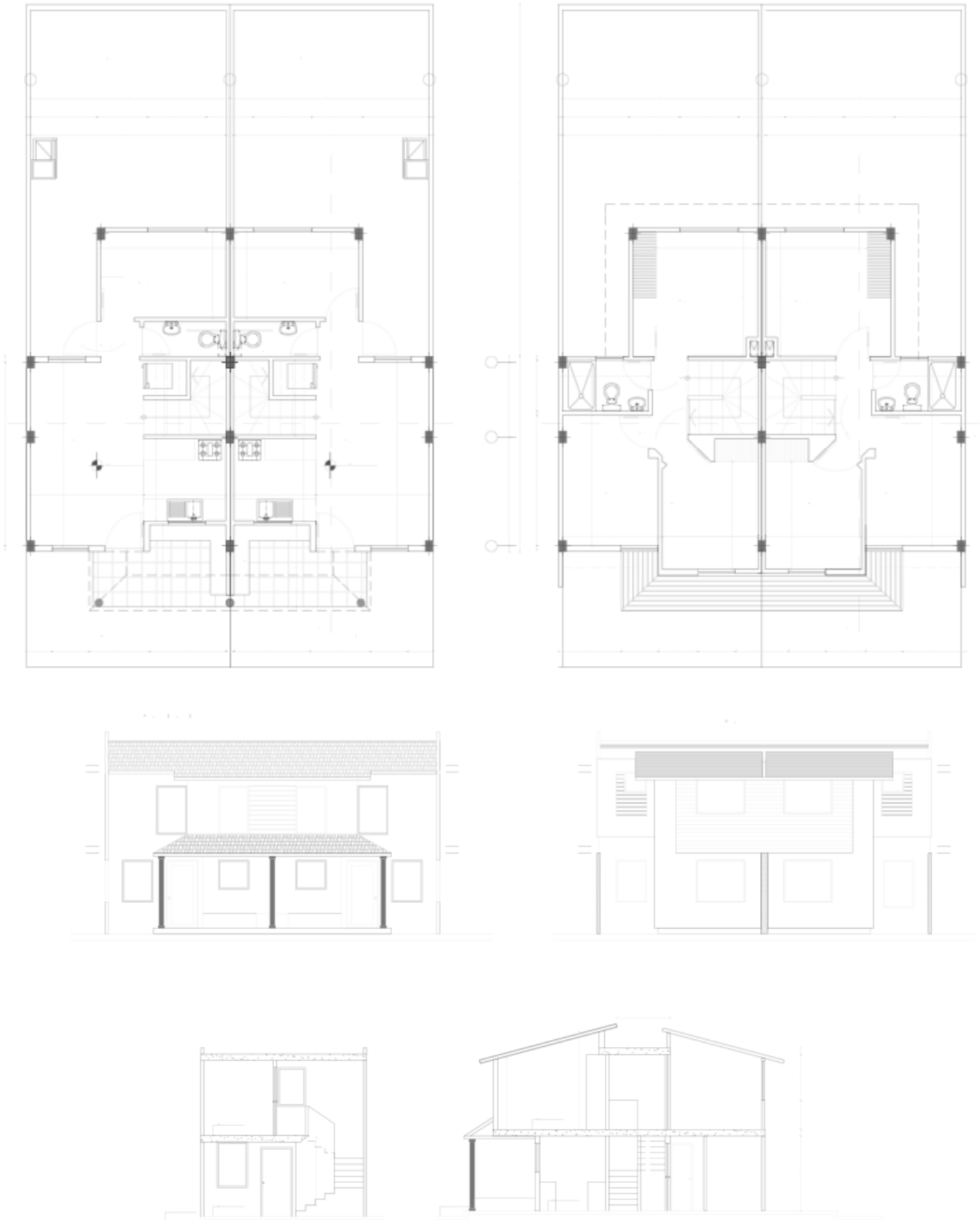


5. **Life cycle** – creation of buildings that adapt to changing needs and extend their life cycle

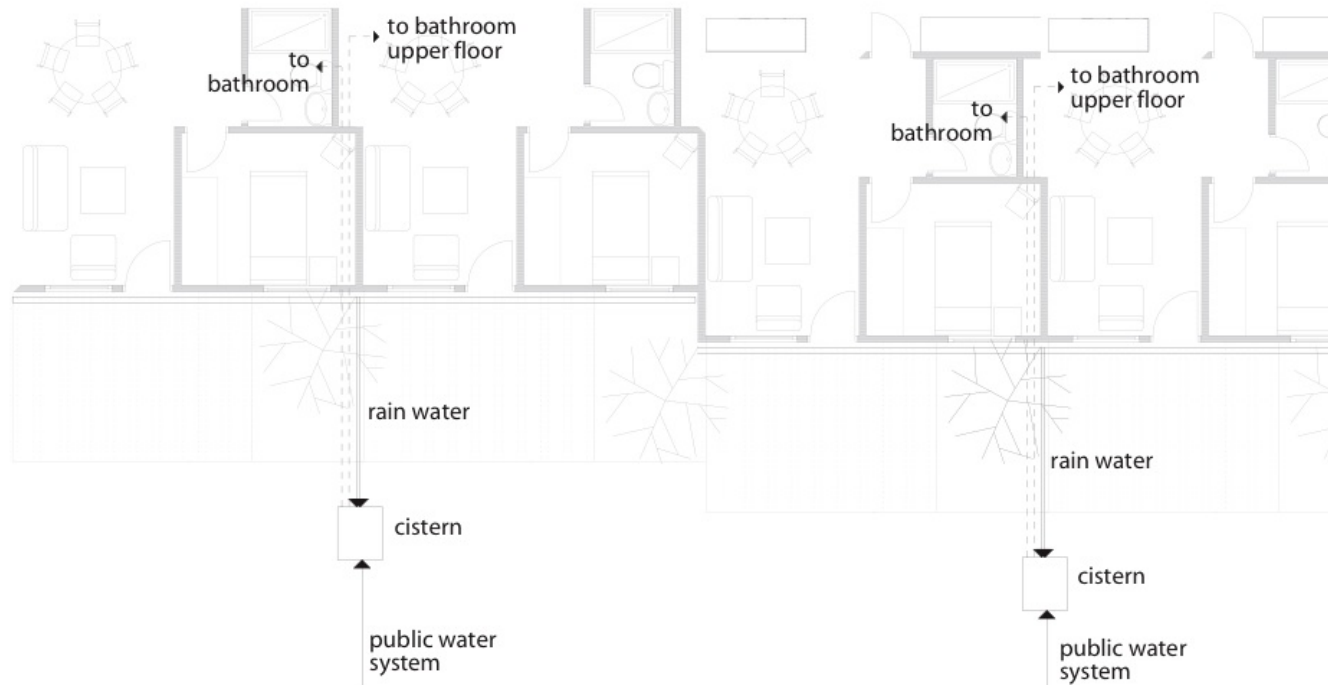
- Basic housing unit 52m²



- Incremental growth to 80m²



4. **Embedded energy** – use of local resources and materials
3. **Residues and contamination** – reducing ecological footprint
 - Differentiated waste collection
 - i. Collection of organic residues for community composting facility. Production of natural fertilizer for sale to supporting flower and rose farms, main activity in the area
 - Differentiated waste water systems
 - i. Gray water collected and used for underground irrigation of community green areas and private patios
 - ii. Black water collected for treatment at plan within project site. Treated water distributed to neighboring agricultural farms for agricultural products for animal consumption (alfalfa, etc)
2. **Renewable resources** – incorporating alternative experimental technologies that could be developed by the community
 - Rain water recovery for household water supply

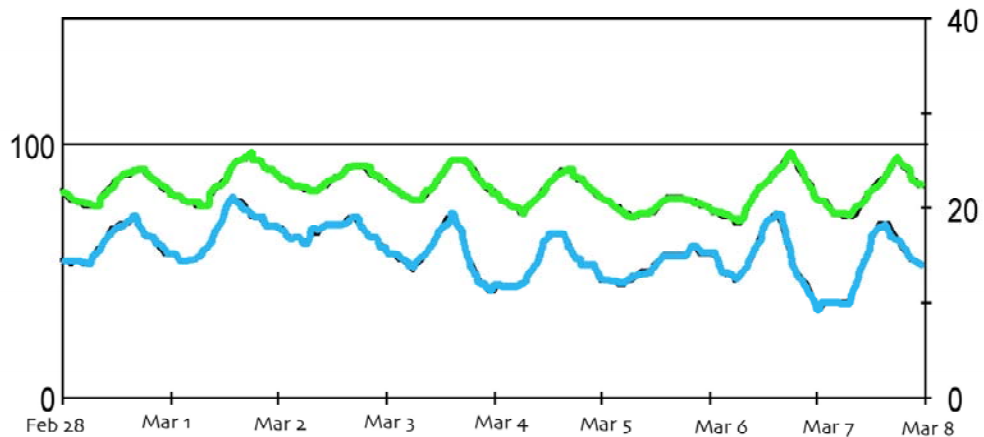


- Owner-made solar water heater for heating of water for personal hygiene

1. **Energy Efficiency** – reducing energy consumption through adequate indoor comfort

- Equatorial mountain climate, median temperature of 15-17 degrees C with low temperature of 10-15 degrees during evening and nighttime.
- All units face east-west for increased solar heat, thus increased indoor temperatures.
- High mass building materials and adequate window area to allow for increased thermal mass and re-radiation during nighttime.
- These criteria help maintain comfortable temperatures at night, when compared to outside temperature.

PROJ1 - Reference Case



Actual Hourly Heat Flows

HVAC +
 HVAC -
 Inside T
 Outside T

February 28 - 12 AM to March 08 - 12 AM

The Stardust Center

for Affordable Homes and the Family

Sierra Flor

P r o j e c t

E c u a d o r

A collaboration project with Fundación Bien-Estar and Fundación Sierra Flor, Ecuador

Summer 2006

Prepared by Veronica M. Reed

The Stardust Center for Affordable Homes and the Family is using innovative design methods to produce affordable housing. The Center, with partners in Latin America, is using developing urban centers and rural areas as laboratories for sustainable housing design. In these laboratories, policies have not yet been formed and developed to an extent where they could become a constraint, but rather still allow for innovative designs that can better serve the community. The hope is that these designs can serve as models for housing development that will benefit Hispanic communities in Arizona and the U.S. The Stardust Center has partnered with Fundacion Bien-Estar, a local non-profit working in Ecuador on providing housing for low-income families on urban and rural areas of the country. Both organizations follow the principle of housing as a mean for achieving family stability and children's success.

The Stardust Center identified Ecuador as the first location for its international work, and as a portal for possible future endeavors. To move this vision forward, the Center's Ecuador-based international fellow conducted research on possible public and private organizations that could serve as viable partners for the development of a best practices housing project. In March 2005, the Stardust Center began work with Fundacion Bien-Estar, Fundacion Sierra Flor and Mutualista Pichincha (a local financial institution).

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SIERRA FLOR P R O J E C T

Stardust Center for Affordable Homes and the Family
Fundacion Bien-Estar and Fundacion Sierra Flor

Background

Sierra Flor Co. Ltd. is an Ecuadorian rose farm and exporter committed to social change and environmental conservation. The company created the Sierra Flor Foundation to provide educational opportunities for the men and women who work for the company and for their children. Since then the Foundation has also welcomed children and adults that live and work outside its rose farm in the vicinity of the Lasso village.

Sierra Flor Foundation believes in providing better housing conditions for its employees. The Foundation thinks this can help attract and retain talented individuals as part of its workforce. It is also a way to further impact and improve the living conditions and future opportunities for the children in the area. In March 2005, Sierra Flor engaged Fundacion Bien-Estar and the Stardust Center to assist in the study and development of a community housing project. The purpose of the project is to work towards better housing conditions for its employees and other low income families in the area, provide this workforce with a better quality of life and promote social development in the region.

The Stardust Center has contributed to the Sierra Flor project with the development of the preliminary social study through a local affiliate advised by the Executive Director and the Associate Director for Design Services of the Stardust Center, and by funding local support from an experienced professional in the field of participatory design and community involvement. The Stardust Center has been working closely with Fundacion Bien-Estar on the design of the urban and architectural project itself.

Fundacion Bien-Estar relied on the Stardust Center to assist and develop the project in close collaboration, contributing to it its knowledge and experience for the development of a true best practices exemplar to serve as a reapplicable model. Both institutions will work together in securing external non-reimbursable funds from international and national organizations for the development of the social component of the project and finally for the evaluation of the impact the project had on the community, to provide data for policy makers for the formulation of innovative proposals that would benefit low-income groups.

Fundacion Bien-Estar has and will continue to work closely with Fundacion Sierra Flor and Mutualista Pichincha to implement the ideas and proposals developed in collaboration with the Stardust Center on all aspects of the project till its completion and occupancy. Fundacion Bien-Estar, through Mutualista Pichincha, and Fundacion Sierra Flor will promote and develop the project under the capabilities and experience that each institution brings on board, in the specific case of Sierra Flor Foundation, by providing the land for the development of the project and by searching for opportunities to help partially subsidize the housing units for the most needy.



Program description

Overview

The project has been divided in four phases of implementation, Preliminary study, design, and construction, evaluation, during which each institution has and will be contributing with their knowledge and experience.

Phase I - Preliminary Study

The Stardust Center, through its international fellow, has conducted and concluded the social study and assessment of the needs of the local community through the use of site visits, observations, and interviews with families from the community.

The main objective of this first phase was to provide the base on which to design and develop a master plan for the housing project in the given site through the use of participatory community workshops to explore possible solutions to land use, layout of housing units, public and private spaces, etc during the second phase, Project Design.

The development of a preliminary social project for economic growth and stability of the community through the use of participatory community workshops will take place at the end of Phase II. This social project will be intended as an initiative for families to become self-sustained by promoting production and employment.

Phase II - Project Design

Using participatory design workshops, the Stardust Center through its affiliate, with support from the local professional has designed master plan for the Sierra Flor project, the one that reflects the actual needs and preferences of the end users. During Phase II the master plan developed has been reworked to fit the community's expectations.

The Project Design phase or Phase II has resulted in the following achievements:

- project start-up and configuration alternatives presented to the community and discussed for consensus
- site design schematic alternatives from information gathered through initial workshop and interviews
- design of the urban master plan for the community housing project that takes into consideration a community productive area for the economic and social improvement of low income families
- design of a housing program that meets actual needs of the Sierra Flor families
- design of progressive housing units that respond to the principles of both the Stardust Center and Fundacion Bien-Estar for safe, decent housing that provides quality of life.

The following items are yet to be developed during Phase II:

- determining best applicable and culturally acceptable construction alternatives and materials
- design of green areas using children's workshop
- schematic plan for Sierra Flor community productive project
- funding proposal for Sierra Flor community productive project

The Project Design phase is expected to be concluded by late August 2006, time at which the project will be presented to Mutualista Pichincha for their further study, development and construction.

Phase III - Construction

During the development and construction of the project, the Stardust Center 's role will be that of an observer, however maintaining a close relationship with Fundacion Bien-Estar, the one that will conclude and oversee that the project designed and developed by both institutions is carried through during construction to completion of the project. During this Phase, Stardust Center staff and faculty and students from ASU could participate and carry on parallel research using the Sierra Flor Project. Fundacion Bien-Estar and the other institutions involved will enable any participation from ASU or Stardust Center staff.

Fundacion Bien-Estar will secure local support and resources for the development of the project, working closely with Fundacion Sierra Flor and Mutualista Pichincha.

Phase IV - Evaluation

The Stardust Center, through its international fellow, will assist Fundacion Bien-Estar in grant writing efforts to secure external funding for the evaluation of the impact the project had on the community once it has been inhabited. Fundacion Sierra Flor will play a key role in this phase, on which, through its educational programs and staff, it will provide a unique opportunity for the Center to have live, controlled data on the social impacts of affordable housing in children and young adults since all the families have their children twelve and under attending the Sierra Flor school.

The Stardust Center will assess the impact that affordable housing delivered with social empowerment had on the educational attainment and job stability of low-income families through:

- Gathering data from the Sierra Flor School on the development of the children before and after being provided with the housing
- Conducting observation visits and interviews with the families
- Conducting site visits to evaluate the impact on the neighborhood

The Stardust Center in collaboration with Fundacion Bien-Estar will document, edit and publish the findings regarding the benefits and impacts of affordable housing on the local community for use by both institutions to educate the community about the importance of developing affordable housing, assist policy makers in affordable housing efforts and present local governments with models for the development of safe, decent, serviced housing. The evaluation phase will serve the Stardust Center to evaluate the impact of innovative design solutions on low-income communities for development of low income housing for similar Hispanic communities in Arizona and the US.

In detail

Phase I - Preliminary Study

For the development of the Sierra Flor Project, “participatory design methods” were the methodology used, which allowed through the preliminary phase and design phase, the participation of the end users with the purpose of satisfying their actual needs on an urban, architectural and social scale. This methodology allows for the establishment of a replicable research model for information gathering on the actual problems and expectations of a specific group, family or community. The participatory design process led to the development of a master plan for the development of the community housing project that truly responds to the needs of the local society and culture through the understanding of the social characteristics that influence the perception and use of space.

The “participative design” methodology requires for the design process to start from a basic understanding of the social characteristics of the community, such as current context, family composition, household economy, etc. This preliminary study of the local conditions was done through the use of surveys, personal interviews and site visits which compiled the information that later shaped the participatory design workshops and the design itself.

The proposed methodology and actual process for the development of Phase I, the preliminary study was conducted as follows

1. Surveys were conducted with identified group of families from the employee community interested in the housing project. A group of thirty-eight Sierra Flor workers and their families were interested in participating. The group was surveyed on topics such as family composition, current housing tenure, etc. From the survey conducted, a smaller sample group of 17 families was randomly chosen. These final seventeen employees and their families were interviewed personally on characteristics such as family composition, future growth of the family, household economics, housing tenure, housing conditions (construction and current state), access to services, local infrastructure, etc.

The surveys and personal interviews allowed us to identify from current housing conditions, the minimum required spaces and areas from families' expectations as well as to identify an affordable housing price range that would require families to direct only 30% of their income towards housing loan payments, thus creating an economical and architectural framework for the development of the project.

2. Local housing context was evaluated through visits to past and current market rate and low-income housing developments in the Lasso, Mulalo and Latacunga areas to evaluate gap in housing offer and to identify housing trends that are a common denominator for the families in the area. The current housing offer is understood for our purposes as the proposed construction processes mostly used by Mutualista Pichincha in its low-income housing developments that had been offered by Mutualista as our alternatives for the development of the Sierra Flor Project. Two construction methods proposed for the Sierra Flor Project were analyzed, selecting one method for its advantages, as presented on page 21.

3. Study of the proposed site including zoning and codes, risk areas, existing infrastructure, existing services, surrounding areas was conducted through site visits and interviews with local authorities.

The preliminary study served as a starting point for the planning and development of the participatory design workshops conducted with the participation of all interested Sierra Flor families, thus the results from this phase were the foundations for the design of the project from its early stages to its current state.

1. Social study - interviews and surveys

Surveys were conducted on an initial larger group of Sierra Flor workers interested in participating in the housing project, 38 families total. Personal interviews were conducted on a second group, a reduced sample of 17 families from the 38 initial ones; this group provided more specific data on their current condition regarding housing, family, economics and services.

30% of families' income towards housing
Family's monthly income
information from Sierra Flor flower farm

estimated \$80/month payment for \$8,000 loan (from estimated cost of housing at \$12,000 at a low rate of 8-9%)	families under the estimated \$80/ month payment for housing loan	possible housing expense	# of families	%
		\$20	0	0.0
\$30	0	0.0		
\$40	10	41.7		
\$50	0	0.0		
\$60	0	0.0		
\$70	0	0.0		
				41.7
estimated \$80/month payment for \$8,000 loan (from estimated cost of housing at \$12,000 at a low rate of 8-9%)	families who could meet estimated \$80/month payment for housing loan	\$80	1	4.2
		\$90	9	37.5
		\$100	3	12.5
		\$150	0	0.0
		\$200	0	0.0
		\$300	1	4.2
				58.3
estimated \$100/month payment for \$8,000 loan (from estimated cost of housing at \$12,000 at a market rate of 12%)	families under the estimated \$100/ month payment for housing loan	possible housing expense	# of families	%
		\$20	0	0.0
		\$30	0	0.0
		\$40	10	41.7
		\$50	0	0.0
		\$60	0	0.0
		\$70	0	0.0
		\$80	1	4.2
		\$90	9	37.5
				83.3
estimated \$100/month payment for \$8,000 loan (from estimated cost of housing at \$12,000 at a market rate of 12%)	families who could meet estimated \$100/month payment for housing loan	\$100	3	12.5
		\$150	0	0.0
		\$200	0	0.0
		\$300	1	4.2
				16.7

From the first larger sample of 38 families only 13% owns a home, slightly under 50% of the group rents in the surrounding area and the other 40% of the families live with other family members but do not own a home. Over 75% of the interviewed families have from 1 to 3 children under 12, and have at least one child attending the Sierra Flor school.

The second group of 17 families interviewed shows the following trends:

All of the homeowners live in a house with 3 bedrooms, 50% of the renters live in similar conditions, and where as 40% of the families that live with other family members have to share one room for their family of 3 or more members.

All homeowners have the bathroom within their unit, 80% of the renters rent a unit with a bathroom, and are connected to the water and sewer service. Almost 96% of all owned or rented homes are built of masonry. Sixty percent of all rented units are only one story high, the other 40% are apartments on 3 to 4 story buildings. All of the shared family units are one-story high houses.

All of the homeowners and renters live in the town's center, within walking distance to commercial, shopping and health services. All workers travel an average of 10-20 minutes either by bus, bike or walking distance from home to their place of work. None of the workers interviewed own a car.

If a lower interest rate of 8 to 9% is secured through Mutualista Pichincha, almost 60% of all interested Sierra Flor families will be able to obtain the housing loan and to own a home.

If on the other hand a low interest rate is not offered to the families, and the market's interest rate of 12% is maintained, only 18% of the families would be able to buy a home.

From the survey and interviews conducted we could identify the minimum requirements for the project in order for it to satisfy the real needs of the families both on social and economical aspects:

The housing units need to satisfy the needs of families of three to six members, requiring at the minimum two bedrooms and one bathroom per unit.

The housing units need to be affordable, having families' use only 30% of their income for housing expenses. From the average income of the families, this requires the housing unit to be sold at a price range of \$10,000 to \$11,000. By maintaining the home unit sale price within the \$11,000 range, 60% of the Sierra Flor families would be able to own a home.

The required low housing unit sale price can be achieved through the commitment of the three participating institutions, Mutualista Pichincha through the development of the project at cost without any profit margin, thus reducing the cost per unit, Sierra Flor Foundation through the provision of land for the development of the project at a highly subsidized cost to the families of \$1 per sq. meter and the Stardust Center through the technical assistance and design services provided for the preliminary study and design of for the project, contributing to the success of this project with no charge to any institution or family involved. The Sierra Flor Project can offer housing at a reduced cost to low-income workers since it has been able to avoid design, development, and land costs, which other projects cannot reduce.

Despite the efforts from these three institutions, still at a low price of \$11,000 per unit, 40% of the Sierra Flor families will not have access to the Sierra Flor Project due to their low incomes. Since the price for the housing units cannot be reduced any further, the Sierra Flor Foundation will be searching for in kind contributions and non-reimbursable funding that will create a housing fund to cover for an amount of the cost of the housing unit for those 40% of the Sierra Flor families in most need, giving every family the possibility to own a home.

2. Local housing context

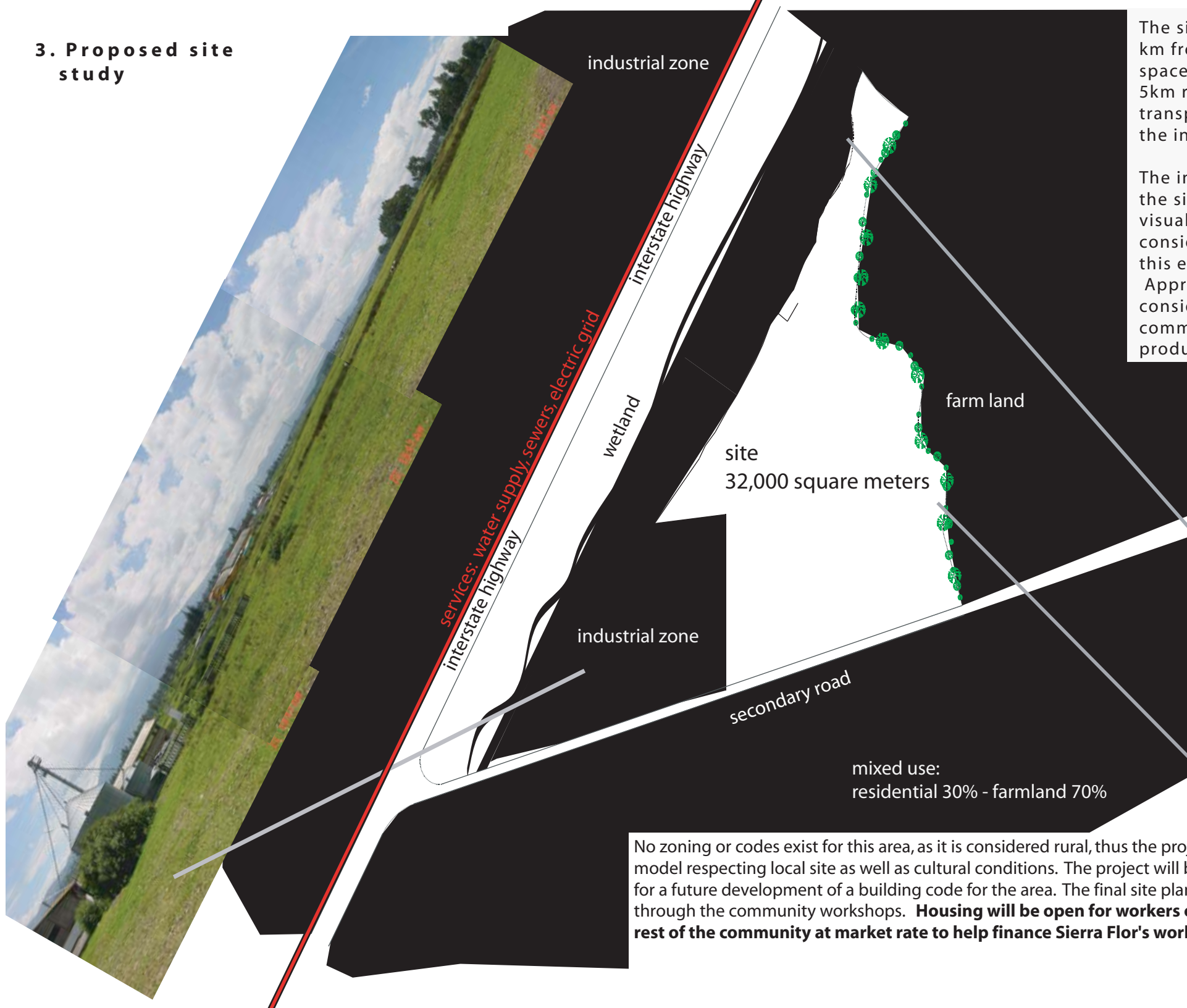
This project has unique characteristics that make it call for innovative solutions to solve its duality between rural and urban space. The site is located in a rural area of the province of Cotopaxi. However, its proximity to the interstate highway and furthermore the actual reality in which most families in the area live are far from rural. According to Ecuadorian national codes, a home is considered rural when it is located on a 5,000 square meter parcel, what has been defined as the required lot area for rural activities such as farming; this however does not occur in affordable housing in so called rural areas since families do not have financial access to such extensions of land and most cannot acquire property or might be only able to afford only small parcels. These issues described make smaller lots in the rural areas urban in nature since families no longer have land to farm and cannot continue with an agricultural culture.

The discussion between what type of development the Sierra Flor project should be, if urban or rural, cannot be answered without taking into consideration the surrounding environment and the reality of the families who will be the end users of the project. In this sense we could refer to the development of the project as semi-urban, or semi-rural according to individual perceptions.

From the first approach to Sierra Flor employees, through surveys and interviews, it has been found that most of Sierra Flor workers currently live within a semi-urban environment due to the architecture and materials used within a serviced core in a rural area. These have no resemblance to the traditional materials used for construction the Ecuadorian highlands, adobe and earth construction. The inclusion of somewhat modern materials as are concrete, masonry and others to the rural areas has been extensive and these are culturally accepted and even preferred methods of construction. However, these semi-urban environments are low rise given the low density common to areas outside large urban cores of the country; this low density imposes certain patterns for development of the Sierra Flor Project, such as the single family-housing unit within a small parcel.



3. Proposed site study



The site is located in the town of Mulalo, Lasso, 6 km from the town's center. There are no public spaces, businesses or commercial zones within a 5km radius, except for the industrial zone and transportation access, which is available next to the interstate highway.

The industrial zone forms a strip that separates the site from the highway, however, sound and visual barriers have been taken into consideration, separating the housing units from this end of the site due to the high traffic flow. Approximately 60% of the site's area is considered for services, infrastructure and common areas, including an 8,500 sq. meter productive area.



No zoning or codes exist for this area, as it is considered rural, thus the project proposed has been developed as an initial model respecting local site as well as cultural conditions. The project will be presented to the local government as a guide for a future development of a building code for the area. The final site plan, presented in page 15 has been developed through the community workshops. **Housing will be open for workers of Sierra Flor at a reduced price and to the rest of the community at market rate to help finance Sierra Flor's worker housing.**

Phase II - Project Design

For the development of the project design, or Phase II, the results from the preliminary study have been used as basis to plan and develop the participatory design workshops which have shaped the project in an community, urban and architectural scale.

For the development of Phase II "participatory design workshops", which allow the participation of the end users through the design of the project with the purpose of satisfying actual needs of the users both on an urban, architectural and social scale, were used. This methodology allows for the establishment of a reapplicable research model for information gathering on the actual problems and expectations of a specific group, family or community. The participatory design process has led to the design of a master plan for the development of the community housing project that truly responds to the needs of the local society and culture through the understanding of the social characteristics that influence the perception and use of space.

From a basic understanding of the social characteristics of the community, such as current context, family composition, household economy, etc, through the use of surveys, personal interviews, and site visits during phase I as well as from the analysis conducted on the local housing offer, housing context and project site, a series of participatory workshops were planned to address the design and development of all areas of the project.:

1. Workshop 1: general project characteristics and possibilities (community, land, use, public-private space relationships, productive component activities).
2. Workshop 2: presentation of site schemes developed from previous workshop, selection of best applicable alternatives
3. Workshop 3: presentation of final site scheme to be used for master plan, discussion of architectural program for the housing units
4. Workshop 4: presentation of progressive housing units through different stages of growth and other alternatives, physical characteristics of housing units '
5. Workshop 5: introduction to and testing of the Mutualista Pichincha M2 building method, site visit and video
7. Workshop 6: Children's workshop
8. Workshop 7: final scheme and organization of productive component of Sierra Flor Project (to be conducted once all three partnering institutions reach an affordable unit price late August 2006).

1. First Participatory Design Workshop

The objectives of the first participatory design workshop were:

- 1) to present to the Sierra Flor farmworker families the housing project:
 - site area, expected number of units, proposed productive area, institutions involved, process for development of project
- 2) to evaluate the opinion of the farm workers, the end users, on the organizational alternatives for the project:
 - who should be included in the project, should we include housing for families outside Sierra Flor, which might help reduce costs to Sierra Flor families
 - what should be the relationship between the different actors and spaces, among them and in relationship to the immediate surroundings
- 3) to understand the disposition, if any, of the farm workers to establish and develop the community productive component for the Sierra Flor Project:
 - can we achieve a project working in community

Sierra Flor families were introduced to the three organizations working on the Sierra Flor Project and what each is bringing to the project as advantages or opportunities for the families themselves:

Fundacion Sierra Flor	providing site for project, selling it to Sierra Flor families at a highly subsidized price
Fundacion Bien-Estar Mutualista Pichincha	funding the project and selling the homes to Sierra Flor families at the cost price, without any profit for the institution, also providing home loans with a preferential annual rate, the lowest offered Mutualista or other financial institutions
Stardust Center	working with Sierra Flor families in designing a project that truly responds to their needs and expectations of safe, decent housing

After a brief presentation and introduction of the project to the Sierra Flor workers, the participatory workshop focused on the two remaining objectives. For this the first issue discussed with the participants was that of the organizational alternatives. The first point to be address was the actors to be involved in the project, for which families were presented with three options as shown in the diagram in the upper right corner.

Two of the alternatives presented gave the opportunity to include housing for other families outside Sierra Flor, this in light of giving the capability to charge families from the surrounding community the market rate price so that the difference helps subsidize Sierra Flor farm worker housing.

From the options presented, the families selected the second option, which includes housing for families outside Sierra Flor, promotes the creation of the community productive component, and makes it accessible to all families providing to all the same benefits and responsibilities.

Once families had selected to have the project developed for both themselves and families from the community outside Sierra Flor, the workshop was focused on the different alternatives of spatial/actor relationship, between the project components themselves and in relationship to the surrounding area.



2. Second Participatory Design Workshop

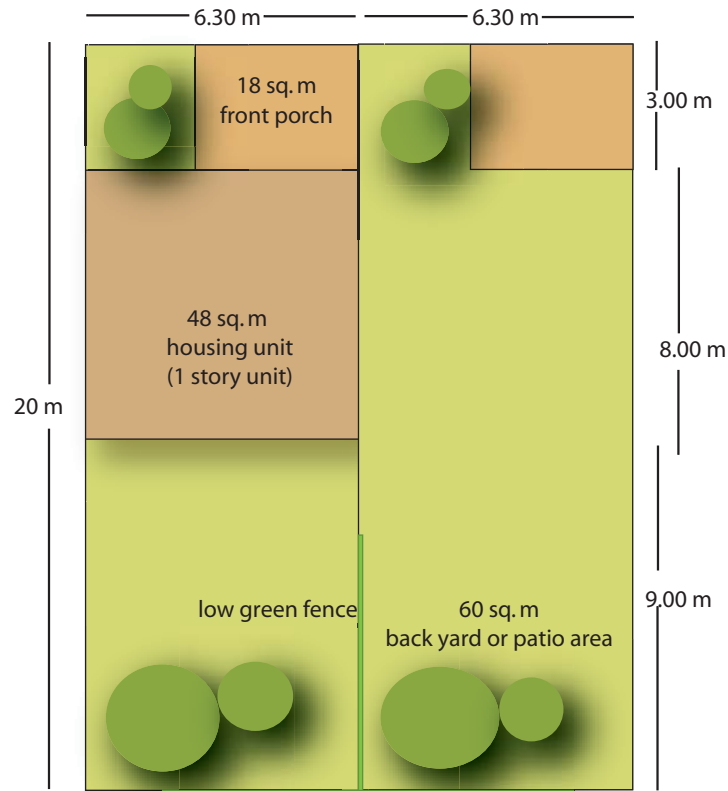
From the results obtained during the first participatory design workshop, alternative site schemes were developed to be presented to the Sierra Flor families. The families themselves through a process of careful evaluation and selection made a choice of the site alternative that best reflects their expectations and needs.

Four different alternatives were presented as possible solutions to the site. Once families had seen all the different alternatives, the facilitators led the discussion on possible advantages and disadvantages of each solution according to the families. This evaluation process was guided to a certain extent in which the final decision would not affect the quality of the housing project or its main objective, the children and the stability of their families.

3. Third and Fourth Participatory Design Workshops

The objectives of the third participatory design workshop were:

1. To present to Sierra Flor workers for evaluation, the last schematic site plan reworked from the selected option during the second workshop
2. To have workers validate the selected solution
3. To discuss the architectural program for the housing units
4. To design the program of the progressive housing unit through various stages, that would meet the expectations of the Sierra Flor workers.



After the workers validated the site plan presented on the following page as a good and efficient solution, the housing program needed to be defined in order to continue with the project design phase.

From the survey conducted on Sierra Flor families at the beginning of the project, and through workshop discussion, the main activities and minimum required spaces for the initial housing unit proposed of 47 sq. meters, later reduced due to cost of housing to 45.7 sq. meters were identified:

- 2 bedrooms
- bathroom
- kitchen
- living/dinning and
- direct access from front to back of lot

All these required spaces had to be carefully studied so that their placement within the housing unit would allow for future growth of the home to accommodate for the changing or growing families. From workshop discussion, a three stage housing unit was proposed; this housing unit can be built in three stages, the first one of 45,7 sq. meters, second stage can grow to a n area of 74 sq. meters and finally to its full grown area of 91 sq. meters in 2 stories.

This phased development allows for families to adjust their home to their payment possibilities while satisfying their basic to full needs as they change in time.

The three stages of growth for the initial housing unit can be seen in pages 13 through 15, were we have the initial 45.7 sq. meter unit to the left. After a few changes, which do not disrupt with the daily functioning of the house, we can achieve a 74 sq. meter-housing unit that has occupied the first and half only half of the second story. This second phase unit can grow to full extent of the home to an area of 91 sq. meters incorporating one additional bedroom in the upper floor and extending the social area in the bottom floor or leaving an additional room or studio.

Sierra Flor workers identified not only the need of the housing unit to be capable of growing progressively to fit a single family's needs, but proposed the possibility of growth of the initial housing unit not as a larger unit but as two separate housing units. This would allow for the families who are small enough to live in the 45.7 sq. meter unit, to own a second apartment over the initial housing unit for rent, thus increasing their monthly income. Such as scheme has been already studied and developed as can be seen in page 16.

Finally, Sierra Flor workers were presented with side sections of the housing units, as well as interior perspectives from which they could have a better and clearer understanding of the spaces that were being created through the housing unit design. These side sections allowed for the workers to understand the different stages of the housing unit while being able to evaluate on a first stage the possible architectural geometry to be achieve through the proposed volumes designed from their own ideas.

Final site plan

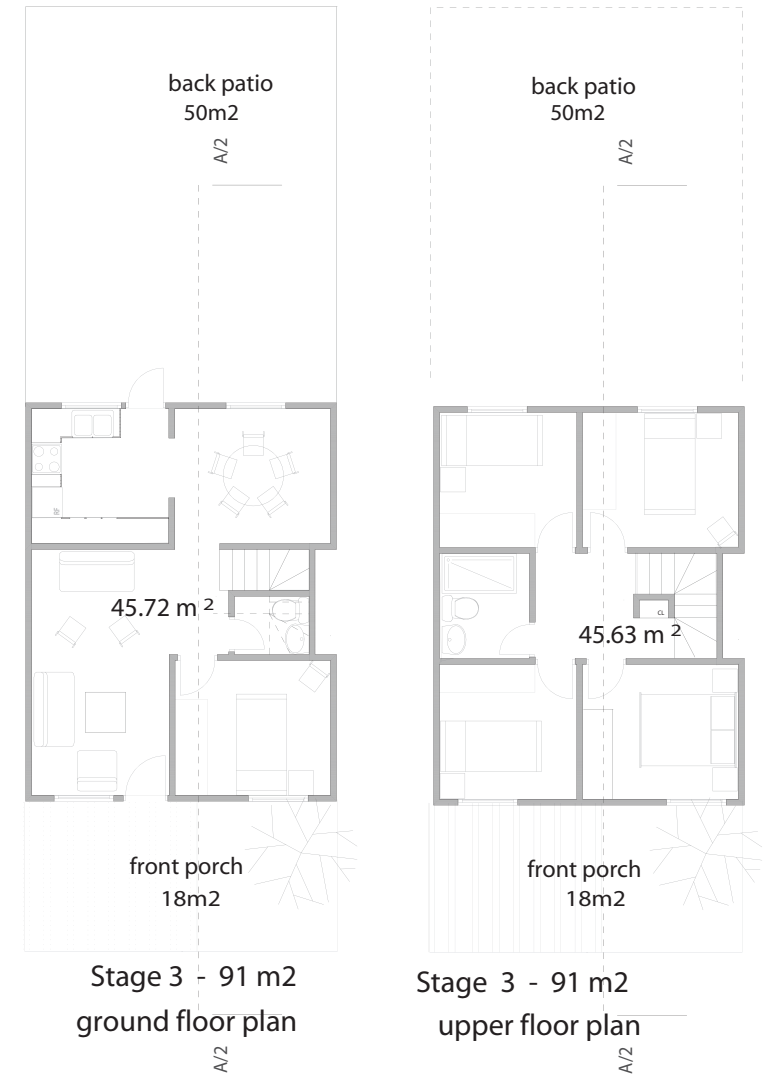
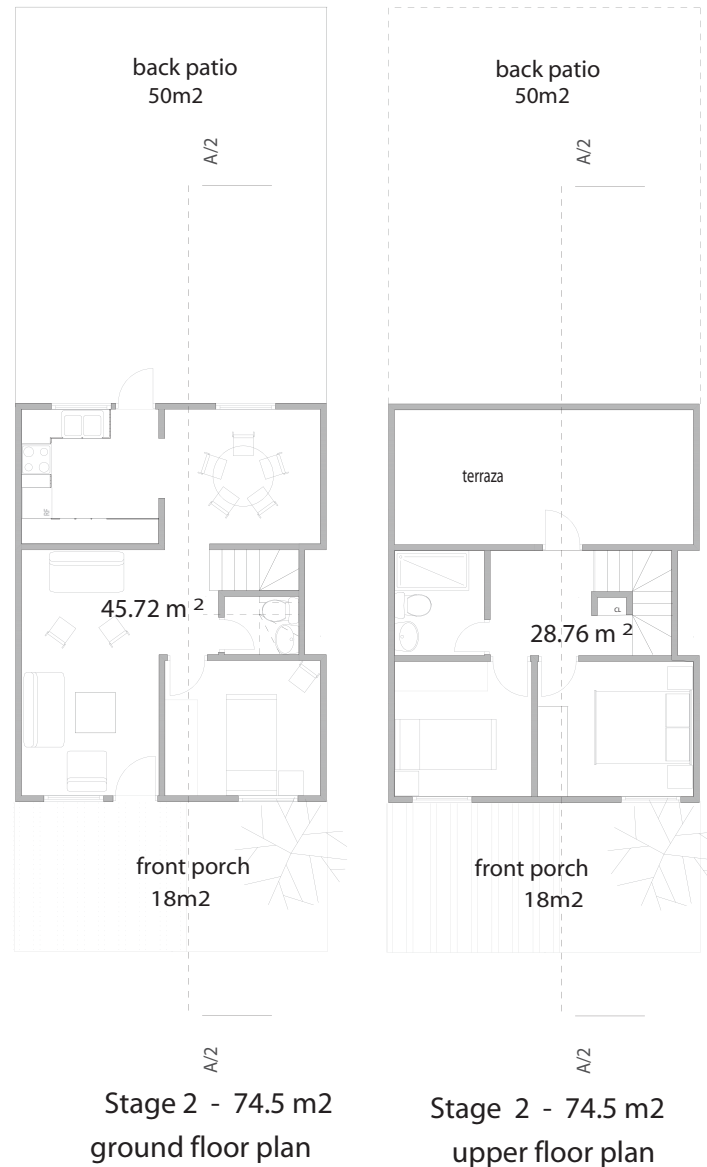
- 90 lots
- of 130 sq. meters (an average lot size which gives families the possibility to develop their household activities comfortably while not sacrificing public green areas)
- with one central vehicular street with parallel parking areas (as selected by the workers in both alternatives chosen)
- making the bigger portion of the circulation in the community pedestrian and children friendly
- with lots moved forward or back to best fit the site geometry, thus creating interesting architectural perspectives and more privacy between housing units
- with a productive area of 8,000 sq. meters serving as visual and acoustic barrier between the industrial zone and housing development
- with an interior walkways and courtyards created as greeting point and entrance to the productive area
- with large green spaces to the front of housing units and green alleys to the back which allow for a more private circulation to public green space and the productive area



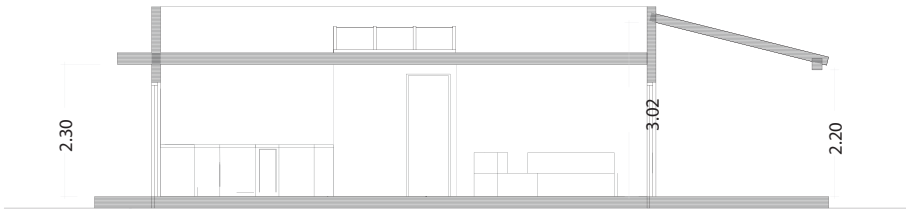


45.72 sq. meter unit
 2 bedrooms
 bathroom
 dinning-living room
 kitchen
 front porch
 back yard

74.5 sq. meter unit
 3 bedrooms
 1 and 1/2 bathrooms
 dinning room
 living room
 kitchen
 front porch
 back yard

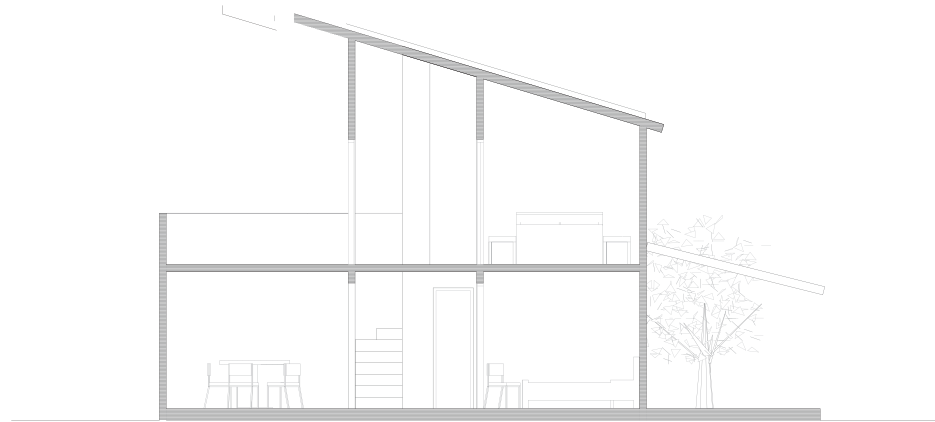


91 sq. meter unit
 5 bedrooms
 1 and 1/2 bathrooms
 dinning room
 living room
 kitchen
 front porch
 back yard



45.72 sq. meter unit

2 bedrooms
 bathroom
 dinning-living room
 kitchen
 front porch
 back yard

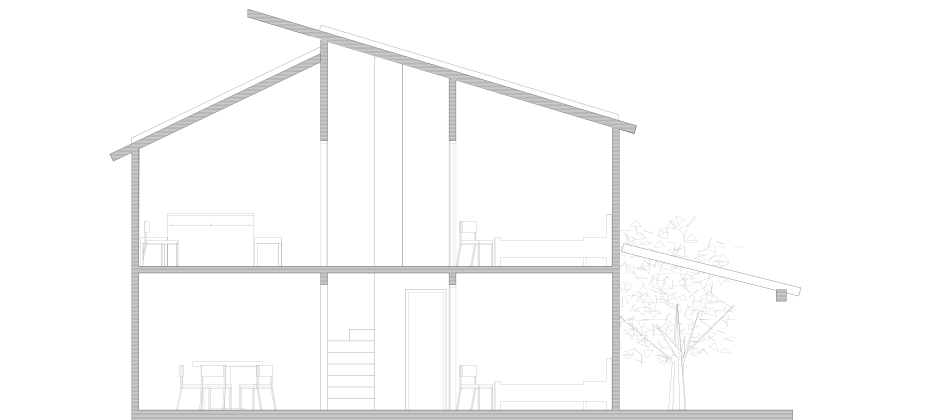


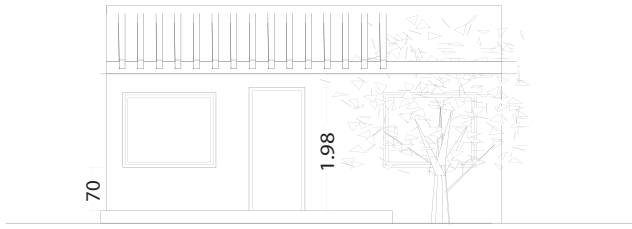
91 sq. meter unit

5 bedrooms
 1 and 1/2 bathrooms
 dinning room
 living room
 kitchen
 front porch
 back yard

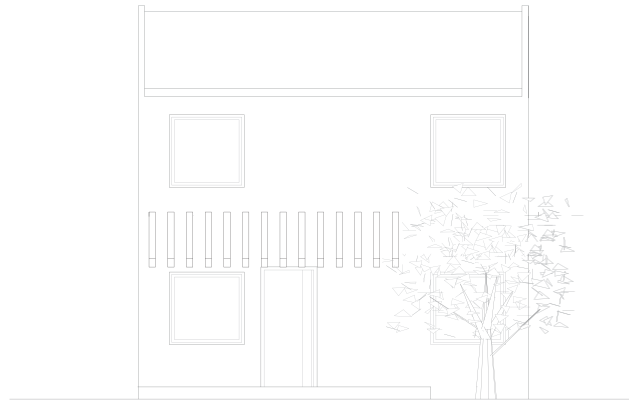
74.5 sq. meter unit

3 bedrooms
 1 and 1/2 bathrooms
 dinning room
 living room
 kitchen
 front porch
 back yard

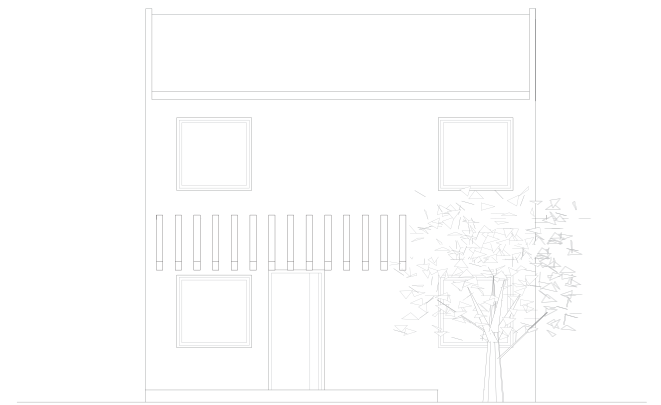




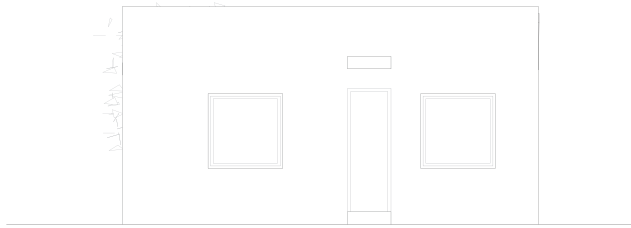
front view stage 1



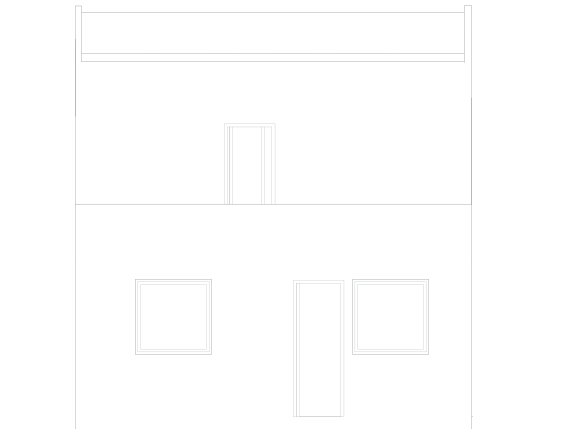
front view stage 2



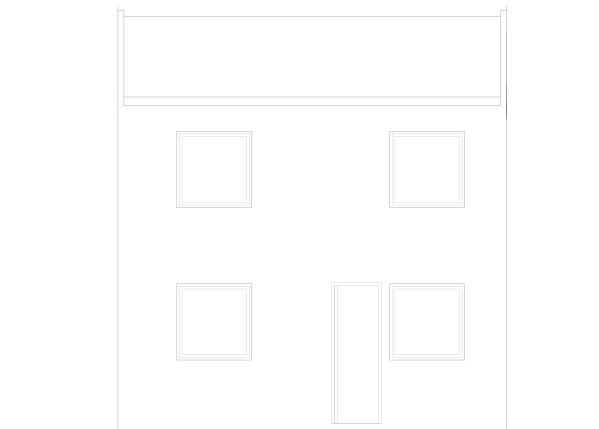
front view stage 3



back view stage 1

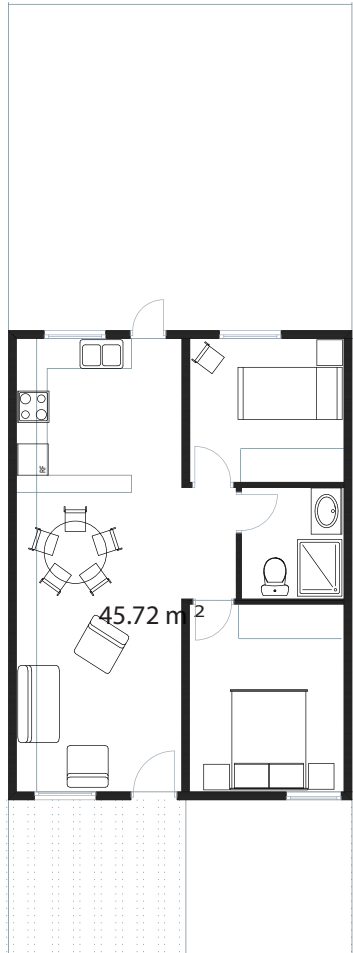


back view stage 2



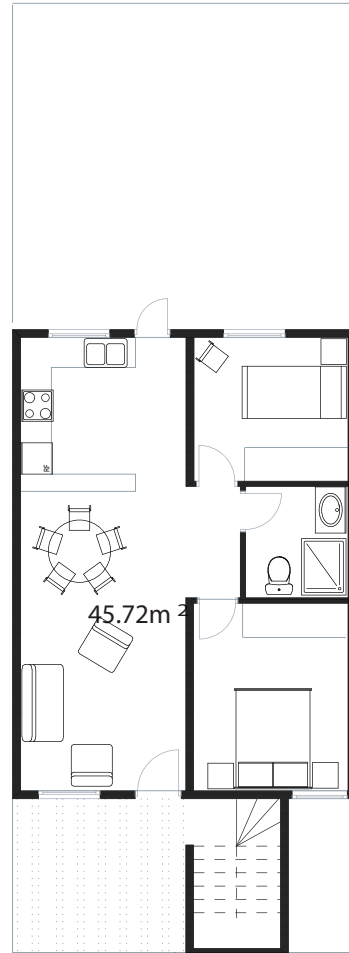
back view stage 3





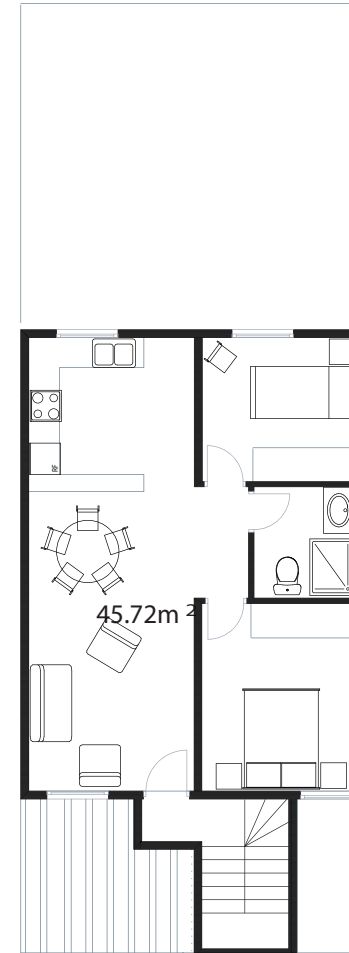
45.72 sq. meter housing unit

- 2 bedrooms
- bathroom
- dinning/living room
- kitchen
- front porch
- back patio



45.72 sq. m. housing unit with added exterior staircase

- 2 bedrooms
- bathroom
- dinning/living room
- kitchen
- front porch
- back patio



upper 45.72 sq. m. apartment over 45.72 sq. m housing unit

- 2 bedrooms
- bathroom
- dinning/living room
- kitchen
- front porch
- back patio

4. Fifth Participatory Design Workshop

The objectives of the fifth participatory design workshop were:

1. To present to Sierra Flor workers the M2 construction method proposed as the best solution from Mutualista Pichincha's construction methods.
2. To discuss and present the several advantages of the M2 method over other traditional building methods.
3. To have workers validate the M2 method as their choice for their housing project.

The "M2" system is an Italian system that Mutualista Pichincha is recently using for its low-income housing developments, which has been proposed as a possible construction system for the Sierra Flor Project. It allows for vertical or horizontal growth, however, vertical growth of the unit will cause for the construction to be more expensive than regular masonry construction, since the structure has to be reinforced to withstand the load of 2 or more stories. This system was evaluated during the preliminary study as the best option for the Sierra Flor Project since it allows for future growth of the housing unit and offers superior structural performance.

The "M2" system was found to offer other advantages to the project besides its structural performance, ease and cleanliness of the construction and its possibility of future growth. Given the economic constraints put on the project due to the reduced income of the Sierra Flor families, features such as chimneys of common use in the Andes could not be included in the project. Thus we strived to achieve comfortable conditions by other natural means, such as correct solar orientation and use of adequate materials. After orienting the housing units from East to West to receive solar radiation throughout the day we have evaluated the use of the "M2" system for its thermal properties and comfortable conditions it can provide to the families living in the high Andes.

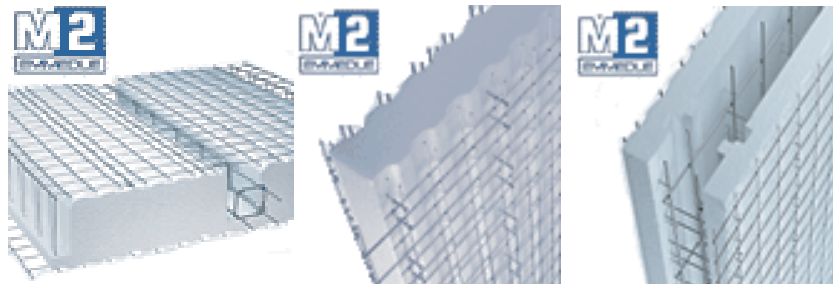


Using Energy-10, an environmental simulation tool, the "M2" system was evaluated for an annual period in the local climate conditions of Laso, Cotopaxi. The project was built on the simulator with the same orientation and architectural characteristics of openings, dimensions of volumes etc.

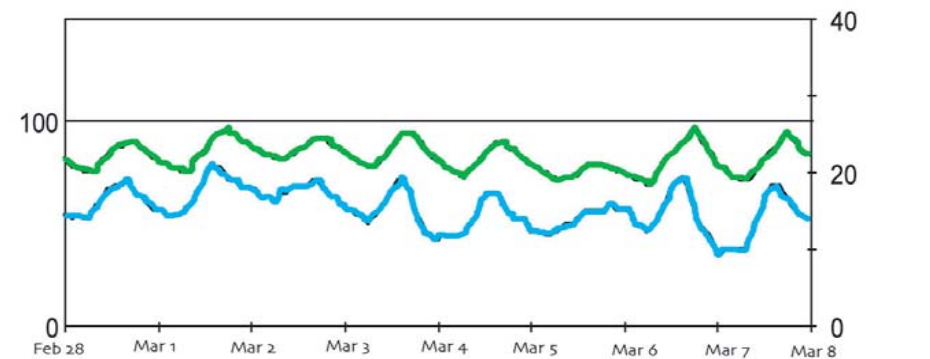
As it may be seen on the graph to the right, the night temperature achieved indoors with a E-W orientation and using "M2" is kept within a temperature range between 20 and 22 degrees Celsius, 68 to 71 degrees Fahrenheit, very much within the thermal comfort zone, while the night temperatures outside fluctuate between 48 to 63 degrees Fahrenheit.

These temperatures achieved during daytime and nighttime provide comfort without the need for heating.

Sierra Flor families were presented with the M2 method during the fifth participatory design workshop. Once the benefits of using M2, such as reduced construction time and costs, greater structural performance, possibility of future growth and increased thermal comfort were understood by the participating families the workshop concluded with a visit to the M2 manufacturing plant. By the end of the meeting all participating families were confident that the M2 system was the best alternative for the Sierra Flor housing project, and expressed their acceptance of the M2 method.



PROJ1 - Reference Case



Actual Hourly Heat Flows

Legend: HVAC + (white box), HVAC - (white box), Inside T (green line), Outside T (blue line)

February 28 - 12 AM to March 08 - 12 AM

5. Project Design Objectives

The Sierra Flor Project, in its efforts to provide better quality of life for low-income families and improving the outcomes of their children, has not been conceived only from an architectural perspective, but has taken into consideration several sustainability issues that will provide for the Sierra Flor families a better environment to live in and their children with an educational opportunity to be more respectful to nature and its resources. Thus in time, what Sierra Flor children learn now will impact their children and others to come generating a mind shift within the community and their future generations.

When considering moving closer towards sustainability, there is a need to consider both, environmental and social sustainability, thus the Sierra Flor project looks to provide solutions that foster both the natural and social environment.

A. Environmental Sustainability

There are everyday processes that determine our relationship with the environment, each in need of an innovative approach to warranty a more conscious and efficient use of resources. These processes defined by our everyday needs, specially in residential environments, require the use of energy to power our homes and use of water for survival while producing lots of waste, water and solid. Every time we use the bathroom, wash the dishes, cook or simply when we turn the light on, we are using natural resources and transforming some of them into waste.

The Sierra Flor project has been designed to make use of natural conditions and to incorporate processes that reduce the need of, recover and reuse resources, on several fronts, from energy, water to waste. In doing so, the project not only meets the needs for a sustainable design which will have a small impact on the surrounding area but also meets the needs of the families and responds to their economic possibilities.

I. ENERGY

The most common application for energy we give inside a residential building is for cooling and heating of the interior space in order to provide comfort. In rare cases given the local climatic conditions it is possible to design for a housing unit to be comfortable without the need of modifying the environment; in most cases there will be a need for either cooling or heating even if it is on a very small scale in order to provide comfort. However, taking into consideration the location, climatic conditions and available materials and resources, an adequate design process can achieve a comfortable dwelling without the need of resources to keep it cool or warm.

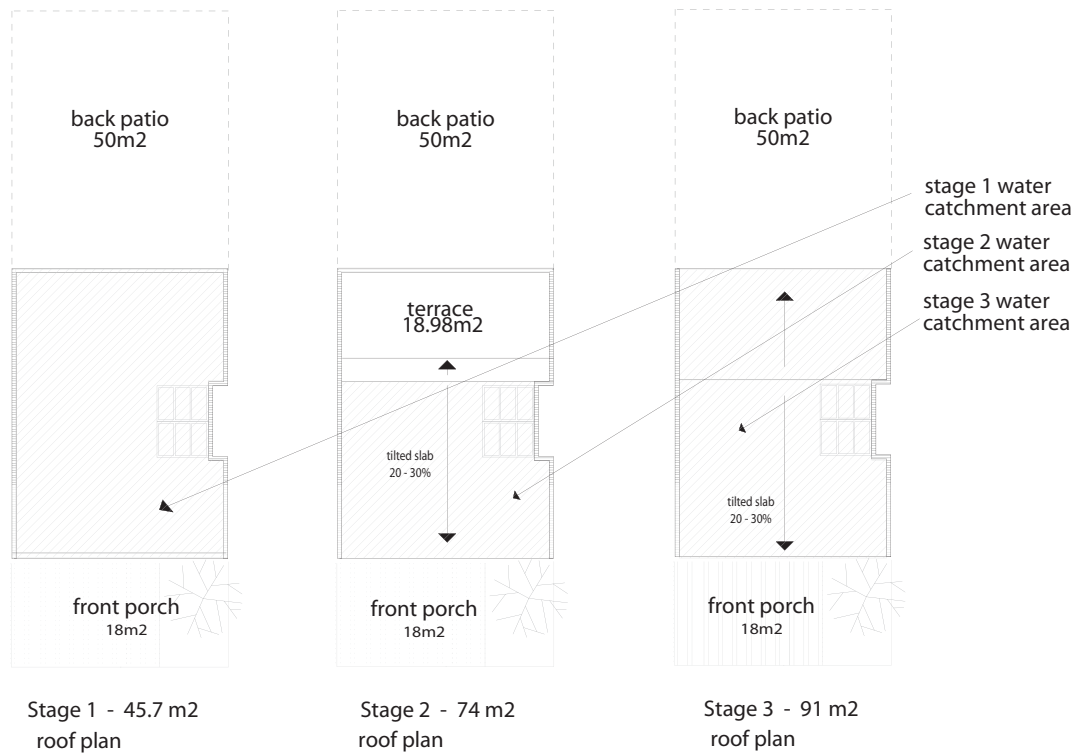
This has been achieved in the Sierra Flor project as can be seen on the previous page, through the use of adequate orientation of the building, adequate orientation and dimensioning of openings and windows and through the use of appropriate materials and construction methods. With adequate design we have achieved homes in the high Andes that will not require the use of electricity, wood or coal to maintain comfortable temperatures year round.

Other uses for energy within a home such as the use of appliances and lighting fixtures is reduced due to the actual conditions and culture of the families which we are benefiting through the Sierra Flor project. These families, as is the case with almost 80% of the population in developing countries such as Ecuador, do not use appliances for house chores, thus no dishwasher, washer, drier etc, is also reflected in a low energy consumption. In the Sierra Flor housing energy consumption is reduced to the maximum, only for lighting and bath water heating.

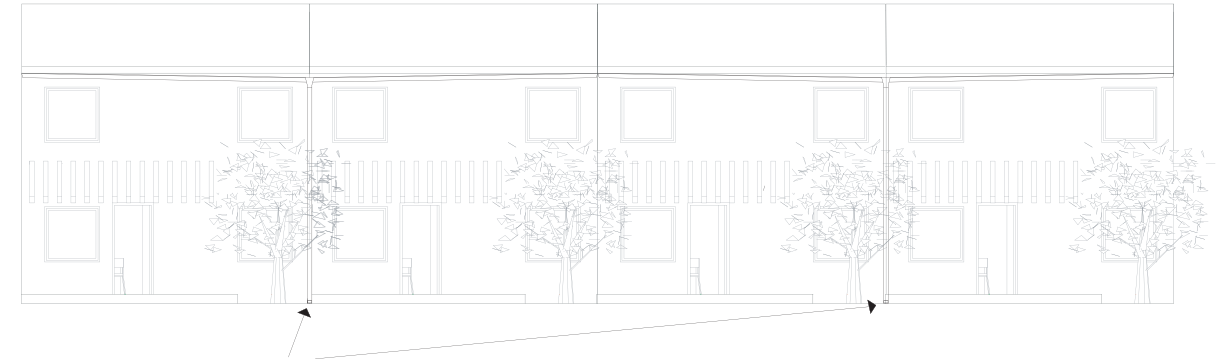
II. WATER AND WASTE

Water is a most valuable resource being rapidly consumed by the world's increasing population. In several areas of underdeveloped countries, water although still found in natural sources, is not a commodity available to most of the population, who are forced to live without this service due to the lack of resources or infrastructure. In the Sierra Flor project, given its proximity to a major highway, this service can be easily provided but at a high cost. Through the application of rain water collection systems and grey water recollection and reuse the project seeks to provide this resource to Sierra Flor families, while educating them and their children on the importance of water consumption reduction and re-use of this resource, while having a positive impact on the environment.

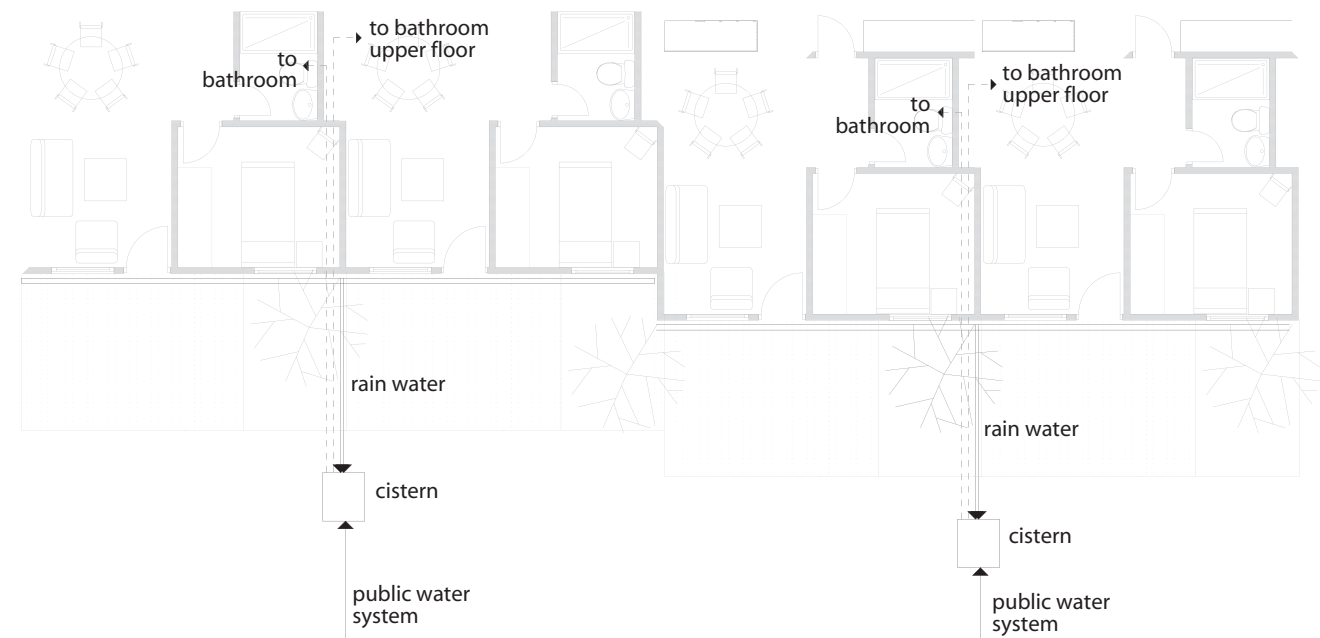
Rain water collection



In Laso, Latacunga, where the Sierra Flor project is located, the average precipitation is around the 1000mm/year, considering dry and wet seasons. Given the annual precipitation and considering the roof area for each housing unit during each one of the stages, a rain water collection system installed every two units can yield enough amount of water collected as to satisfy from 8% to 10% of the annual water needs for two families of 6 people.



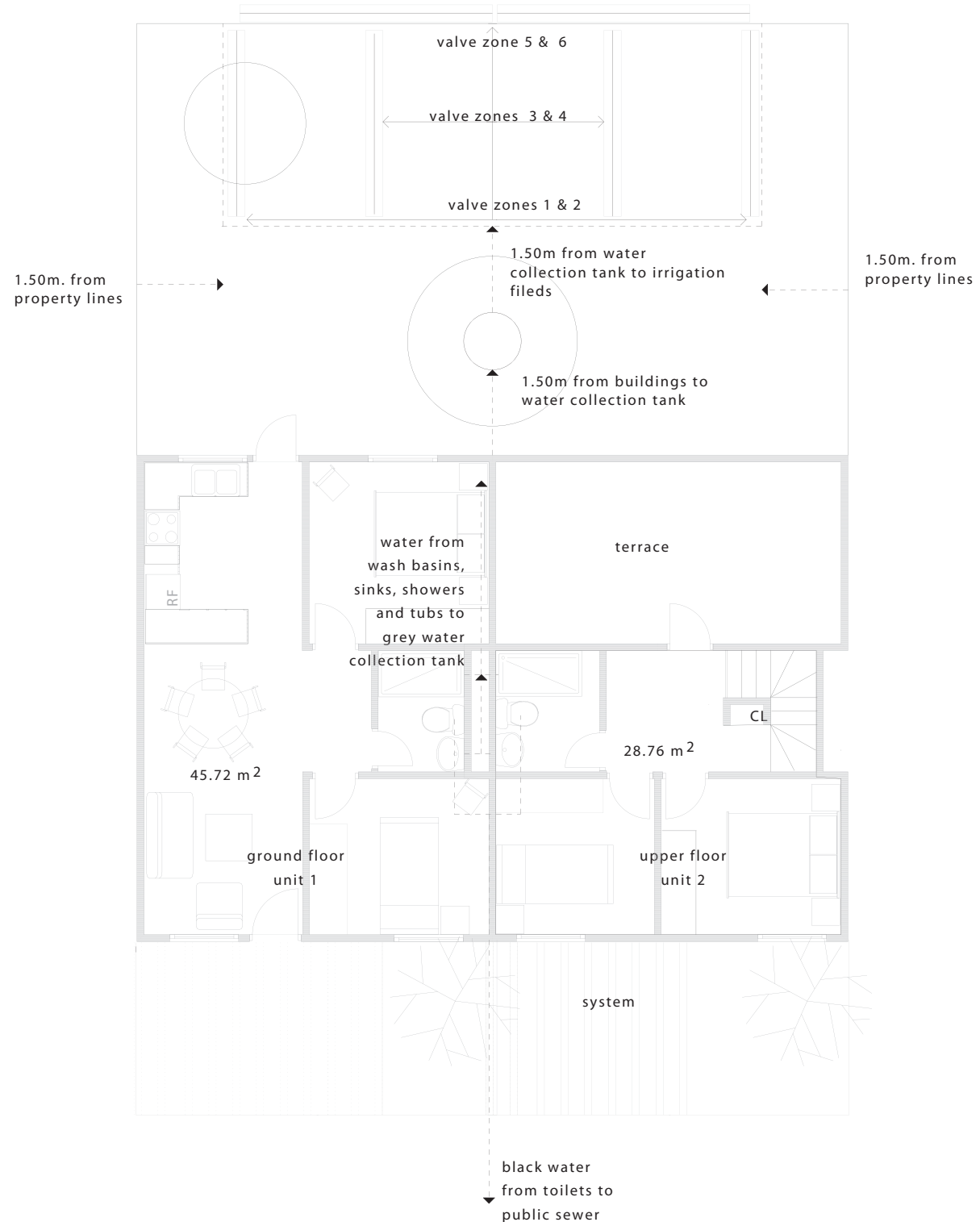
Water collection system connection to cistern every two units. Rain water collected is incorporated to water from public water system



Grey water collection and re-use

Water is the resource most used in households that is not consumed but rather turned into waste; grey water and black water are the result of result of using clear water for our daily needs. Thus the best approach to reduce water consumption has to involve the recycling and re-use of consumed water while satisfying certain needs, which do not require 100% pure water.

Through the collection and treatment of water used for personal and household cleaning, we can cover other needs a common household may have. Wastewater treatment systems may be costly and in most cases cannot be part of a low-income housing project due to the economic impact on the families themselves. The recollection and treatment of black water from toilets can be very complicated and costly, even more so when the water requires to be purified in order to use it in common household activities. However, water treatment can be done at different levels, involving only certain type of water and restricting its use for suitable purposes that do not require elaborated processes. This is the case with the Sierra Flor Project, where water from toilets is not collected but sent directly to the public sewer system, and water from wash basins, showers and sinks is collected, treated and re-used for underground irrigation of back patios and lawns, re-using waste water and reducing the household's fresh water consumption.



B. Social Sustainability

The objective of the Sierra Flor Project is to improve the quality of life of low-income farm workers in the Ecuadorian highlands while increasing the opportunities for their children to live a productive and prosperous life. When considering the improvement of quality of life, the provision of safe affordable housing must be accompanied by the provision of services, processes and tools that would allow for families to gain greater economic and social stability.

In the Sierra Flor Project this is done two-fold, first achieved through the Sierra Flor Foundation itself, which provides the families with free childcare, educational and personal growth opportunities for the children and their parents, and second achieved through the Sierra Flor Project itself, by providing areas for community production, thus fostering economical improvement of the families and their future generations.

The Sierra Flor project as has been mentioned before was initiated by the interest of the Sierra Flor flower farm in providing their employees with adequate housing so that the farm would be able to attract and retain talented individuals within its workforce, thus maintaining a stable environment through generations, increasing production while providing good living conditions for all. All Sierra Flor families interested in the Sierra Flor project have one or two family members working at the Sierra Flor Flower farm, thus there is a direct interdependence between the housing project and the current employment offered by the flower farm. However, the Sierra Flor project does not seek to tie families to the flower farm but does need to provide increased employment opportunities for family members who now work as informal workers and for unemployed family members and neighbors.

By providing adequate areas for community production, the Sierra Flor Project is assisting families in creating their own source of income, as a community, independent from their current employment. The start and future development of a community productive project will give families an additional income while it strengthens their ties to their community and surrounding area. By widening their employment perspectives, an eventual employment loss within the farm, would not force families to leave their home but would encourage them to work and remain rooted in their community.

The Sierra Flor will include an 8,500-m² area destined for the development of a community productive effort. The community productive area will have direct access from the main road and will provide produce and services to the surrounding community, existing flower farms, produce farms, etc, depending on the project identified as most viable and selected given the available resources and experience. The project will generate profit from the services provided which will go into a community fund to assist all Sierra Flor families with their living expenses, cover for maintenance of the project's common areas and gardens and other operational costs. Several viable production alternatives have been identified and studied given the local context, local production and climatic characteristics and most promising scenarios given the current economical, political and productive conditions. The alternatives have only been proposed as viable possibilities, which would need to be validated, by a market study and the conditions and context at the time of implementation. Agricultural activity is not a viable option given the available land thus other options have been identified as profitable for the Sierra Flor families.

A. Produce processing plant - making use of the large local production of agricultural products such as broccoli, berries and other exotic fruits, the proposal for a produce processing plant requires acquiring produce from small local farmers and processing them into canned goods for export to international markets.

B. Artisan dairy processing plant - being Cotopaxi the largest milk producing province in Ecuador, the proposal of a dairy processing plant would take advantage of the local context by acquiring milk from small farmers to produce through artisan methods quality dairy products such as gourmet cheeses and yogurts.

C. Hummus production plant - the largest business sector in the Laso area is flower production and export, by initiating a local business to produce natural fertilizer from waste agricultural material would satisfy a need common to various flower and produce farms in the area while utilizing waste and reducing its impact on the environment.

D. Community tourism lodge - by establishing a lodge providing a different experience to tourists interested in high mountain activities and promoting community participation and cultural learning, the Sierra Flor project would foster local cultural traditions and open the market for a specialized tourism, an activity that currently generates 30% of the national income.

End notes

The Sierra Flor housing project will provide affordable housing to 90 low-income working families in the Laso, Mulalo area of the Ecuadorian highlands, to improve their living conditions and their children outcomes and future. Housing will be provided with services to foster community development, family stability and personal growth.

To respond to the current economic and social conditions of the families, housing has been proposed on a three stage or phase design, in which the unit can grow according to the family's need and economic capabilities, without forcing them to adapt their life to an static unit which will not fit their needs in the future. Housing units will be sold at a price of \$11,000 per unit, to be affordable to Sierra Flor's low-income working families. The price for the initial housing unit of 45 sq. meters (400 sq. ft) includes a 130 sq. meter lot of land, with a 50 sq. meter back patio and front porch for the development of required family daily activities.

Mutualista Pichincha will develop the project and sell it at cost to the Sierra Flor families, also providing each family a home loan at a reduced interest rate so that most Sierra Flor families can own a home.

Sierra Flor Foundation has contributed with the land for the development of the project, selling it to the families at a highly subsidized price. Sierra Flor Foundation will also assist the families in searching for external non-reimbursable funding to help subsidize the cost of the housing itself for the families in greater need.

The Stardust Center has contributed with the technical assistance and design services which have shaped the Sierra Flor project, and that warranty the project will satisfy the needs of these low income families and improve their quality of life

The project design has been concluded and it is now being under further development at Mutualista Pichincha for its construction phase.

Once the project has been occupied, the Stardust Center will conduct the evaluation phase, to asses the impact that housing provided with services and developed through community participatory methods has had on the life of the 90 families that will be benefited from this project.

The Sierra Flor housing project through its participatory design, innovative practices and project objectives, and through the commitment of all institutions involved has become an exemplar housing project which will challenge local housing developers and advocates to provide housing that truly responds to local community needs.