

An urban project for *Costanera* of Asunción

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Abstract: A premise “Progetto Urbano Costa di Asunción – P.U.C.A” (Urban Project of Asunción’s Coast) is the title of the undersigned’s (awarded the cum laude honor) master’s thesis, developed between July 2013 and June of 2014, under the supervision of Prof. Anna Irene Del Monaco from Sapienza – Università di Roma (Rome, Italy) and Prof. Ricardo Meyer from UNA – Universidad Nacional de Asunción (Asunción, Paraguay). The thesis project has been awarded the Sapienza Foundation scholarship and honor on June 20th 2013, allowing for a three month (July-October 2013) in-situ stay, during the initial phase of the investigation. In Guaraní (native language of the Tupi-Guaraní populations and an official language of the Republic of Paraguay, still diffusely spoken) the word “puçà” (also spelled pukà) means “smile” (noun): such title is the summa of the spirit with which the following work was conceived. Visits – even dealing with situations of relative risk – and established relations with local occupants of the project’s area gave the operative guidelines of the work: designing with social compromise, involving the recipients concretely in the construction of the project in an attempt to interpret their wills and expectations. The objective was to return a project capable of generating what seemed to be, to the eyes of whom is writing, often missing in the thoughts and looks of the local inhabitants: confidence in one’s capabilities, hope in a better future, expectations that things will go better. In one word: the missing smile.

Keywords: social housing, Latin America, environmental issue, self-construction.

Research interest, intents and method

Governments of countries such as Paraguay, interested by tumultuous economic and demographic growth are facing the housing issue with great financial effort and such themes engage the contemporary academic debate on the shape of cities and the way they will be in the future. Such themes, involving the scarcity and therefore the need of optimizing public economic resources, were over decades – and still are – extremely current, taking place in whichever region of the world as soon as diffuse economic growth begins. For instance, such an historical moment occurred in Italy after the implementation of the European

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Recovery Program following the end of World War II; the first social housing plan, “piano Fanfani” dates back to '49 and over the following 14 years a great amount (around 350.000) of housing solutions were produced² with the country's G.D.P. constantly growing – on average –, such as that of Paraguay over the last two decades and in specifically +4,8% for the current year.³

The choice to participate in the final design studio in “architectural composition and urban project” held by Prof. Lucio Barbera (Chairholder of the UNESCO chair on “sustainable urban quality and urban culture, notably in Africa”) testifies of the interest towards urban planning conceived as an instrument to create urban quality. Such goal was to be achieved – in that case – in a peripheral area of Rome lacking services and infrastructure, where the city growth arrested itself against territorial means of transportation (railways, highways), besides the once called “campagna romana”. A single – primarily residential – 35 store tower building was developed inside the general masterplan in accordance to demand and offer data of the housing market in Italy's capital city. Family composition, number of rooms, floor area were among other variables taken in consideration when designing housing solutions. An equally pragmatic and concrete approach – based on people's needs and preferences – and similar *modus operandi* (designing from masterplan to housing solution) was used when dealing with Asunción's coast urban project. In the case analyzed in the following work though, more numerous variables were taken into consideration and a wide range of complications arose: natural – the area is interested by periodic flooding –, bureaucratic – informal settlements on public lands date back almost two centuries – and economical – public commission imposes restrictive budget for social housing. The project was thus conceived in the framework of Asunción's coast on-going transformations and Paraguay's social housing policy.

It is interesting to appoint that Paraguay's architectural culture has been strongly influenced by the work of Italian designers since the early colonial époque: some of the most relevant missions

2. OTTONELLI 2013.

3. The World Bank Group, data available at: <http://data.worldbank.org/country/paraguay>.

(*reducciones*) in Paraguay and the closeby regions of northern Argentine Chaco and Brazilian Mato Grosso – were in fact built by the Jesuit father Giovanni Andrea Bianchi. Relevant public buildings of independent Paraguay (1811>) were projected in Asunción by the *Milanese* Alessandro Ravizza such as the monument to the nation (*Pantheón de los Héroes*), the Cathedral's façade and the governmental palace (*Palacio de López*), while the church of Incarnation (*Iglesia de la Encarnación*) was designed by Giovanni Colombo; all of these during the second half of XIX century.⁴ Such contribution to Asunción's architecture is incumbent on the considered area, adjacent the historic center and colonial heart where the city was founded by Spanish *conquistador* Juan De Salazar y Espinoza in 1537.

Various academic agreements and exchanges exist between UNA's faculty of Architecture (held by dean Prof. Ricardo Meyer) and Italian universities such as Venice, Florence, Reggio Calabria and Rome's Sapienza. In spite of such historical and academic relations Italy has not given any contribution nor cooperation in SENAVITAT's (*Secretaría Nacional de Vivienda y Hábitat*) and MOPC's (*Ministerio de Obras Públicas*) social housing projects, unlike other governments such as that of Chile, Australia and Germany which participated variously over the last years in the framework of Paraguay's PEES "*Plan estratégico económico y social*" (Economic and social strategic plan 2008-2013: proposal for a socially inclusive economic growth in Paraguay).

The primary objective of this study is to propose a solution of elevated urban quality and adequate living conditions for the inhabitants of the floodable areas of an informal settlement historically referred to as *Chacarita* laying on the shores of Asunción's bay inside a more vast swamp known as *Banco de San Miguel*, north of the city and on the south bank of the Paraguay river. Methodological approach was to design in accordance to technical customs (use of local materials and techniques), adapting to peculiar natural conditions (primarily in accordance to the behavior of waters) and pre-existing/in completion artificial interventions (*Costanera* by-pass road and some extemporaneous social housing developments, among others). The proposed urban project origi-

4. BUSSINI, TORRESI 2010.

nated from studying every one of these aspects and resulted in a design capable of stitching and harmonizing a very fragmented situation by interpreting its position in space (it required for example complete knowledge of the behavior of waters) and time (many projects have been, some are being completed and others are planned on the area of *Chacarita*).

A similar approach was used when studying social housing solutions; observing and analyzing the government-built examples (on the area or elsewhere in Paraguay) was the first operative step. The approach allowed to choose technical solutions that could be realistically built and easily modified/expanded (auto-construction is a major theme of this work) along their lifespan to fulfil the needs of the recipients. These are not intended here as a mere “quantitative” matter, on the contrary the concept of “need” was understood “qualitatively”. Urban and living quality being treated as a single matter in order to create conditions that are to be recognized as “desirable” by the population. Study of previous social housing cases insisting on the area, used as direct comparison, (starting 2001, *Pelopincho* housing) and their critical evaluation highlighted criticism and points of strength in each.⁵

In order to fundament and develop this work a secondary – operative – intent was to study and draw attention on the heavy transformations occurring in Asuncion's northern shore, providing that such transformations are peremptorily connected to the solution of CHACARITA'S century long-lasting social/housing emergency. Besides, such attention with an eye on interpreting fast-evolving urban scale situations observed from multiple points of view while concentrating and appraising a certain contest's amenities has always distinguished Rome's school of Architecture “Sapienza” *modus operandi*. Developing the work in this case required profound and dedicated study spanning almost one year.

Economic, legal and historical background

Paraguay has been performing well since the end of the military dictatorship in 1991 experiencing years of constant and heavy economic growth (on average). Such circumstances allowed for a growing investment by the government in social housing: the budget – expressed

5. GULINO 2003.

in millions of U.S.\$ – of SENAVITAT (founded in the same year with the name CONAVI, *Consejo Nacional de Viviendas*) in the 2008-2020 period is in exponential growth (Chart 1).

Gráfico 3: Evolución del Presupuesto de la SENAVITAT en U\$S
Fuente: SENAVITAT / PLANHAVI / Ignacio Correa

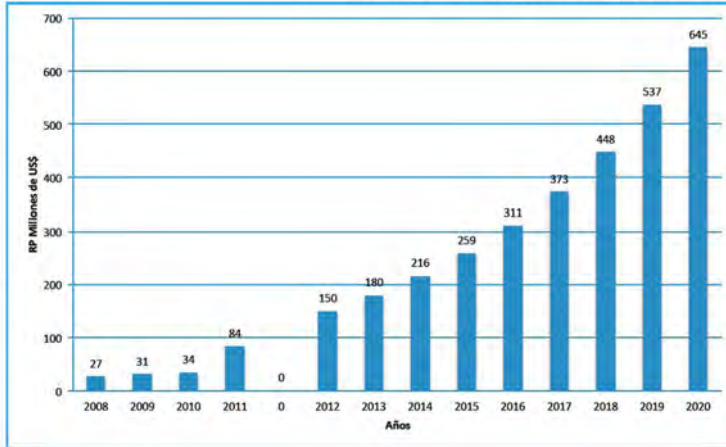


Chart 1: SENAVITAT’S public budget (*recursos publicos - RP*) / year. Agency’s summary report, published November 2013. Available at: <http://www.senavitat.gov.py/blog/publicaciones/plan-nacional-de-habitat-y-vivienda-planhavi/>. Demand of new built social housing (155.000) as of 2014, in relation to the quantity of constructed social housing units (36.500) for the current year (chart 2) highlights that, despite "(as chart 1 illustrates), also testifying of the political will to eradicate such situations of social marginalization, the phenomena of homeless people still has dramatic proportions in Paraguay. Anyways, as the charts demonstrate, public budget for social housing is constantly increasing: such trend testifies of the political will to eradicate situations of marginalization progressively.

The local administration of Asunción was somehow farsighted; soon after the first democratic elections in 1991 in fact, elected mayor Carlos Filizzola promised – under strong social pressure – that the issue of informal settlers in floodable areas of the city (at the time 40.000 people) would be resolved once and for all, providing them with long-lasting, healthy and safe housing solutions. The P.M.F.C., Master Plan of the Coast was developed over the next few years and finally published in September 1993.⁶ The plan divides the floodable areas in “boxes” of 1 hectare each analyzing 17 different criticalities – represented on color scale – such as the effects of floods in relation to the number of

6. Municipality of Asunción and FLACAM (*Facultad Latinoamericana de Ciencias Ambientales*) of La Plata (1993), “*Plan Maestro de la Franja Costera*”, chief technical coordinator: Arch. Gonzalo Garay.

Gráfico 4: Proyecciones del Déficit Habitacional Crítico y de las Soluciones Habitacionales en el marco del PLANHAVI

Fuente: SENAVIDAT / PLANHAVI / Ignacio Correa

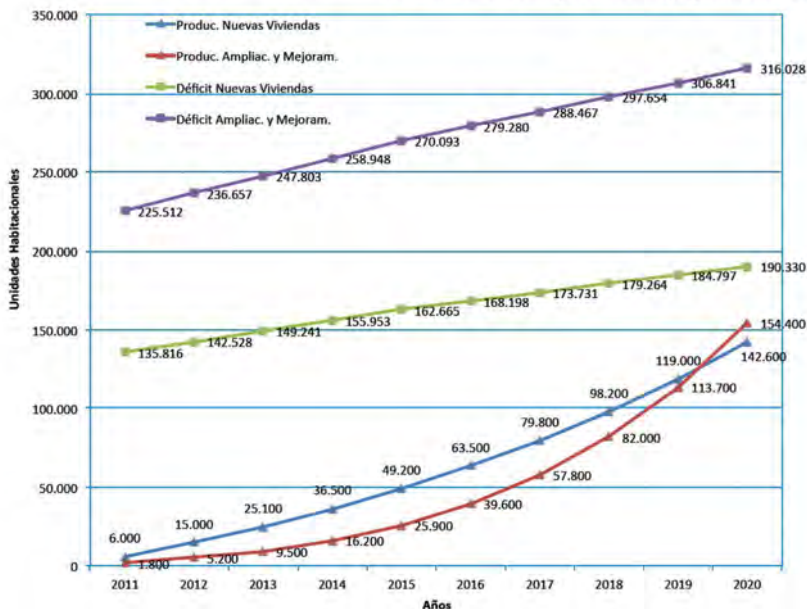


Chart 2: Paraguay's history and projections of (new-built and improvements) social housing deficiencies / solutions. Agency's summary report, published November 2013. Available at: <http://www.senavidat.gov.py/blog/publicaciones/plan-nacional-de-habitat-y-vivienda-planhavi>

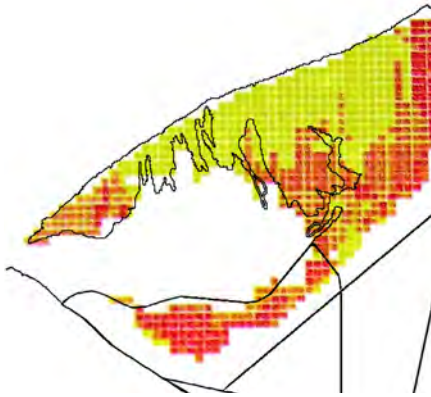
occupants (criticality 1) and the occupation of public land (criticality 5).

Seven key strategies and a group of 34 basic projects to be realized are determined with regard to aspects such as city accessibility, informal settlements, creation of urban centralities and areas of environmental interest; the most relevant ones involving the area of *Chacarita* are: P.D.U.A. (*Plan de Desarrollo Urbano Ambiental*) – Urban and Environmental Development Plan – released in October 1995⁷ examines the key strategies in major detail with special focus on their environmental impact.

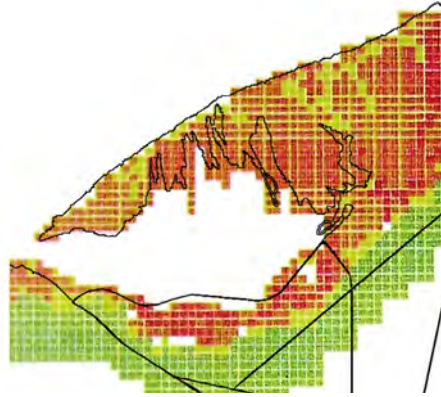
The first preliminary project and environmental-social-technical feasibility study⁸ released in 1997 evaluated the impact of different possible designs of the *Costanera* by-pass road; hydrodynamic studies

7. *Plan de Desarrollo Urbano Ambiental – Asunción 2000*, Documentos ambiente n°3 *Plan de Desarrollo Urbano Ambiental – Asunción 2000*, Documentos ambiente n°3.

8. THE ABT ASSOCIATES INC. TEAM 1997.



Criticality 1: Floods/population affected



Criticality 5: Unauthorized occupation of public lands



Project 14: “*Costanera*”, a by-pass, elevated road facing the bay

Project 17: “*Parque Costanero de la Bahía*”, a park next to the city center, re-defining the waterfront

Project 18: “*Relocalización Chacarita baja*”, reallocation of occupants living in the floodable areas

on the behavior of currents in the bay and on the orography of the floodable areas determined the final layout of the infrastructure. Some of the more creative proposals included alternatives with artificial islands in the middle of the bay for high density private dwelling.

Work begins: “Arranque” (2004) and “Bicentenario” (2009) project

Turning point of *Chacarita* transformations came in 2004 when the ultimate preliminary project was released (Fig.1). The zo-

ning proposed for the *Chacarita* divides the 227⁹ hectares of the area between the bypass road (entitled to world famous Paraguayan musician José Asunción Flores – native to the neighborhood –), and the border of historical *Chacarita* towards the consolidated city (overlooking the *Avenida Artigas*), in two distinct sectors:

- “humid areas” below security level to be filled with the technique of hydraulic filling summing to 157 hectares area, 33 of which are to be used for new social housing developments;
- “non-floodable” areas “to be stabilized/recovered” at an altitude of +64 mt a.m.s.l. (or higher) with a surface of 70 hectares, corresponding to the consolidated/historic core of the informal settlement. An accurate technical feasibility study composed of R.I.S.¹⁰, (social impact relation) and R.I.M.A.¹¹ (environmental impact relation) was commissioned and exhaustive material has been released in December 2004 both on the costs/benefits of the chosen technical solution (hydraulic filling) and the results of social investigation carried out with participative surveys. The movements for hydraulic fillings were estimated in 8.700.000 m³ of river sand, up to the +64 mt a.m.s.l. for the 157 hectares humid area, dredging an average of 10 meters in a deposit on the bottom of the bay, under 1.5 mt of silt in suspension.¹² Estimated costs of dredging, arranging and stabilizing river sand (covered with 0,5 mt of fertilized soil) was about 2.4 U.S.\$/m³ so the total expense for landscape works was estimated (2004) in about 18.000.000 U.S.\$.

A time schedule was proposed for the execution the hydraulic fillings and social housing developments in 72 months but only a very small part of the preliminary project was realized over the following year.^{10b}

Data collected with surveys, also published in 2004, procures a clear image of demographic composition and expectations of inhabitants of the floodable areas. There were 10.580 people living in floodable areas in 2004 corresponding to 2590 families with an average composition slightly above 4 persons. Population growth betwe-

9. Initial project (Fig.3) referred to a larger area, later reduced to the North-Eastern edge.

9. THE ABT ASSOCIATES INC. TEAM 2004a, 9a pp. 1-10; 9b pp. 30-44.

11. THE ABT ASSOCIATES INC. TEAM 2004b, 10a pp. 1-10; 10b pp. 30-44.

12. M.O.P.C. press release, December 2012.

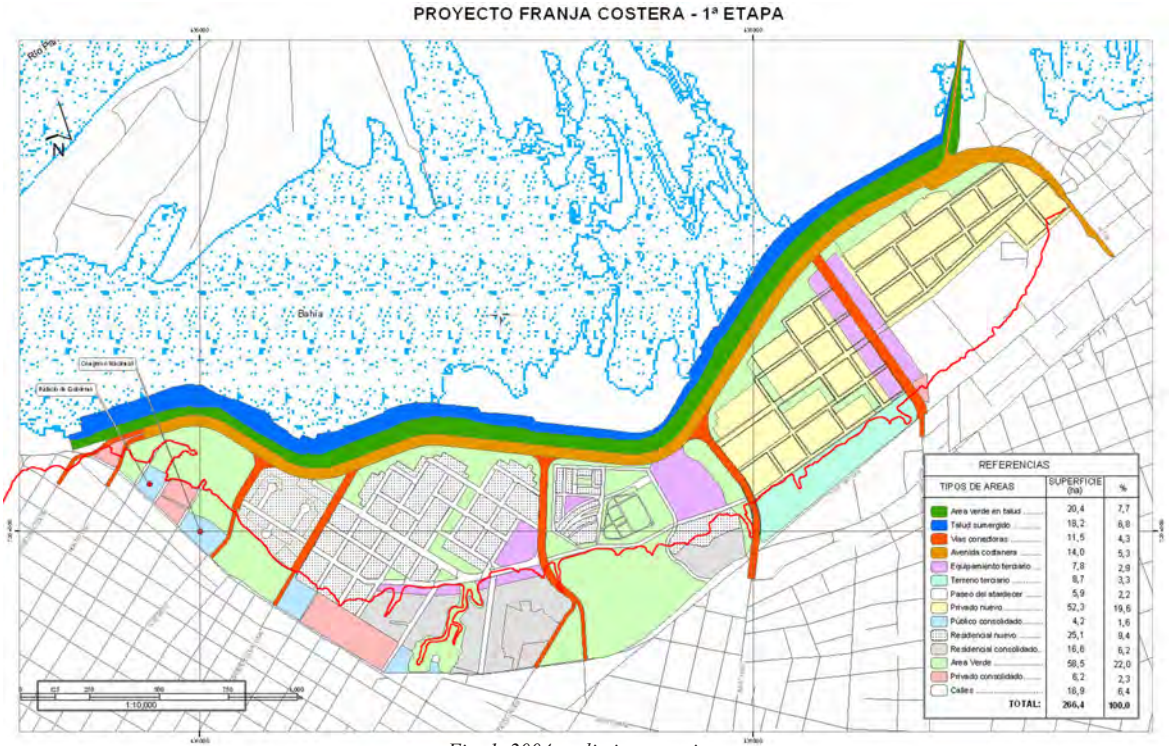


Fig. 1. 2004 preliminary project

en two census (1994-2004 decade) evidenced a rate of +15/20%, much higher than the average for the city of Asunción. Composition of the families resulted as following: 30% of them were composed of up to 2 people, the same percentage from 2 to 4 people; 25% was from 5 to 6 people and the last 15% were more numerous families.

The high rate of relatively “small” families can be explained by the number of lonely mothers with up to a few children. Census highlighted a very young population: 46% of 10.580 were in the range 0-18 years old, 38% from 19 to 48 years old, thus only 16% were older.^{9a} Surveys evidenced strong skepticism about government’s action: 10% of interviewed declared they would take an immediate compensation (less convenient, but immediate) instead of a social home in the future (considered uncertain). Furthermore a high amount (30%) of occupants believed that the area would not be recovered soon, preferring a relocation elsewhere in heal-

thier areas of “gran Asuncion” (notwithstanding *Chacarita*’s contiguity to city center). The residual 60% of the inhabitants were proposed a participative survey in which families were asked to express housing preferences between three options: type1) duplex home of 35 m² on 90 m² plot, type2) apartment home of 50 m² in superimposed bi-familiar unit and type3) apartment home in tower building. The enquiry gave unmistakable results: 75% expressed preference for the first two solutions, only 25% would choose an apartment in a tower.¹³

After more than 20 years planning, the first stone of *Costanera* was placed in 2009 and now works are almost complete (Fig.2). A set of interventions for U.S.\$ 40.000.000¹¹ began in the same year. The *Costanera* avenue, built on elevated cross section at +64 mt a.m.s.l., using the technique of gabion mattresses with underneath geotextile to restraint the dredged soil and control erosion, the technique allowed that rapidly the artificial slopes acquired natural-like look. The road consists of a 2 lanes per direction divided by planted divider which also contains a bicycle path: it is extremely generous in terms of public space, in fact it is bordered on the city-side by a linear park – in completion – 40 meters wide, equipped with sports and cultural facilities such as basketball fields, skate parks and bleachers for musical shows.

This infrastructure improved considerably the accessibility of Asunción’s city center but transversal connections to the city’s mayor historical roads have not yet been built. A second mayor intervention is on the header (Western tip) of the wedge-shaped area and consists in a memorial park at the same elevation, adjacent the governmental palace and the senate, it is entitled “*Parque del Bicentenario*”, celebrating the independence of Paraguay from Spain (1811). Finally a social housing development (*Gral. Santos* housing) began in the North-Eastern corner of the area for 120 duplex homes on 80 m² plots, housing approximately 540 people to be re-settled from the Western sector of *Chacarita* when hydraulic fillings for the *Bicentenario* Park begun.

13. THE ABT ASSOCIATES INC. TEAM 2004, pp. 30-44.

Water, orography and the phenomena of occupation

Studying the behavior of Paraguay river (one of the mayor in South America, with Amazon and Paraná) was preliminary to any idea of intervention. Local 0 level is +54,04 m a.m.s.l.¹⁴ but it is much more significant to recall that the average flood of the Paraguay river is +3,40 meters (mean between winter's and summer's mean).

Typical water level is therefore +57,40 mt a.m.s.l., calculated in 2004's R.I.M.A. Studies by *Secretaria Nacional de Emergencias* registered the yearly maximum levels in the 1909-2009 span (Chart 3) from which the estimated return periods of the different flood levels was calculated. A level of +59 mt a.m.s.l. for instance has a return period of 11 months, while a +62 mt a.m.s.l. flood has a chance of occurring every 25 years one (Fig.3). The highest flood, corresponding to +64 mt a.m.s.l. has an estimated return period of 500 years. Further information regarding the permanence of floods, the number of affected occupants of the floodable areas, the study of hydrodynamic fluxes and their erosive action on the slopes of *Costanera* can be found in the R.I.M.A.¹²



Fig. 2. Advance of works, December 2012 North-East aerial view

14. See R.I.M.A. (relatorio de impacto medio-ambiental), *Componente urbanistico vol.1, Estudios hidrologicos del Rio Paraguay* (a).

Water analysis revealed high – above legal standards – concentrations of coliform faecals: the informal settlement in fact discharged sludge directly in the waters. It was established that a treatment plant must be built at the mouth of the bay. Building costs of electricity, water and sewer networks were also calculated.

Year	Max.	1935	59,07	1961	60,09	1987	59,94
1910	57,34	1936	59,48	1962	56,36	1988	61,79
1911	61,04	1937	57,56	1963	58,13	1989	60,46
1912	61,3	1938	57,3	1964	58,04	1990	59,79
1913	61,12	1939	58,64	1965	60,81	1991	58,77
1914	59,88	1940	60,4	1966	58,93	1992	62,59
1915	58,52	1941	58,54	1967	56,66	1993	59,2
1916	58,89	1942	59,9	1968	56,38	1994	59,02
1917	57,93	1943	59,11	1969	58,54	1995	60,16
1918	59,44	1944	57,15	1970	55,42	1996	58,59
1919	61,78	1945	57,06	1971	60,39	1997	60,93
1920	60,48	1946	60,54	1972	58	1998	61,23
1921	60,06	1947	59,47	1973	57,37	1999	58,8
1922	60,03	1948	55,34	1974	59,02	2000	58,29
1923	59,89	1949	57,65	1975	58,24	2001	58,1
1924	58,64	1950	58,16	1976	57,69	2002	58,1
1925	58,98	1951	59,31	1977	58,78	2003	58,8
1926	58,89	1952	58,56	1978	57,79	2004	58,88
1927	57,46	1953	58,88	1979	61,21	2005	57,95
1928	59,49	1954	60,42	1980	60,57	2006	58,34
1929	58,39	1955	57,05	1981	58,44	2007	58,81
1930	58,84	1956	60,49	1982	61,8	2008	58,06
1931	61,56	1957	59,49	1983	63,05	2009	57,26
1932	59,95	1958	60,06	1984	59,59		
1933	59	1959	59,84	1985	61		
1934	56,82	1960	59,24	1986	58,73		

Chart 3: Yearly maximum levels (in meters, above average mean sea level), per year

The action of the waters of Paraguay river caused progressive erosion of the coastline; historical photos and cartography (Fig.5,6) show a rather steep slope evolving progressively into the floodable marshland state of fact (Img.4). Three brooks of water (*Arroyos*), conveying meteoric waters from the city center, cut the area transversally. Inhabitants traditionally divide *Chacarita* into 8 transversal sectors (Fig.4, dotted in red), defined by the water courses and organized around local football team's fields. Because of the adjacency to the historical center (which guaranteed many informal work occasions), *Chacarita* was increasingly occupied since 1850's (although municipal regulations prohibit occupying floodable public lands since the beginning of XX century). Population of the informal settlement is estimable in 11.700 persons

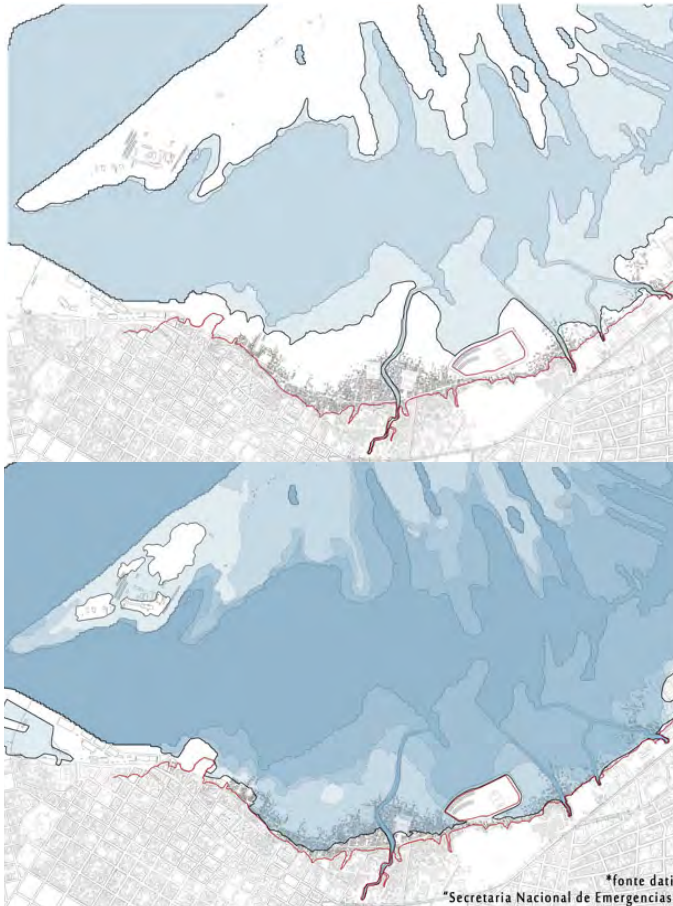


Fig. 3. Effects of +59 mt a.m.s.l. and +62 mt a.m.s.l. floods

in 2014 applying the previous decade's growth rate (+15/20%). Beginning 2001 different social housing projects have been developed in *Chacarita* (Fig.7). The most recent of them (*Gral. Santos*) as part of the *Bicentenario* project. 2001 and 2002 *Pelopincho* and *San Felipe* duplex homes (terraced, in opposite parallel rows with backyards) are both dimensioned for 320 homes. *Arranque* – beginning – was completed by the end of 2005, providing 72 homes in bi-familiar dwelling conceived for self-built rear expansions and with a maximal capacity of 360 occupants. A general plan highlights the fragmentation and chaos of interventions, in relation to the layout of Asunción's *Costanera* avenue.

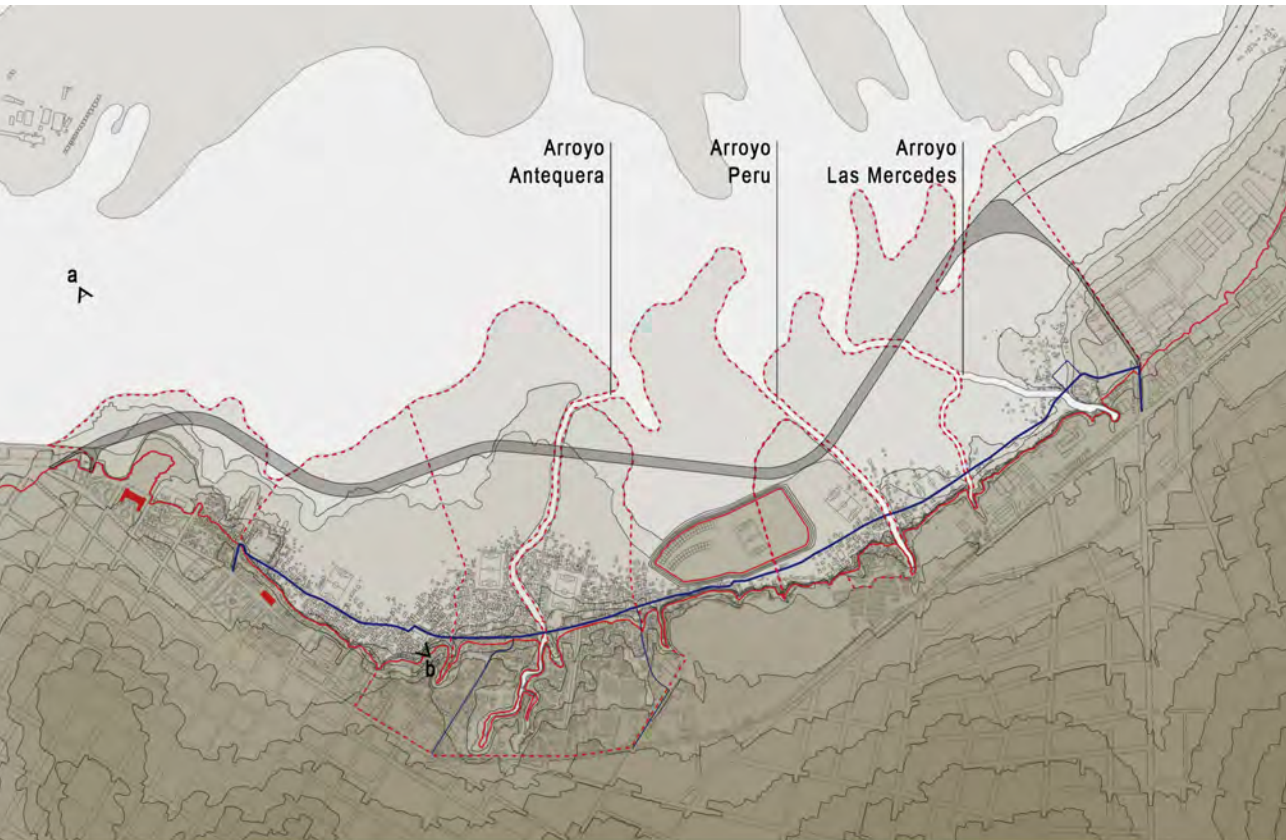


Fig. 4. Actual situation with waters at +57.40 mt a.m.s.l. (typical flood). Masterplan's design goal was, as afore said, stitching the pre-existences by relating them to the thread of new-built social housing, roads and public parks. Thus, considering the autochthonous social-living conditions of the inhabitants of the informal settlement, in accordance to the zoning quantities proposed in the preliminary project and the preferences expressed in participative surveys, the plan was dimensioned as following: The updated population of 11.700 persons was reduced by 30% (occupants who would rather be transferred elsewhere) and by 10% (occupants who would rather take an immediate compensation for the expropriation instead of being assigned a public built home in the future), then subtracted by 360 persons (population of Arranque development) finally resulting in 6460 people. 75% of them (4840) preferring low dwelling (type 1+2 housing solutions), 25% (1620) destined to tower buildings (type 3 solutions). Public services and facilities, private housing and non-residential private development areas where dimensioned in accordance to the 2004 project.



View “a”: notice the waters of the bay, now occupied by informal housing in the proximity of the Senate (left hand)



View “b”: the area in front of the governmental palace

Fig.5. Evolution of Chacarita coastline in historic (1900) and modern (2009) photos



1786 - Colonial Asunción,
Ramón De Cesar

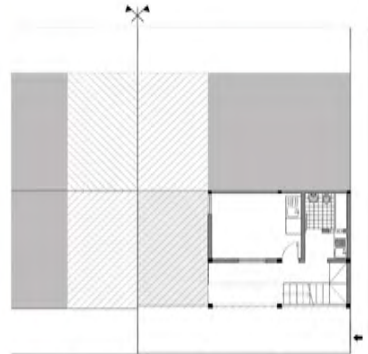
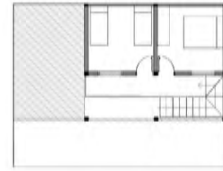
1869 - Planned Asunción,
Roberto A. Chodasiewicz

1908 - Modern Asunción,
Alonso Criado

Fig. 6. Historical cartography of Chacarita area, note the progressive erosion of the shore in the drawings



2004,
Arranque



2009 on-going,
Gral. Santos



Fig. 7. Social housing interventions insisting on *Chacarita*



2001, Pelopincho



2002, San Felipe

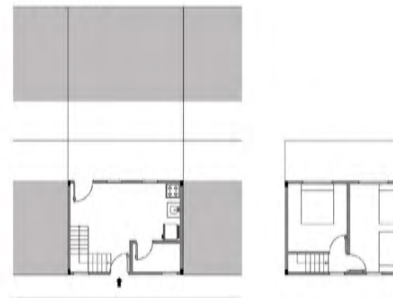


Fig. 7. Social housing interventions insisting on Chacarita

Masterplan

Major roads, apart from *Costanera* avenue, – already completed – were traced in compliance with the 2004 preliminary proposal: two elevated ones, 7 meters above the +64 mt level, connect the new infrastructure to some of the principal transversal axis of the city (*Av. Perú* and *Av. Estados Unidos/Brasil*) which intersect directly with three most relevant radial roads (*Av. Artigas*, *Av. España*, *Av. Mcal. Francisco Solano López* and *Av. Eusebio Ayala*). Large parking areas were inserted at the intersection with *Av. Artigas* where the header of public parks along water channels is, allowing for extremely comfortable access to the new urban park from the whole city of Asunción. All of the above cited avenues are characterized by heavy traffic to/from city center (especially during rush hours); in addition average density – and automotive traffic – has increased exponentially in proximity of them, starting downtown moving outwards as high-rise buildings were built more and more frequently since the beginning of '90s.



Fig. 8

Conflict between heavy traffic in the consolidated city and the *Chacarita* reality (Fig.8) – where almost no one owns a car – has become consequently more striking; the strategy proposed is to separate local traffic (scarce, directed exclusively to homes) and major urban flows (intense, of urban interest) by superimposing the last ones on elevated roads destined to heavy traffic (Fig.9).



Fig. 9

Underlying streets are conceived hierarchically with structuring two-way roads on the edges of hydraulic-filled embankments and an internal road approximately following the path of *Calle Florencio Villamayor*, the major axis of the informal settlement at floodable elevation, between +59 and +63 mt a.m.s.l. Local road system originating from these, consists of one-way parallel tree-lined roads serving two blocks of (parallel or perpendicular) row housing, one on each side. Service patches to each home are constructed with the local technique of *Empedrado* (a mixed, dirt and rough stone technique, serving as base for future asphalt or cement paving), with less artificial surfaces, reduced costs and good drainage. Green mobility is supported and incentivized by a longitudinal axis at lower level (+60 mt a.m.s.l.) with respect to vehicular roads, running perpendicular to them.



Fig. 10



Fig. 11

The “green corridor” (Fig.10) has a wide two-direction bicycle path divided by an aisle which is the seat for an electric bus connecting the entire neighborhood; the path is directly linked to the minor public spaces laying between social housing rows thus creating a strong physical relation (as in the Radburn case) between them (Fig.11). Such system is intended to increase neighborhood quality and maximize social exchange/relation opportunities for inhabitants. The “green corridor” (15 meters wide, +60 mt a.m.s.l. at its lowest) connects minor public areas to the floodable park; an mayor urban park is in fact extremely necessary in Asunción, especially in the vicinity of the center. This suggested to introduce compatible functions inside the park itself, from sports and free time to urban gardening. Terraces at different levels were shaped according to the outline of elevation lines from the orography of natural elements and constructed embankments (due to previous interventions *Arranque*, *Gral. Santos housing* and *Costanera* avenue itself). This approach allowed for a reduction of about 30% soil movements with respect to the 2004 preliminary project estimation (8.270.000 m³), reducing costs for hydraulic filling and environmental impact on the bay’s ecosystem. Floodable terraces are assigned different uses according to the return

periods of high waters: plans illustrate the flooding at different water levels of Paraguay river (Fig.12):

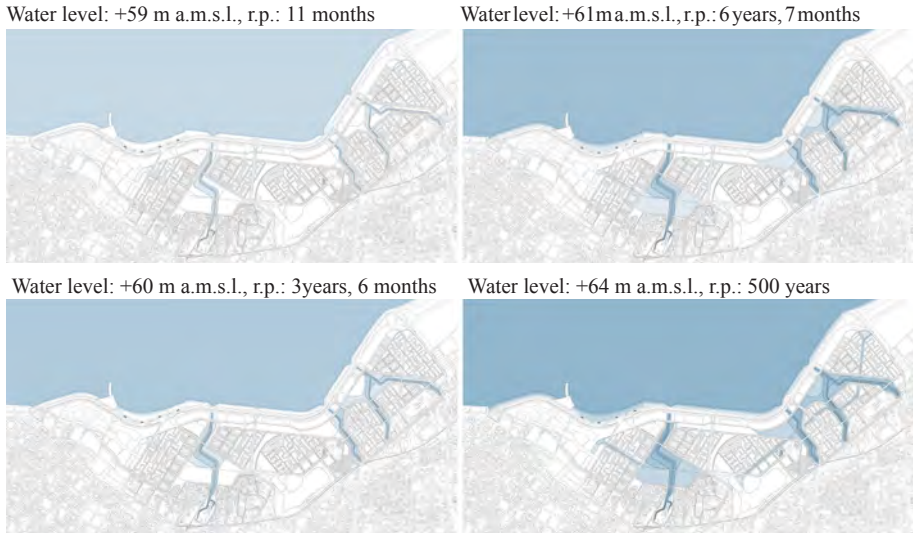


Fig. 12

It is calculated that green corridor (at +60 mt a.m.s.l.) will be flooded with a frequency of 3 and a half years and 6 months. Existing football fields and related social club centers have been preserved approximately in their original position, slightly elevating them to avoid continuous floods to which they were exposed; bleachers on the slopes of embankments follow the shape of the landscape and allow for watching football games. Terraces at the same elevation can be used for floatable or light service structures to the users of the park: toilets or rest areas with bars, for instance. Local fairs, commercial, cultural and sporting happenings are among other uses that are carried out in temporary structures to be disassembled when events end. Plenty of city farming areas are provided for in the +60 and +59 mt floodable terraces; soil's elevated humidity is in fact excellent for growing tubers (especially manioc, a most commonly used ingredient in Paraguayan cuisine), vegetables such as cauliflower or broccoli and fruits, for example papaya or watermelon (all of these widely grown in Paraguay). Closeness of urban gardening areas to the homes makes

it very effective and simply for the inhabitants to grow fruits and vegetables on their own, saving money and maybe even selling some as a secondary income source; abundance of urban gardens allows for *Chacarita alta* inhabitants to use of these areas too. The wonderful abundance of spontaneously long-grown trees and bushes (a variety of over 90 autochthonous species has emerged from the R.I.M.A) is to be preserved so paths, planted gardens and any structures in the floodable areas will be shaped around the pre-existing vegetation: deep respect and care for natural elements is inborn in Paraguayan culture.

The lower – thus more frequently flooded – terraces may not be planted and serve as expansion basins while during low water periods they will be used primarily for leisure activities. Light docks for row boats may be constructed along the lowest banks (+57,40 mt, corresponding to the typical water level) while scarce dredging of the channels will be needed to make them always navigable. It is relevant to note that fishing was, before the *Costanera* avenue, a common activity for the local men and 40% of them practiced it according to R.I.S. (Fig.13).

The natural engineering technique of gabion mattresses with underneath geotextile is adopted to restraint the dredged soil of the terraces and control erosion during floods (as in all interventions of hydraulic filling already carried out in the area).



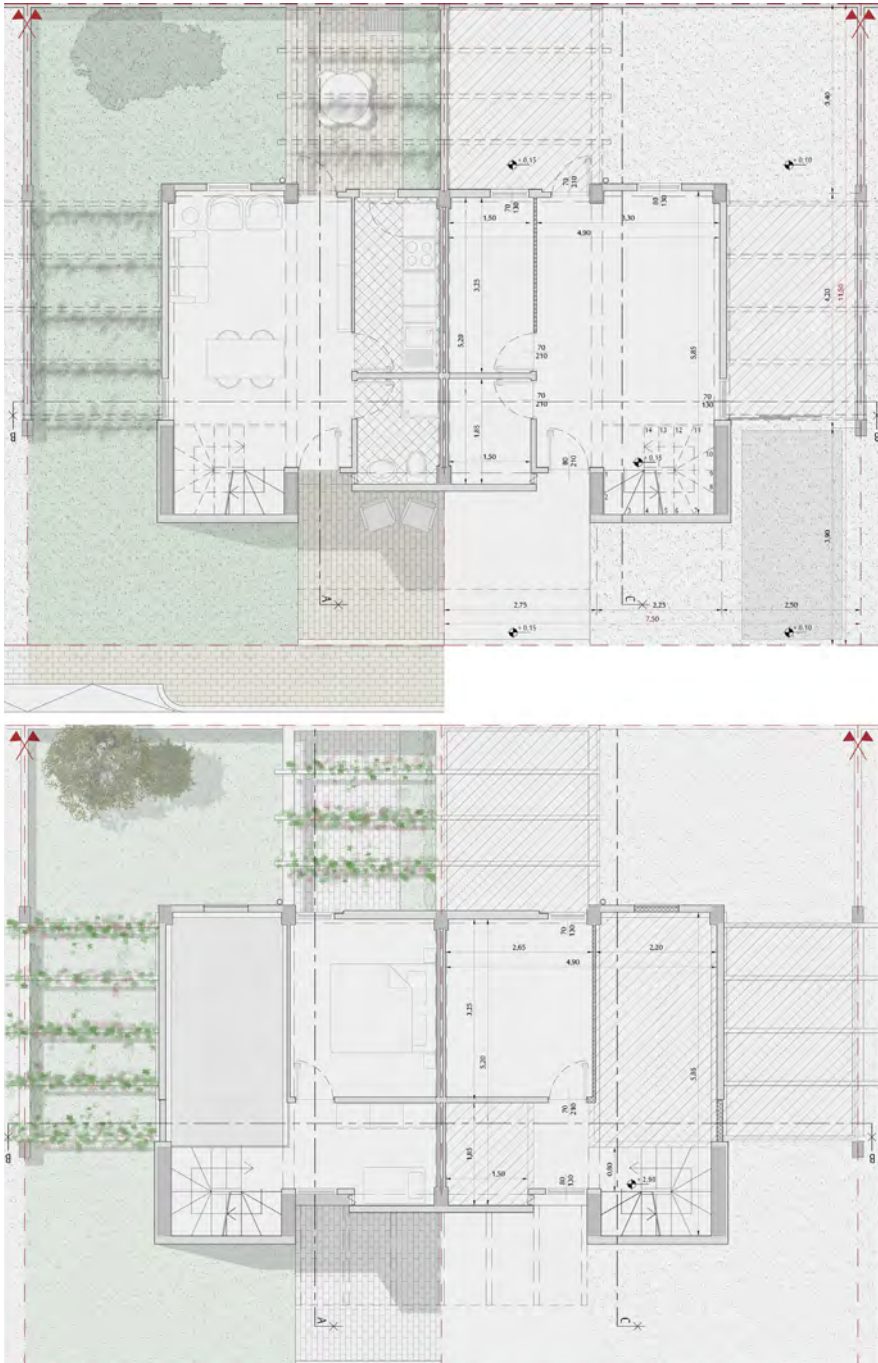
Fig. 13

7. Housing settlement

Social life in the informal settlement historically occurs primarily “on the front door” where occupants sit for hours chatting beneath a mango tree, drinking “mate” (a daily ritual in creole culture) while talented children play barefooted all day long on improvised football or volley fields:

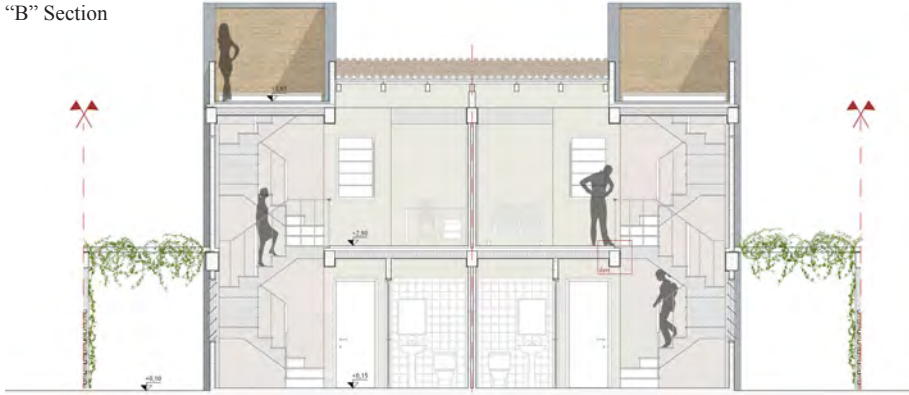


Adopting bi-familiar duplex homes with a shared central porch facing the green public areas included between the housing blocks responds to the idea of creating domestic, familiar, semi-private spaces where inhabitants facing the same plaza can find the social conditions they are familiar with. Public spaces assumes varying proportions, the semi-private space in front of the homes is conserved. The perpendicular layout of settlement and the generous proportions of the green areas are intended to avoid “grey areas”, corners where illegal activities and occupations could take place and to guarantee sufficient room for nature’s wonderful structures to grow enormous: *Mangifera Indica*, *Eucalyptus Regnans*, *Ficus Benjamina* and *Tabebuia Impetiginosa* are only some of the most diffused species, growing up to several tens of meters high in Asuncion. The proportions of minor public spaces included between social housing rows are varying – as in the informal settlement – but respect a minimal standard of width; according to dimensions the areas are seized by the inhabitants and used – as the neighborhood becomes more densely populated – for different uses as the inhabitant’s customs suggest. The continuum of public areas is in physical connection with the “green corridor” (consequently with the floodable park) through a system of terraces and ramps which connect the underlying bicycle paths allowing inhabitants to cross the neighborhood and reach the city center, *Bicentenario* park (at the western edge) or *San Miguel* natural reserve (at the eastern edge, north of the *Costanera*, where hydraulic fillings and further housing will be realized in the future) without crossing any vehicular road. As aforesaid, base module is a bi-familiar duplex home with a porch, shared between two units, facing the public plaza. Each home stands on 90m² plot including an individual parking lot and backyard; the initial floor area is about 35m² (as proposed in the 2004 R.I.S.). The bi-familiar unit is mirrored once with respect to the backyard (4 homes); both modules are then copied laterally -row housing- from one (8 homes) to six (32 homes) times.



Ground and first floor plan. The 45° hatch correspond to self-built expansion areas

“B” Section



“A” Section

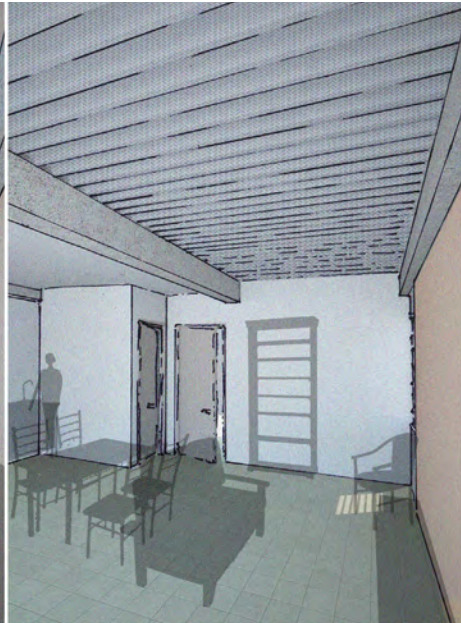


Structural solutions and constructive elements (windows, doors) are derived from previous SENAVITAT and MOPC social housing developments; the longest beam of the armed concrete structure has a span of 5,10 meters (shorter than that of *Gral. Santos* row-housing). A supplementary exterior structure (tin-plated for protection) is prearranged for self-built lateral and rear expansions in precise positions: a lateral arch and rear patio with concrete beams and wooden lattice are initially used to grow climbing plants such as *Bougainvillea* and *Wisteria*. The same wooden beams can be used to construct expansions directly or can be substituted with different materials, supported by the existing concrete structure, to realize them in a wide range of possible techniques. The tri-lithic principle of construction works safely for expansion and offers the richest variety of solutions in accordance to the availability of different materials, taking advantage of the intuitive constructive know-how of local inhabitants (many of them are construction workers). Concrete beams on the inside and outside stick out of the brick claddings by approximately 10 centimeters, allowing for extremely intuitive and simple expansion (of which the internal one represents the first phase). Even though, the local execution of armed concrete by construction workers showed certain “empiricism” and the future -provided for- self-constructed expansions would also burden on the structure which is why very long beams were avoided in favor of safety. Roofing solution is a “mix” between the common local technique (wooden structure, pitched and shingle covered) of colonial derivation and the modern plane-floor allowing for roof-gardens. Construction wise the skills, execution velocity and fantasy of local workers in bricklaying is impressive; reason for which complex alternate solid brick walls were used to separate units: besides, solid brick cladding is a most common technique in Paraguay, in every example of social housing but also in luxurious private developments. Internal distribution is reflected in the arrangement scheme of the module: lateral brick-cladded blocks contain the staircase which is initially visible on the inside, in the double height; placing the stairs on the facade allows for transforming – after all expansions are comple-

ted – the duplex into two superimposed – independent – units with only minimal work, thus representing a possible source of revenue for the assignees who can sell/rent the independent flat. Roofing of the lateral block is plane and practicable trough the staircase, illuminated from above by a large foldout skylight. The central portion of the base unit (with rear warded principal facade wall) is covered with a protruded pitched-roof defining the entrance porch with a deep shadow during the summer: according to Paraguayan customs social life will mostly occur here or, on more private occasions (such as meals) and according to the position of the sun, in the backyard patio. Behind the purist white wall of the principal elevation – separated from the roof which seems to be “suspended” on it with its white painted, wooden beams – is the humid zone (bathroom and kitchen) with the wall in common between the two adjacent homes.



Base module internal configuration



Superimposed independent units



Base module's principal façade (above), self-built expanded configurations (below)



The position of openings and light-removable claddings used in lateral and rear elevations is determined by functional schemes since progressive, organic expansions (A: internal expansion, + 2 beds max.; B: external ground level expansion, +4 beds or +2beds and shop or laboratory; C: external first level expansion, +2 beds) are built by the assignees. Great functional flexibility can be observed in the following plan schemes with a wide range of possibilities and the number of beds and floor area varying from the initial configuration (35m², 2 beds) up to a maximum of 75m² and 9 beds in the "A1+B3+C" configuration:

Step A expansion:
double height area
A1, one extra bed
A3, two extra beds

Step B expansion:
ground floor
B1, two extra beds
B1var, extra shop/laboratory
B2var, two extra beds
B3, four extra beds
B3var, two extra beds and shop/laboratory



B1. laterale - camera doppia



B3. posteriore e laterale - due doppie



B3var. posteriore e laterale - doppia e ristorante



Step C expansion: first floor two extra beds

Eventual separation in two units: Ground floor (blue) apartment and First floor (red) apartment have each up to 4 beds

C. laterale - doppia



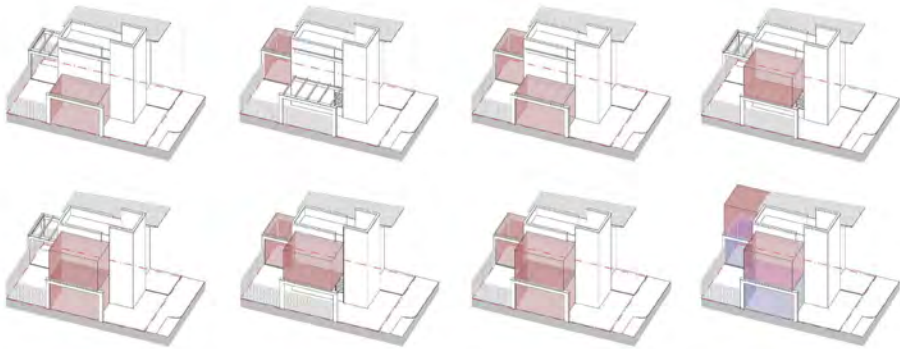
P1max. matrimoniale e doppia



P1max. matrimoniale e doppia



Organic expansions determine a vast variety of solutions in terms of floor area and number of beds; although only 8 volumetric schemes are possible (half base module, one duplex home, is shown in the drawings): Lateral expansion areas are conceived, as afore illustrated, to house artisan's laboratories and little stores; the economic and productive tissue of the *Chacarita* is in fact rich of small scale activities: tailors, wood workers, mechanicals, luthiers and blacksmiths (among other artisans and some small shops) can be found strewn in the alleys of this neighborhood, both in the historic consolidated and in the more recent – floodable – parts of it. Purist and dramatic design – of evident Kahnian inspiration – of the base module's facade is to be considered not only in its initial configuration but primarily in its varied aspect, once the self-built controlled expansions have been completed: the apparent original rigidity finally reveals itself as the "score" in which infinite possibilities are possible.



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