

PLANNING IN HILLSIDE: AN ADAPTATION TO LANDSCAPE: Colinas de Bello Monte–Caracas- Venezuela

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ABTRACT

In the cities, particularly in hillside areas, geomorphological conditions are characterized by an important visual focus, because of its urban form and the natural landscape, but with development in urbanization that has not done much a physical site survey and established an urban form not suitable to the physical characteristics of the site, especially the topography. The natural landscape perceived in these parts of cities has a visually rich does that not everything is negative in this type of urban settlement, and can present unique opportunities to develop and contribute to the binding of the neighboring towns to entire city .

INTRODUCTION

According to UNDP [1], in the Andean cities, the slope is a factor secreted in space to different actors, restricting the location and increase facility costs. It is for this reason that in these cities, the slopes are occupied by higher or lower economic strata:

- "The richest occupy the slopes to be excluded because they can pay the architectural, geotechnical and hydraulic works for prevention and mitigation, and because they have the economic and political power to overcome impunity environmental and planning requirements.
- The middle classes do not occupy the slopes because the formal construction (they claim) of buildings, networks and equipment is too expensive in these areas.
- The poorest groups occupy neighboring slopes because they are close to jobs and services, because there is no supply of land and housing for the poor in these cities because they are misinformed or willing to assume the risks of these locations to other more urgent priorities. The slopes are spaces that attract attention and assistance of a State easily policing role ranges from complicity with the informal and welfare with the marginalized at election time ". [2]

For this work the focus of study is focused on the processes of occupation made by senior middle strata, involving modifications and currently still running in the territory for mainly residential and altering and putting pressure on the natural balance.

Two factors favored the growth of the city. On the one hand, the construction of roads to connect it with the rest of the country, and secondly, the change of use of land from agricultural to urban. The latter was moving to sectors more resources to the east of the city, "developments" were also favored by the construction of roads and infrastructure by the state. The valley consisted of farms and small towns linked to the city. To the west the population began to settle around the road. World War II sparked an oil boom and with this new neighborhoods were built.

In 1950 [3], the figure of the Metropolitan Area of Caracas (AMC, Decree 647 of 10.11.1950), in which the city, for statistical and census purposes, is comprised, for the time, is created by: a) the Liberator Federal District (except for a portion of the Sucre parish); b) The Chacao, and Los Dos Caminos of Petare, Baruta El Hatillo and Sucre District municipalities in Miranda State. This can be taken as the validation of urban growth of the city to the northeast sector of the valley of Caracas.

With this appointment of AMC, it was to respond to the emerging occupation of the south of the valley, where by the decade of the 40s of XX century, developments in Bello Monte - built in part of the grounds of the Hacienda Ibarra - and Las Mercedes, were arranged as a

kind of pioneering a process that cores only be consolidated at the end of the following decade (50) [4].

In recent decades this problem was accentuated. The services in the neighborhoods were inadequate and sometimes did not cover the entire area due to their continued growth (Figure 2). In this sense, the occupation of the slopes of the city of Caracas, by sector of the population from different socio-economic levels at different times, shown as the hills became the new urban spaces in the city, regardless of which this urban growth created more pressure on space and on the slopes, and began to be evident landslides.

In the same decade (50 years), the then government practiced a policy of relocation in tall buildings called "super-blocks" in an attempt to modify the profile of the city and replace these neighborhoods. An example is the so-called January 23, with 100,000 people in 38 buildings each with 15 floors with a total of 150 apartments [5].

In 1958 a change in the regime again changed the configuration and dynamics of the city. "Controlled" by the dictatorship in the period before areas were again invaded by low-income population, and the government plans to counter the growing discontent of citizens led to an Emergency Plan, administered by various government entities and was to provide some areas of infrastructure such as streets, stairs, sewers, schools, and in some cases the construction and / or improvement of housing. The election promise of land and improvements in the neighborhoods, in exchange for the vote was very important in explaining this phenomenon of rapid city growth factor.

"Currently the neighborhoods occupy over 5,000 hectares of the city and home to 75% of the population of the capital ..." and "... continue to strengthen risk scenarios of the capital city, since there are few initiatives that consider conditions present in the neighborhoods threats "[6]. In this sense, the occupation of the slopes of the city of Caracas, by sector of the population from different socio-economic levels, shown as the hills became the new urban spaces in the city, regardless of this urban growth generated more pressure in space and on the slopes, and began to be evident landslides.

2.. MONTE BELLO HILLS

The urbanization Colinas de Bello Monte is located in south-central Caracas Metropolitan Area. Its name comes from the property that covered the area where you are currently urbanization and in Figure 1 the southern hills without modification and with little urban interventions is.



Figure 1. hills south of the city of Caracas unchanged. In the red box area where urbanization Colinas de Bello Monte implanted shown. Source: Modified from photo mosaic uncontrolled 1936.

The conformation of Colinas de Bello Monte occurs between 1945 and 1955, considered by Gasparini & Posani [7] as the critical growth phase in Caracas, and the conditions that strongly affected the pace and quality of construction. This period constitutes the structure and defining features: the first is the invasion of the "ranchos", by the peasant exodus; the second is land speculation and construction; and third: the disorganized government intervention [8]. These last two features, conditioned the origin of Colinas de Bello Monte.

After 1948, the policy of the Government, was the throttle, and under all risks, building the necessary physical infrastructure for the growing city "as if guided by the slogan" do anything but do "... " [9], which transformed the city. Immigration provided the abundant and cheap labor for public and private works and allowed for some reasons, perform difficult and unusual works for the city at the time, many times works done in record time. Among these reasons was the art-building experience they brought with immigrants, particularly Italians, Portuguese and Spanish. [9]

According to Gasparini & Posani [10], fast growth of the city brought improvisation, neglect, merely commercial exploitation of land and housing; attorneys-builders, "surveyors" military-architects and investors took over the large and small contracts in a race against time. The city changed in appearance from one moment to another, the promoters of the house and not by architects and urban planners, and who filled the paths

you were creating developers with buildings made in any way, with lots of tractors , mines and leveling [10].

In this context, the "first climber of mountains", in his words, was Innocent Palacios, the developer of Colinas de Bello Monte. According Hannia Gómez [11], this development spread its urban development model for decades around the periphery. The decade of the 50's was the golden decade of the Venezuelan architecture, "... when the country was building each and every one of his dreams of progress" [12]. Ignacio Palacios openly devoted to planning; and is regarded as the author of the idea that you could make a hill without allowing urbanization earthworks [13]; this statement holds true not because there were many landslides and topography modification was done in the hills for urban purposes (Figure 2).

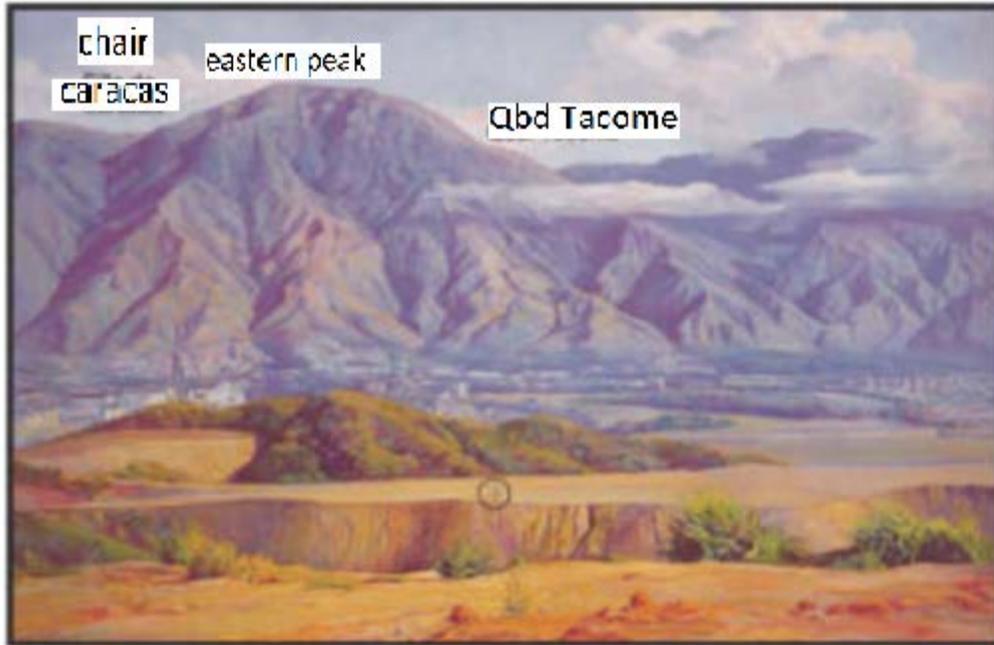


Figure 2 Painting Pedro Angel Gonzalez, 1950 where earthworks are shown in the hills of Monte Bello. Source: Taken from Oropeza & Zambrano, 2007.

Aided by the Italian architect Antonio Lombardini, called the "architect of hills" and a remarkable team, Ignacio Palacios built Colinas de Bello Monte. "Soon it would be impossible to prevent not go with the theatrical analogy offered him their land. Justified it by saying that "in those years, people thought that I needed to grow Caracas Valley because he was getting too small." A parallel phenomenon occurs also in the informal city of neighborhoods, the other huge aspect of the vertical periphery. It was the horizontal illusion

apparently extended city annexing the valley. Clearly, this climb was not so urgent in Caracas empty fifties, but an act of urban illusion, supported by an innovative real estate marketing idea [14]. These buildings on hillsides possibly occurred when Innocent Palacios and Antonio Lombardini realized the monetary value involving visual of homes in the south Colinas o over the Avila and the city.

To promote this development, "the development company opened a competition for el diseño-fifth of a house, on a lot with a minimum slope was 70 by the way, for a Family Model 5 to 6 plus 3 service, family which the leave was a professional "well off"; house-fifth had to have large spaces "for social relations marriage" and lounges for "meet the intellectual proclivities" of some member of the family ".34 On the other hand, to grant permission for this development was necessary to amend Ordinance in areas such as: reducing the width of the tracks, eliminating the possibility sidewalks and parking on one side of the street. "It lowers the road because it is assumed that there will be a minimum, i.e. traffic, there is a sidewalk attached to the hill, a street of 5.50 a curb and a defense of land, enough to do that, because there is parking; trucks up to the respective garages ... "[15].

"With a path between organic and totalitarian arises the maze of streets. Gone was the clarity of the checkerboard. Its layout is always faithful convoluted topography ... The dangerously steep slopes smallholding be the inescapable challenge to the engineering expertise. Very typical of the decade. "[16] Unfortunately, not only houses, but multiple residential buildings that are very close to steep slopes on which it was assumed they would go home and not buildings [17] were constructed. In Figure 3 the construction of the development is shown as well as topographic changes executed in the hills for housing construction and building construction shown, which initially were not covered at the beginning of this planning.

"There is no doubt that the call to urbanize" the string of beautiful hills surrounding our capital "was followed by both private developments with permission as the" neighborhoods "without him, as by developments in the public sector [18]. Figure 4 shows how the urbanization of Colinas de Bello Monte and subsequent housing complexes were built in the hills south of the city of Caracas.



Figure 3 Topographic Modifications in the hills south of the valley of Caracas for the implementation of development Colinas de Bello Monte, for the year 1953 Source: Modified from aerial photographs of 1953.



Figure 4 3D view of urbanization Colinas of Bello Monte. Source: Modified from Google Earth, 2012.



2.1 Implementation of Colinas from Bello Monte

Colinas de Bello Monte, for having conceived between 40 'and 50', was made under conditions designed in the value of the land, regardless of the future of both the territory and the elements that constitute it. The fact that he changed the ordinances to build this urbanización³⁹ reflects the need to intervene at any cost hillside areas, promoting the balcony view over the valley that houses would be built in the area. And although at that time there were lands in flat areas for new construction, Colinas de Bello Monte is set as the starting point for climbing hillsides for the creation of new neighborhoods and informal settlements, which somehow have affected change in the topography, and thus in the generation of slips.

This review of the implementation and the urban fabric of Colinas de Bello Monte, allows to account for the mistakes of the past, issues of land speculation and uncontrolled urbanization by "urban developers" who thought more on the profitability of soil than in the urban process that should include environmental impact studies, mobility, vocation land use, among others. In this regard, the need for a review of planning instruments that govern this territory, and must be designed and subsequently modified based on the needs and physical characteristics of the environment to intervene to influence the generation of landslides, for that new urbanization processes that occur with less impact on the territory, and reduce vulnerable elements to natural phenomena such as landslides. This search for balance between the natural and the anthropic raises the need for new or improved methods

of construction on slopes, to allow greater preservation of natural and quality of life for the occupants of these areas.

3 PLANNING IN HILLSIDE

Currently, the slopes are places where the construction methods applied by man not favor these areas, as in these great changes and strong cuts of ground stuffed with the same materials and material transfer are established to facilitate urbanization processes contributing to a degradation of the landscape. That is why the occupation of areas with slope should be in harmony with the environment and based on the characteristics of the territory, maintaining the natural balance of the slopes and thus reduce the chances of risks to natural hazards.

In this sense, some recommendations for the development on slopes becomes more efficient and sustainable way. The idea is that these recommendations are taken into account in later experiences, adapting to the characteristics and needs of the specific place. These are the guidelines proposed for urban interventions in slope for different areas:

3.1 Physical parameters of natural slopes

3.1.1. Slope

The slope is not necessarily directly related to the slope stability. This material is a function of soil moisture, groundwater condition, the geometry of the slope, and vegetation cover, among others. Consequently, the slope should not be regarded as the sole determining factor in the potential development of hillside areas. Here are some recommendations on the subject:

- According to the literature, it is recommended that for slopes greater than 33% (approximately 18 °) should not make changes.
- A geotechnical assessment and slope stability assessment will provide essential technical information on the geological condition and stability of the slope.

3.1.2. drains

We recommend:

- Conduct hydrological and hydrogeological studies to identify possible natural drainage and aquifers.
- Avoid clogging the drainage channels or changes in the waterway.

3.1.3 Vegetation

We recommend:

- Replace the vegetation been eliminated in earthworks, using erosion control systems.
- Maintain existing trees, provided they are no danger to the community. This is due to help control erosion and regulating water levels and infiltration and runoff mechanical drag
- From implemented a type of non-native vegetation to the site, it must be assessed, as it can be counterproductive.

3.1.4 Lithology and geological structures

We recommend:

- Conduct studies to obtain the Geomechanical parameters of rock and soil for stability analysis of slopes and hillsides, such as cohesion, friction angle, and shear strength, among others.
- Conduct orientation of rock mass structures.
- Determine the permeability to assess the subsoil.

3.1.5. Showers

We recommend:

- Conduct studies to determine the rainfall design of structures and piping to determine values of infiltration and runoff.

3.1.6 External Geodynamics

We recommend:

- Analysis of aerial photographs for ancient landslides that can be enabled or potential landslide areas.
- Review and make a database of landslides occurred in the area and who are registered for location and possible causes that triggered.
- Conduct field work to inspect the area to intervene and, if they exist, to make a survey of landslides or some symptoms of potential landslides.

3.2 Recommendations for urban deployments slopes

3.2.1. Changes in geometry of the slope

We recommend:

- Earthworks to make are made up of small staggered terraces that will maintain the closest possible to the original topography (Figure 7).
- Following up with fillings made in the area of modification, from aerial photographs and / or inventories.
- Avoid debris cans and / or debris on slopes, or make boats poorly formed material.
- Perform slope stability study of court to assess changes in geometry.
- Implement erosion control systems and reforestation cut slopes.
- Incorporate materials suitable for cut slopes to reduce the visual impact to the general public.



Figure 7: Recommendations for changes in the geometry on the slopes. Source: Land use planning & Policy planning, development and assessment, 2009.

3.2.2. Works containment

We recommend:

- Building construction low visual and environmental impact.

- If building walls with a height not exceeding 1.5 m in height, to minimize the visual impact. If you require high containment walls, terraced walls is recommended to avoid high surfaces that restrict views.
- Preferably staggered wall construction with a combined no steeper than 33% (approximately 18 °).
- Perform drainage systems for water drainage.
- Retaining walls must avoid the presence of large uniform walls. Gabion walls that ensure water evacuation and blend with the natural environment in terms of appearance are recommended.
- Provide landscape adjacent to the retaining walls, especially along public roads (Figure 8).

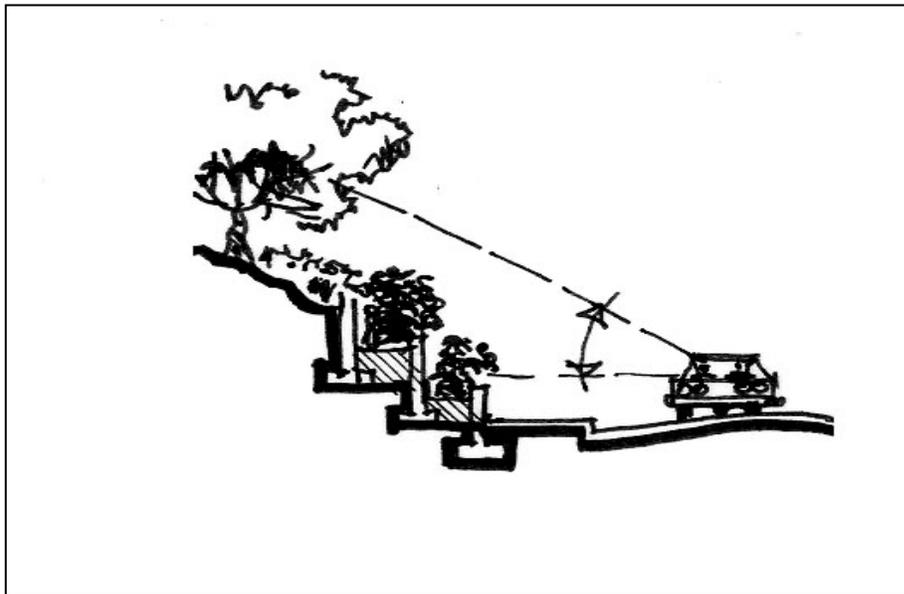


Figure 8: Example of containment works on hillsides. Source: Land use planning & Policy planning, development and assessment, 2009.

3.2.3 Infrastructure

We recommend:

- Construction of roads to follow the contours, making the fewest cuts (Figure 9).
- For projects of regional order, tunneling is recommended.
- Construction of curvilinear walkways, with a slope no greater than 4%, for the convenience of pedestrians.

- Respect natural watercourses placing relevant structures drains, sewers, ditches, among others.
- Locate buildings parallel to the contour lines.
- In the steeper slopes to 33% can include buildings provided that the manufacturer has demonstrated that the slope stability has been mitigated, and with the approval of the responsible entity.

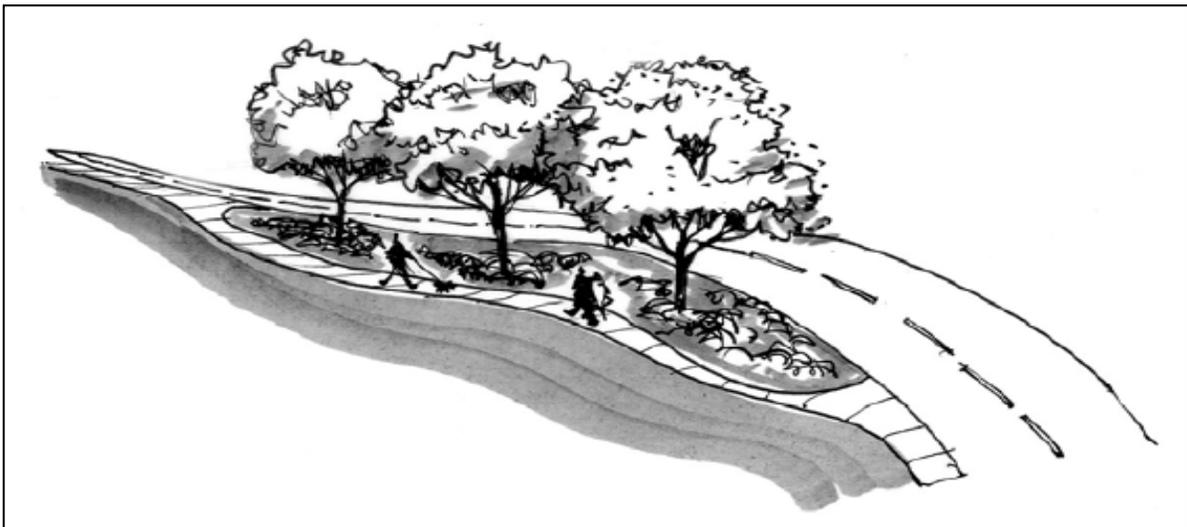
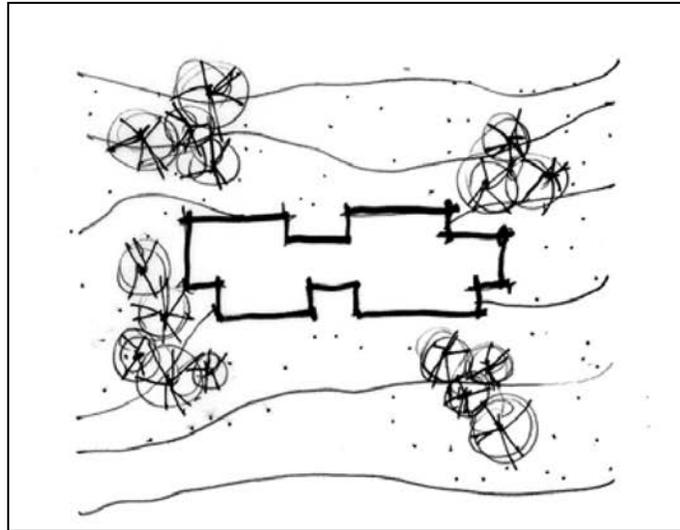


Figure 9: Example of infrastructure on hillsides. Source: Land use planning & Policy planning, development and assessment, 2009.

3.2.4 Networks and Services

We recommend:

- Pay attention in trenching for the installation of networks, which are sites of potential water infiltration but are again covered.
- Likewise, it must signal service networks to avoid further constructions on them that can cause disruptions that would discharge water or solid ground, if aqueducts.
- The construction of drainage must be in inconspicuous places, and is designed to simulate natural drainage courses, whenever possible.
- Find a balance between the water circulating and infiltrating.

3.1.5 Transport

We recommend:

- Installation of low impact in nature, implying little modification of the topography, eg cable car type and / or "cable cars".

4 OPINION

Urbanization in slopes are executed today by two economic groups, which have different impacts on the territory. The low income population do not make major changes in the territory but the lack of utility infrastructure harms the stability of slopes by runoff and infiltration of waters not embauladas. By contrast, the population with high economic resources made strong changes in the territory, which results in possible instability processes on the slopes.

In Caracas, Venezuela, specifically Colinas de Bello Monte and its implementation allowed to know as the soil became, from the 50's to the present, a business where the environment and balance pass into the background, bringing in result in an imbalance in the natural conditions of the slopes.

Likewise, land speculation, in particular for the construction of Colinas de Bello Monte, and got prompted changes be made to the regulations of the time, showing that the economic interests take precedence over environmental concerns of the area.

Thus, urbanization on slopes should be done in collaboration and respecting the natural terrain. Therefore, the detailed review of the physical characteristics of the area is recommended to intervene, and anthropogenic processes that generate in these areas must be designed and tailored to the characteristics of the territory, leaving aside the quality of life of residents. Knowledge of these characteristics enables designs for urban installations are tailored to the needs of both the residents and the physical environment.

The slopes have urban properties of interest, but the planning should be done in these areas in a sustainable way, using control of relevant authorities and based on standards that maintain the balance of the land and the quality of life of residents.

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