Re-creating the gullies,
re-creating the city

A review towards a new urban green system for Quito

Estefany Mena L.
Re-creating the gullies,
re-creating the city
A review towards a new urban green system for Quito

Msc. Thesis Landscape Architecture track, Flowscapes Graduation Studio
Estefany Carolina Mena Lalama
4418514
estefanyc.mena@gmail.com

Mentor team:
TU Delft, Faculty of Architecture, Department of Urbanism, Chair of Landscape Architecture
Frits van Loon, Ir.

TU Delft, Faculty of Architecture, Department of Urbanism, Urban Design Theory & Methods Chair
Taneha Kuzniecow Bacchin, Dr. Ir. T.

TU Delft, Faculty of Architecture, Department of Urbanism, Chair of Spatial Planning & Strategy
Diego Sepulveda, Dr.

Examiner:
TU Delft, Faculty of Architecture, Department of Architecture
Chair History of Architecture and Urban Planning
Drs.Ir. C.A. van Wijk

TU Delft

Delft 2016
Re-creating the gullies, re-creating the city
A review towards a new urban green system for Quito
The volcanoes and mountains surrounding Quito are like paintings; sometimes bright, sometimes blurred, but every time with an imposing presence. They are always there, in front of our eyes, but far at the same time. This project was born from the fascination of this daily landscape, the interest in the complexity of Quito’s geomorphology and, especially, the desire of making the natural landscape more accessible in daily life.
Acknowledgements
All my gratitude to Frits, Taneha and Diego, whose support, knowledge, help and guidance have always been there since the beginning until the last day; not only my recognition for you as the great teachers and professionals you are, but also as human beings. Thank you for all the advices, recommendations and for always encourage me to do more and better; this process has been, without doubt, an academic enrichment but more than that, a great personal experience.

To my parents and siblings, for being with me despite the distance; your support has always been essential for my accomplishments, and this is clearly not an exception. Being away from home is difficult but the love from you made it easier, thank you. A special thanks to Alex for your help and motivation.

To all the landscape family, this amazing experience would not have been the same without you, thank you guys.

And to all my friends in Quito, entities and people from the Municipality that somehow helped me in the development of this project, a big thank you.

Estefany
Introduction
Usually the image of cities is created by their great parks, squares, amazing buildings, etc., but unimportant is the fact that there are also leftover areas inside these cities willing to be converted. ‘Existing at the blurry edges of the built world, such areas cast doubt on spatial and behavioral codes’, (Barron, Mariani, 2014, p.1) they are considered as vulnerable spots due to their situation (pollution, waste, crime, and others), however, it is becoming more common the reclaiming of these spaces and, therefore, the necessity of transforming them into useful places. The importance of this reclaim lays on the fact that the transformation has not only a spatial impact, but also social; a better environment creates more sense of belonging, less stress and appropriation from the community in the surroundings. It can also improve the preservation of species and resources and the integration of the city. ‘As counter spaces, terrain vagues are also containers of a fragmented shared history, illuminating the imperfect process of memory that constantly attempts to recall and reconstruct the past.’ (Barron, Mariani, 2014, p.1) In some cities, these interstices are leftover areas of the urbanization growth; such is the case of Quito, capital of Ecuador, located in a valley along part of the Andes Mountains.

This location has created along the Mountains, the city and the periphery, many natural drainage channels which, according to Peltre, where the shapers of the city during the colonization (1989); these spaces are called gullies and at the beginning were ‘holy places for rituals and connection to the water and nature’ (El Telégrafo, 2014) and nowadays, leftover areas where people do not go. During the last years, some projects for the restoration of gullies have been done; however, there is still a lack of a plan for the connection and preservation of them as a system. The goal of this project is to create or define design principles for a new layer of green-blue infrastructure for the city of Quito, where the leftover spaces, specially the gullies, are the main element. The purpose of this proposal is not only to bring back life to gullies and other “terrain vagues” but also to improve the mobility and the relation of the people with the nature and the city. These principles will be the result of an intervention in “Quebrada Cantana Gallo”, located in the north of the city; which at the same time, will be the starting point of a progressive strategy whose final aim is to connect the whole city of Quito with a new green system integrated within the existing urban fabric.
Table of contents
A brief story of Quito related to the gullies

1.1 Gullies: natural landforms
1.2 Quito and its geographical location
1.3 The urbanization of Quito
1.4 Gullies through time
1.5 The actual situation of the gullies
1.6 The gullies and their risks

The gullies as a system of the city

2.1 Gullies and the drainage system
2.2 Gullies and mobility
2.3 Gullies and the green system
2.4 Gullies, an isolated system
2.5 Habitat of different species

Quebrada Cantana Gallo, a new experience

3.1 The gully as an element of a system, Cantana Gallo’s situation
3.2 The criteria behind the design
3.3 Defining principles
3.4 Experiencing the space

Expanding the experience

4.1 A progressive strategy, from local to the city
4.2 La Delicia, intervention zone
4.3 The new green system of Quito

Conclusions
A brief story of Quito related to the gullies
Picture 1. Domestic landscape of Quito. (Taken from De Jojagal - Trabajo propio, CCO, https://commons.wikimedia.org/w/index.php?curid=19440666, 2016)
Eugenio Espejo, in one of his speeches for the people of Quito, said that when ‘having’ the Earth in his hands and turning it around, he could not find more joyful horizon, more benign weather, more green and fertile fields, clearer and calmer sky, than the one from Quito. All of this, because of the location of the capital, its proximity to the Equator and its position on the Andes, which allows the city to have the called ‘eternal spring’ weather and an interesting topography where one particular element is visible: the gully, a natural landform created by fluvial erosion.

Quito cannot be described without mentioning the presence of the gullies. They are part of the history of Quito since ancient time, and despite the efforts to fill them in to settle the city, they are always there. Uncovered or under the city, through the urbanized area or along the surroundings, neglected or restored, the gullies can be considered as the ‘omnipresent’ element of the capital of Ecuador. A space that, despite the great ecological values it offers, is still considered a vulnerable area related mainly to garbage and crime; a space that was the shaper of the city but due to urbanization is, in the present, a neglected area where people do not go. Overall, it is an extremely complex, but at the same time, magnificent space that should be explored, restored and preserved towards the benefit of the city, the people and other living beings.
1.1 Gullies, natural landforms

A gully or ravine is a natural landform created by fluvial erosion specially in hillside. In many cases it can be considered a natural channel for drainage while in others it is used for water storage. With a concave shape, a gully can vary in depth, width and length.

Formation

The process of formation of a gully starts by a break on the surface (Drawing 1). This break can be created in two ways:

   a) Natural: the surface is weak and the ground water goes out breaking it

   b) Caused: the runoff water that cannot go through the soil breaks the surface

After this break, erosion makes the crack bigger (Drawing 2). Since most of the time, at the beginning the break is small, human or natural intervention can stop it from growing. At this point the crack is not considered a gully; only when it gets to a big and deep size it is called gully or ravine (Drawing 3).
Composition of the gully

Generally, a gully is composed by three parts (Scheme 1), a border which usually shows the extreme change on the complex topography of these natural landforms. The slope, characterized by being extremely steep, and with different shapes (Scheme 2). Since they are created by fluvial erosion, the water bed is one of the main parts of the ravines; however, water is not always present in them because it is a seasonal characteristic. Same as rivers, the gullies have three courses. The upper course where the source of water is located; the middle course where the water goes down slower and, sometimes, wider because it connects to other gullies and the lower course where erosion has almost disappeared and the water falls into the main rivers. (Drawing 4)
1.2 Quito and its geographical location

- Valley N-S
- 2850 masl
- 352 km
- 2'361444 hab
- 4 climate zones
Quito, the capital of Ecuador, is located at 2850 meters above sea level in a narrow valley that goes from north to south in between the eastern and western Andes mountain range, at the slopes of the Pichincha Volcano; “it lays down close to the zero latitud, a condition that only ten countries in the world have. It is the only city within a context where fourteen high mountains are located reaching in average the 5000m” (MDMQ, 2011, p.10).

Due to its location, most of the area of the city is covered “almost uniformly by a layer of 10 to 20m thick of silty volcanic ash from eolian origin -cangahua- which molds an ancient topography” (Peltre, P., 1989, p.46). This topography is not resistant to fluvial erosion, allowing the water to create deep and steep canals which form a system of gullies inside the city and outside of the urban border.
1.3 The urbanization of Quito

Quito was settled on the slopes of the Pichincha Volcano since the Inca’s period, but it was after the colonization when it started growing. According to Peltre since the foundation in 1534 until the beginning of XXth century, the urban growth was slow and within a radial scheme. During the first half of the XXth century it grew towards the north and south, reaching around 1300 hectares in the 50’s.

After this period, the expansion grew faster, and the gullies were more constantly filled in, hence, the natural drainage channels of the city were now replaced by sewers, which at some point were not enough for the expansion of the city, collapsing and provoking many floodings and disasters after the heavy rains (1989). However, the city was still growing and occupying the gullies. (Drawing 5, Drawing 6)

After a mud avalanche in the 90’s at the Pichincha Volcano slope, hydraulic interventions have been done in the western gullies to avoid these disasters and have more control over the flooding and raise of water during rainy seasons; nevertheless, the migration and informal settlements are still filling the gullies to build houses, especially in the southern part of the city.

Drawing 5. Urban expansion of Quito (Author, 2015)


Picture 3. El Cebollar, restored gully. (Taken from “…en las faldas inmensas de un monte…” 2016)

Picture 4. Quebrada grande. Gully without intervention (Gerardo Túquerrez, 2015)
ancient times
sacred spaces, rituals

1492
colonization
protection of the invasion

1534
Spanish foundation
shape the city

1914
growth of the city
simplify the connections

1980
no more space for the urban area
leftover spaces
1.4 Gullies through time

The gullies have always been part of the history of Quito, and even though some of them were filled in and in the present there is a lack of appropriation of them. In ancient times they were “holy places for rituals and connection to the water and nature” (El Telégrafo, 2014). During the colonization they were also fortresses which allowed the Incas to protect from the Spanish invasion; but unfortunately, after 1534, their situation changed converting them into neglected and leftover areas of the city, a situation that remains until now, especially inside the urbanized area. Despite the fact that the ravines of Quito are mostly associated with garbage and crime, in 2012, a community in the south of the city reclaimed their right to have a better quality of life and more security. Together with the Municipality, other organizations and leaded by Luisa Maldonado, they worked on a plan to restore and change the image of the gully of their neighborhood. Luisa, as a member of the Municipality back then, proposed to declare the gullies as natural, historical and cultural landscape heritage of Quito in order to give them back their real identity as “the habitat of quindes and house of trolls” (Luisa Maldonado, 2012). Not only the proposal was accepted, but also the project was executed, a big step towards a new vision of these spaces.
1.5 The actual situation of the gullies

Restored gullies

Despite the lack of accessibility, connections and the idea of gullies as ‘garbage places’, some of them have been transformed into nurtured areas. At the beginning, and after the disasters on the slopes of the Pichincha Volcano, most of the interventions were about civil work in order to avoid flooding, displacements and alluvions on the gullies of the west of Quito.

The EPMAPS (Metropolitan Water and Sewage Company) developed a plan called ‘Environmental Sanitation Program’ which was executed in two phases. “Phase I of the program involved the construction of water regulation works supplemented by environmental stabilization works in the ravines and recovery of open spaces” (Vidal, X. Burgos, L & Zevallos, O., 2015, p.190). The importance of this program was the involvement of the community whose surroundings where improved towards a better quality of life.

The phase two of the program continued with the development of the plan executed in phase one, focusing more on the training of the people of the area so they could learn what could be done and what should not be done on the slopes. It is important to use these actions and interventions as a guide on what can be done to restore the gullies.

After the interventions on the western gullies of the city, the restoration continued mainly in the southern part of Quito. A successful example is Quebrada Ortega (Picture 5), one of the latest projects accomplished. A gully that for many years was the dump of “La Ecuatoriana” neighborhood, is in the present a beautiful park with “23 hectares and three longitudinal kilometers equipped with paths, colored paving stone, a variety of playgrounds, fountains, seats” (Aguaquito, 2014). It is now a space that allows people to enjoy a better, greener and safer environment.

This project was developed together with the community; the people of the area started a plan to restore the gully and make it part of their lives instead of covering it; during 10
years, before the interventions were done, they cleaned the gully with the purpose of having a natural green area instead of a garbage place. This initiative had also impact on other living species, “in the natural recovered space there can be found over 130 species of plants, 20 of them medicinal. A small oasis in between the asphalt.” (La Fundició, 2015)

Quebrada Shanshayacu is another project for the restoration of a gully, specifically the superior border of it. An intervention of 780m long, where paths, playgrounds and water fountains can be found (Picture 6). This intervention benefits the houses next to it and is also part of the water system of the first water treatment plant that is being built now in Quito; the clean water will be discharged directly to this gully. Located also at the South of Quito, is Quebrada Río Grande, where seven sections have been restored providing the community in the surroundings a direct access to the gully with pedestrians and bike paths and in some specific locations, some playgrounds and sports fields can be found. In general, the intervention of this gully improves the connection of the area, encouraging the use of soft mobility (Picture 7). Unfortunately, despite the interventions and actions done to restore it, due to the sewage system that goes directly to the water it is still one of the most polluted gullies of the city according to a publication of El Comercio in 2015, a problem that affects mainly the people living at the edge or along the slope of the gully.
Neglected gullies

The ´Environmental Sanitation Program´ was developed on the occidental side of the city, including the gullies from the slopes of the Pichincha Volcano and Atacazo Volcano in the south of the city; but in Quito, there are more than 250 gullies, and many of them still need a restoration plan. Each gully has different conditions and its context can vary, nonetheless, the problems are in general the same. In the south of the city, most of the gullies are vulnerable areas due to the informal settlements and the risk of displacement; while in the north and other urbanized areas the problems are mainly the lack of accessibility and maintenance, converting the gullies into crime areas and garbage disposals (Picture 8, Picture 9). All these different situations, in addition to the lack of knowledge of the citizens related to the potential of the gullies as an ecosystem, have converted these spaces into leftover areas of the city where the pollution of the water is the common problem and in most cases, perceivable when being close.

Picture 8. Quebrada Almeida (Author, 2016)

Picture 9. Quebrada Grande (Author, 2016)
1.6 The gullies and their risks

Pollution

It is known and perceivable that the water of rivers and gullies of Quito are polluted because they are part of the sewage system. Actually, according to El Comercio, there are some taken samples that exceed 3000% up the allowable range for the water to be considered drinkable, being the south of the city the most polluted area due, mainly, to the density of people and the short time it takes to discharge the black water directly to the rivers. The situation gets worse because all sort of garbage is thrown to the gullies: clothes, dead animals, plastic, tires and others can be found there (Picture 10).

Displacement

This risk can be understood in two directions, the displacement of the slope and the displacement of the houses on the border and along the ravines. Mostly, the displacements occur during the rainy seasons. The slopes collapse, going down to the river and bringing everything with them; the risk grows when houses are close by. The normative does not allow building on the slopes, but most of the informal settlements have used these areas to have a place to live (Picture 11). Programs of relocation for these houses have been done, but they are not enough for all the families living there.
Sinking

Many of the streets and avenues of Quito were built over gullies that were filled in. Also some neighborhoods were constructed above these natural spaces. Unfortunately, some of these constructions, especially the streets, have been victims of the land downfall. The bad compacting of the filling, the heavy rains, or the collapse of the drainage system are some of the reasons why the streets that were once gullies go down creating huge holes in the ground (Picture 12); this phenomenon can not be predicted and even though sometimes it is not considered a disaster, it is one of the risks of all the gullies that are filled in.

Erosion

Erosion is another common problem of the slopes of the gullies. Even they are natural areas where vegetation exists, certain parts of the slopes can be dry and without vegetation. This erosion can be natural or provoked by people when throwing different things to the gully, killing the existing vegetation and taking down part of the soil of the slope (Picture 13). In some cases these erosion can be controlled by the use of new vegetation and mixed vegetation to preserve the existing; unfortunately some slopes are too eroded to be recover, life is not more visible in these cases.
Fires

During the dry seasons, June-September, fires can consume the forests of Quito, particularly those with eucalyptus trees. The eucalyptus not only absorbs easily the water from the ground, leaving the soil dry, but also has oily leaves which make fire’s expansion faster. The low density and the height of these trees are other reasons to make the fires uncontrollable. Some of these disasters have occurred along the slopes or on the borders of the gullies where eucalyptus are planted. (Picture 14) However, other type of vegetation on the slopes can also expand the fires but they can be more controlled, especially if it is low vegetation. During this period of time many fires occur, most of them provoked by the people.

Other risks

Many other problems can be found in the gullies and the areas around them. Sometimes when the rains are very heavy, the water rises up and the rivers overflow provoking floodings in the surroundings; it gets worse when the sewage system has a problem or is blocked (Picture 15). Probably one of the biggest problems is the insecurity and crime, the shape of the gully, the lack of appropriation of the space and the idea of garbage stores, have converted the gullies in insecure areas where crimes are committed.
The gullies as a system of the city

Source: Agua de Quito (fb page)
Picture 16. Plan of Quito 1735 (Taken from De Jojagal - Trabajo propio, CC0, https://commons.wikimedia.org/w/index.php?curid=21625157)
When analyzing a city, it should be thought as one thing, one system, one artifact. It is important ‘to view the city as a whole, no matter what concept to describe the city is used’ (Velde, R. and Wit, S., 2009, p. 56) because at the end, every element in the city should be connected to make the place work as one. The gully is an element present along the entire city and even though each of them has different conditions and problems, for this project, it is essential to understand the role of them as a system of the city; how it works and how it integrates with other flows. This second chapter describes an analysis of the gully system in relation with other systems of the city, mainly to the sewage system where channels; the mobility and accessibility because the “movement is the motor of a physical and visual experience.” (Velde, R. and Wit, S., 2009, p. 60) and this is one of the aims of the project, to enhance the soft mobility and therefore the experience while moving around the city. And to the green system to define how the integration with the existing green can be improved. The purpose of this analysis is also to clarify how an intervention of the gullies as a system can be helpful for the different ecosystems of the city; the gullies are by themselves green corridors with many living species that need to be protected within the urbanized area.
main interceptor
drainage
water treatment plants
urban border
gullies
The system of gullies inside Quito is part of the drainage system. They are the natural drainage canals of the city. Rain, gray and black waters go directly into the gullies (Scheme 3). As a consequence, the water is completely polluted, specially in the main rivers of the city. This contamination has caused many other problems. Citizens in general treat the gullies as garbage places instead of natural ecosystems; therefore, there is not only a lot of solid waste contaminating the water, but also the smell and animals influence in the quality of life of the people who live near by. Sometimes, the garbage has also caused the collapse of the drainage system, resulting in big floodings and displacements of the ground. Fortunately, the Municipality together with the Metropolitan Water and Sewage Company (EPMAPS), had developed a plan called “Program for the decontamination of the rivers of Quito” whose aim is to clean the water of the rivers before sending it to the main rivers of the country. To fulfill this goal, collectors and interceptors are being build next to the gullies (Scheme 4); once they are done, the urban residual water will go through these pipes and/or tunnels to water treatment plants which will clean the water and use it to generate energy before pouring it back into the rivers.
2.2 Gullies and mobility

Quito is a longitudinal city, around 50km from north to south and around 8 east-west. This condition has developed an urban fabric where the main avenues connect the city north-south, the secondary connections are transversal to these avenues.

Considering the complex topography, many gullies have been filled in to build the infrastructure, especially in the east of the city; most of the entrances from the valley to Quito are over filled ravines.

Same as with the main avenues for cars, Quito has mostly longitudinal bus lines to connect the north with the south, most of the time insufficient for the demand of citizens. Additionally to this main lines, more local bus lines exist, which connect the city from east to west and other areas not reachable by the main lines; however, the access to the gullies and some areas on the urban border is still very limited.

Quito is not a city for bikes, but in the last fifteen years around 60km of bike paths have been created, promoting and encouraging the bike as a way of transportation in a city thought and planned for cars. Nevertheless, this bike path is too restrained for the dimensions of the city, hence the demand of a larger, extensive and inclusive bike path which can reach more areas of Quito.
green areas
urban border
gullies
2.3 Gullies and the green system

The urban green index of Quito shows that the city has 20.4 square meters per person. These green areas include parks, squares, gardens, sport fields, stadiums and all the other green areas that are under the supervision and receive maintenance from the Municipality. The city has metropolitan parks, city parks and neighborhood parks. Green and public space is all over the city, on the urbanized area and the periphery, the problem is not the lack of green areas, but quality and security on them. Because of these problems, some parks have been converted into leftover areas.

The gullies are also part of these urban green, however, they are not really quality public space as they should be. Only few gullies can be considered as public and urban green in terms of the open accessibility and the good conditions that they have, like the newly projects mentioned in the previous chapter and Cumandá Park (Picture 20), which was built a few years ago over an already filled gully.

Along some gullies there are also lineal parks like Machángara (Picture 21) but due to the existent contamination of the water, these parks are not always friendly with the people and the environment itself.
2.4 Gullies, an isolated system

As a conclusion from the previous analysis, it can be said that the gullies are an isolated system of Quito which is little by little integrating into the rest of the city with the different restoration projects to recover the gullies that have been done. However, they are still not working as a system in terms of public space and/or green corridors, characteristics that should be developed in favor of the living species inside them.

It can also be inferred that the gullies are leftover areas that people do not visit due to its direct relation with the drainage system which causes a severe pollution of the water. In addition, the construction of streets over the gullies denies their existence and potentials. Hopefully, the new plan for the sewage system helps to bring more awareness on how important it is to preserve these spaces uncovered and nurtured. (Scheme 5)

From this analysis and conclusions, the goal of this project is to integrate the gullies into the city by enhancing and encouraging the use of soft mobility instead of cars, this way, not only the gullies are preserved but also green corridors can be created along the city for the movement of people and animals. By intervening the gullies, the aim is also to make people aware of the importance of the gullies for a better environment and quality of life.
2.5 Habitat of different species

Fauna

“Ecuador is one the five ’megadiverse´countries of the planet which natural heritage is reflected on the Metropolitan District of Quito that is shelter of 111 mammals species, being 13 endemic of the country and 11 in worldwide danger; 542 bird species, 92 amphibians, 53 reptiles and 21 fish” (City Hall of Quito. Resolution 349).

According to a publication in El Telégrafo newspaper, 50% of these native animals and also plants live in the gullies, therefore these spaces are considered the last redoubt of wild life of the capital.

With the goal of encouraging preservation and increase the knowledge of the citizens about their biodiversity, the “Secretary of Environment” have declared fifteen animal species as representatives of the city due to their biological and cultural importance (Picture 22). Among these representative species there are butterflies, birds, snakes, frogs, and others. Some of these animals “specially birds and insects have found refugee in the defiles of the capital. With the knowledge and the proper care, it is possible to find more than 90 species of birds, 60 types of mammals and more than 20 insects” (El Telégrafo, 2014).

The interest of the gully then, is not only on the complex topography and the green vegetation on the slopes but also about the great quantity of animals that can be heard and seen while walking through these valuable spaces; animals that are also in danger if the gullies continue being polluted or filled in, hence, the importance of restoring and preserving the gullies as the ecosystem they are.

Flora

Same as with the representative species of animals, Quito has seven emblematic plants and trees that were declared as representative because of its relation with the city and the people. Inside this list there are trees, medium vegetation and even fruit trees. (Picture 23) “The proximity of the city of Quito to the Equator line and the variety of heights on the peripheries (from the top of Guagua Pichincha to the canyon of Guayllabamba River) is the reason for the adaptation and evolution of around 18000 vascular plants from Ecuador. A lot of these plants still survive in the gullies and the river sides that cross the city, in the close valleys, in the Metropolitan Park and Itchimbia Park and other public spaces.” (Ruales, C., 2013, p.21)

According to Carlos Ruales, the problem is that the lack of knowledge about these variety and extensive vegetation have provoked the destruction of them thinking that they are just grass around the city. Actually, Quito has dozens of species name after its name, like Mimosa Quitensis which is an emblematic specie of the gullies or Salvia Quitensis, a plant that birds love (Picrure 24). More than 12 of this family are endemic from Ecuador, are unique and are in danger of extinction. Therefore, the necessity of preservation programs for this magnificent and unique vegetation.
The proximity to the Equator and the altitude, allow Quito to have different type of weather, which vary from the north to the south of the city creating different atmospheres and experiences as moving through the city.

There are four climate zones (Drawing 7):

a) Lower montane wet forest: characterised for temporary icing and heavy rains, around 2000mm per year or more. Streams in this area have water almost all year.

b) Lower montane moist forest: its considered the best climate zone for human and animal live. Moderate temperature.

c) Lower montane dry forest: microclimate variation depending on the height. Between 2000-3000masl.

d) Lower montane thorn steppe: very dry plains, ravines and valleys. Rains around 250-500mm per year. Characterized by dry soils. Reforestation programs needed.

The existence of these different climates influences also on the type of animals and especially the different vegetation along the city and the surroundings. For purposes of landscape projects, new green areas, gardens and others, the “Secretary of the Environment” created a list of the species that grow in each of the climate zones. (Tableau 1)
### Lower montane wet forest

<table>
<thead>
<tr>
<th>Native trees</th>
<th>Exotic trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chalán</td>
<td>Tilo</td>
</tr>
<tr>
<td>Aliso</td>
<td>Chilca rosada</td>
</tr>
<tr>
<td>Arrayán tola</td>
<td>Castó</td>
</tr>
<tr>
<td>Cedrillo</td>
<td>Araucaria chilena</td>
</tr>
<tr>
<td>Cedro</td>
<td>Yuco</td>
</tr>
<tr>
<td>Floripondio blanco</td>
<td>Sándala</td>
</tr>
<tr>
<td>Jaboncillo</td>
<td>Eugenia</td>
</tr>
<tr>
<td>Pusupato</td>
<td>Capulí</td>
</tr>
<tr>
<td>Nogal</td>
<td>Acacia púrpura</td>
</tr>
<tr>
<td>Palma de cera</td>
<td>Álamo plateado</td>
</tr>
<tr>
<td>Porotón</td>
<td>Álamo plateado</td>
</tr>
<tr>
<td>Pumamaqui</td>
<td>Cepillo blanco</td>
</tr>
<tr>
<td>Roble andino</td>
<td>Cepillo amarillo</td>
</tr>
<tr>
<td>Podocarpus sp.</td>
<td>Casuarina</td>
</tr>
<tr>
<td>Peralillo</td>
<td>Caucho</td>
</tr>
<tr>
<td>Polylepis</td>
<td>Eucalipto moneda</td>
</tr>
<tr>
<td>Lechero verde</td>
<td>Ciprés limón</td>
</tr>
<tr>
<td>Aguacate</td>
<td>Dracena</td>
</tr>
<tr>
<td>Chamburo</td>
<td>Frejolón</td>
</tr>
<tr>
<td>Chilca Blanca</td>
<td>Cucarda</td>
</tr>
<tr>
<td>Guantugcillo</td>
<td>Farol Chino</td>
</tr>
<tr>
<td>Cococumbi</td>
<td></td>
</tr>
<tr>
<td>San Pedro</td>
<td></td>
</tr>
<tr>
<td>Pauce Piramidal</td>
<td></td>
</tr>
<tr>
<td>Laurel de cera</td>
<td></td>
</tr>
</tbody>
</table>

### Lower montane moist forest

<table>
<thead>
<tr>
<th>Native trees</th>
<th>Exotic trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algarrobo</td>
<td>Araucaria norfolk</td>
</tr>
<tr>
<td>Arupo rosado</td>
<td>Falso arupo</td>
</tr>
<tr>
<td>Molle</td>
<td>Magnolia</td>
</tr>
<tr>
<td>Yalomán</td>
<td>Arupo blanco</td>
</tr>
<tr>
<td>Chalán</td>
<td>Cepillo Rosado</td>
</tr>
<tr>
<td>Aliso</td>
<td>Cepillo rojo</td>
</tr>
<tr>
<td>Arrayán tola</td>
<td>Fitósfero</td>
</tr>
<tr>
<td>Cedrillo</td>
<td>Fresno</td>
</tr>
<tr>
<td>Cedro</td>
<td>Grevillea</td>
</tr>
<tr>
<td>Floripondio blanco</td>
<td>Laurel ornamental</td>
</tr>
<tr>
<td>Jaboncillo</td>
<td>Liquidámbar</td>
</tr>
<tr>
<td>Pusupato</td>
<td>Morera</td>
</tr>
<tr>
<td>Nogal</td>
<td>Níspero</td>
</tr>
<tr>
<td>Porotón</td>
<td>Palma de chile</td>
</tr>
<tr>
<td>Pumamaqui</td>
<td>Palma abanico</td>
</tr>
<tr>
<td>Roble andino</td>
<td>Palma Fénix</td>
</tr>
<tr>
<td>Cholán</td>
<td>Piracanto</td>
</tr>
<tr>
<td>Sandala</td>
<td>Pomarrosa</td>
</tr>
<tr>
<td>Arrayán común</td>
<td>Sauce cuencano</td>
</tr>
<tr>
<td>Guaba</td>
<td>Trueno árbol</td>
</tr>
</tbody>
</table>

Tableau 1. List of vegetation for each climate zone, adapted by the author
### Lower montane dry forest

<table>
<thead>
<tr>
<th>Native trees</th>
<th>Exotic trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algarrobo</td>
<td>Araucaria norfolk</td>
</tr>
<tr>
<td>Arupo rosado</td>
<td>Falso arupo</td>
</tr>
<tr>
<td>Molle</td>
<td>Arupo blanco</td>
</tr>
<tr>
<td>Yalomán</td>
<td>Magnolia</td>
</tr>
<tr>
<td>Chalán</td>
<td>Trueno seto</td>
</tr>
<tr>
<td>Aliso</td>
<td>Cepillo macho</td>
</tr>
<tr>
<td>Arrayán tola</td>
<td>Cepillo Rosado</td>
</tr>
<tr>
<td>Cedrillo</td>
<td>Cepillo rojo</td>
</tr>
<tr>
<td>Cedro</td>
<td>Ciprés piramidal</td>
</tr>
<tr>
<td>Floripondio blanco</td>
<td>Eucalipto rojo</td>
</tr>
<tr>
<td>Jaboncillo</td>
<td>Fitósfero</td>
</tr>
<tr>
<td>Pusupato</td>
<td>Fresno</td>
</tr>
<tr>
<td>Palma de cera</td>
<td>Grevillea</td>
</tr>
<tr>
<td>Porotón</td>
<td>Laurel ornamenta</td>
</tr>
<tr>
<td>Pumamaqui</td>
<td>Liquidámbar</td>
</tr>
<tr>
<td>Roble andino</td>
<td>Morera</td>
</tr>
<tr>
<td>Podocarpus sp.</td>
<td>Níspero</td>
</tr>
<tr>
<td>Peralillo</td>
<td>Palma de chile</td>
</tr>
<tr>
<td>Polyplepis</td>
<td>Palma abanico</td>
</tr>
<tr>
<td>Lechero verde</td>
<td>Palma Fénix</td>
</tr>
<tr>
<td>Aguacate</td>
<td>Piracanto</td>
</tr>
<tr>
<td>Chilca blanca</td>
<td>Pomarrosa</td>
</tr>
<tr>
<td>Farol chino</td>
<td>Sauce cuencano</td>
</tr>
<tr>
<td>Guantucillo</td>
<td>Trueno árbol</td>
</tr>
<tr>
<td>Cococumbi</td>
<td>Araucaria chilena</td>
</tr>
<tr>
<td>San pedro</td>
<td>Capilí</td>
</tr>
<tr>
<td>Sauce piramidal</td>
<td>Acacia púrpura</td>
</tr>
<tr>
<td>Chirimoya</td>
<td>Acacia negra</td>
</tr>
<tr>
<td>Siete cueros</td>
<td>Álamo plateado</td>
</tr>
<tr>
<td>Guarango</td>
<td>Álamo verde</td>
</tr>
<tr>
<td>Llin Ilín</td>
<td>Cepillo blanco</td>
</tr>
<tr>
<td>Quishuar</td>
<td>Casuarina</td>
</tr>
<tr>
<td>Cholan</td>
<td>Caúcho</td>
</tr>
<tr>
<td>Sandala</td>
<td>Eucalipto moneda</td>
</tr>
<tr>
<td>Arrayán común</td>
<td>Ciprés limón</td>
</tr>
<tr>
<td>Guaba</td>
<td>Dracena</td>
</tr>
<tr>
<td>Mimosa</td>
<td>Frejolón</td>
</tr>
<tr>
<td>Laurel de cera</td>
<td>Cucarda</td>
</tr>
</tbody>
</table>

### Lower montane thorn steppe

<table>
<thead>
<tr>
<th>Native trees</th>
<th>Exotic trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algarrobo</td>
<td>Cepillo macho</td>
</tr>
<tr>
<td>Molle</td>
<td>Cepillo rosoado</td>
</tr>
<tr>
<td>Yalomán</td>
<td>Cepillo rojo</td>
</tr>
<tr>
<td>Aguacate</td>
<td>Ciprés piramidal</td>
</tr>
<tr>
<td>Chamburo</td>
<td>Eucalipto rojo</td>
</tr>
<tr>
<td>Chilca blanca</td>
<td>Fitósfero</td>
</tr>
<tr>
<td>Farol chino</td>
<td>Fresno</td>
</tr>
<tr>
<td>Guantucillo</td>
<td>Grevillea</td>
</tr>
<tr>
<td>Cococumbi</td>
<td>Laurel ornamental</td>
</tr>
<tr>
<td>San Pedro</td>
<td>Liquidámbar</td>
</tr>
<tr>
<td>Chirimoya</td>
<td>Morera</td>
</tr>
<tr>
<td>Siete cueros</td>
<td>Níspero</td>
</tr>
<tr>
<td>Guarango</td>
<td>Palma de chile</td>
</tr>
<tr>
<td>Llin Ilín</td>
<td>Palma abanico</td>
</tr>
<tr>
<td>Quishuar</td>
<td>Palma fénix</td>
</tr>
<tr>
<td>Laurel de cera</td>
<td>Piracanto</td>
</tr>
<tr>
<td>Cholán</td>
<td>Castór</td>
</tr>
<tr>
<td>Mimosa</td>
<td>Yuco</td>
</tr>
<tr>
<td>Guayaba</td>
<td>Eugenia</td>
</tr>
<tr>
<td>Guaba</td>
<td>Ceibo</td>
</tr>
<tr>
<td>Sandala</td>
<td>Jacaranda</td>
</tr>
<tr>
<td>Arrayán común</td>
<td>Ciprés limón</td>
</tr>
<tr>
<td>Guaba</td>
<td>Dracena</td>
</tr>
</tbody>
</table>
| Mimosa                     | Frejolón              | Carbonero             | Pomarrosa
Quebrada Cantana Gallo, a new experience
Picture 25. Quebrada Cantana Gallo, intervention
To develop this project, a specific gully of Quito and its surroundings, ‘Cantana Gallo’ is the case study, with the aim of transforming it and integrating it within its context. When analyzing and studying it, the gully is understood as an element, and when integrating within the urban fabric, it is improved as a system of the city. Quebrada Cantana Gallo is located in the western part of La Delicia, in between the urban-rural border. However, because of the urbanization growth, all the area outside this border is completely urbanized, leaving the gully inside the urban fabric of the city as a neglected area, which surroundings do not relate with it as the natural landscape it is.

Based on an analysis of the conditions of this gully and a established criteria to intervene on it, certain design principles are proposed towards a better quality of space, life and experience within the gully and its extension into the city.

The goal of intervening in Cantana Gallo is to change the image of a useless space for a green and natural space where people can interact, to connect it with the existing public space of the surroundings and further on, to use it as an example on how the relation with the gullies and their preservation can be improved by integrating them into the urban landscape. The design principles developed for this gully are replicable, extendible and adaptable depending on the conditions of the different gullies.
3.1 The gully as an element of the city, Cantana Gallo’s situation

Cantana Gallo is a gully located on the northern part of the city, at the edge of the urban border of “La Delicia”, one of the eight administrative zones of the Metropolitan District of Quito (Picture 26). It is approximately 4.29km long and is divided in three sections, the waterway is a stream that starts up in between the urbanized area and goes down to the river Villorita, at the boundary of the city (Picture 27). Even the profile and section of Cantana Gallo changes as it goes down, it can be described in general as a gully with “v” shape and variable slope, which is almost vertical everywhere and at few points has soft acclivity.

Along the gully different conditions can be appreciated, specially when being inside it. One particular and probably the most obvious, is the difference between borders and accessibility, Cantana Gallo is surrounded by houses and some of them are part of gated communities. Some of these gated communities have taken care of the gullies as if they were private, by cleaning and creating access to be able to walk through them. While the sides of the gully that are next to the streets are unmaintained and neglected, converting those sides of the gullies in waste storage points and sometimes, insecurity in the area. (Picture 28)
Another visible condition that can be felt and perceived is the micro-climate generated by the variety of vegetation founded along the slopes and on the border of the gully. A micro-climate that within being in the city, the perception can be felt as being in the forest or in a natural park not only because of the vegetation and weather but also because of the presence of other living species like butterflies and humming birds, animals that make the experience of being in the gully more enjoyable and interesting.

The micro-climate together with the complex topography and deep depression of the gully are characteristics that should be explored, exploded and preserved within the city. The gullies are each one a different world inside Quito and in order to know how to intervene them, to change the idea of garbage stores but also to integrate them to the city, an analysis of different conditions of the gully and the context is shown in the next pages; the conclusion of this analysis is the base for the proposed design of the project.
3.1.1 Borders of the gully
The maintenance of the borders is not the only problem, they are also associated with the access to the gullies. Along Cantana Gallo and the other gullies of the area of intervention different type of borders can be found. Gullies in general are public, therefore, the access is open for everyone, nevertheless, some ravines have restriction or limited access because of the risk they represent; especially when the slope is too steep, walls and fences have been built to avoid people going in. Even in this area most of the borders are accessible, the bad conditions do not invite people to go in, the spaces are destroyed and there are no facilities that allow the user to interact with the gully. Mostly, only the borders next to the gated communities are accessible and well maintained, the only problem is that they have become private gullies, making the access also limited for those living there.
3.1.2 Accessibility to the area
The present conditions of the gullies are also related to the accessibility to the area where they are located so people can go there and interact with these spaces. The surroundings of Cantana Gallo are crossed by some important avenues that connect the city from north to south and with other cities, unfortunately, to build some of this infrastructure, gullies have been filled in or closed to the rest of the city; meaning that all the facilities to get to the area are for cars, there is no a bike path around.

Public transportation is also very limited to this part of the city, in La Delicia there are more stations and equipment but in the closer area to Cantana Gallo only three bus stations are located, being only one part of the main bus lines of Quito. However, due to the location and already existing amenities, the accessibility can be improved by generating a bike path and pedestrian paths that connect the gullies, the existing public spaces and the rest of the city.
3.1.3 The existing green areas and public space
One of the aims of this project is to connect Quebrada Cantana Gallo with the existing public space and the other types of green that are in the surroundings. In general, as it is seen in the map, many facilities can be found. These are mainly local parks and squares where people can walk around the paths and use the different sport fields; these parks are sometimes close to schools or community areas, some of them are also next to the border of the gullies, as an extension of them, actually, they were built over the fillings of the existing ravines.

There are also green areas which conditions are deplorable, even they have access and paths, people in the area do not use the equipment; they describe these places as unsafe spaces that they do not visit. Some of these neglected areas are eucalyptus forests, and others are just empty lots in between the urban fabric; these spaces are green areas inside the city that can be connected to the gullies since some of them are next to them.

The focus of this proposal is Cantana Gallo, however, there are three more gullies in the area that are considered for the connection and extension of the project in order to create a new system of urban green within the urban fabric.
3.1.4 Different conditions

- eroded
- steep
- eucalyptus forest
- next to houses
- next to street
- slope with paths
- next to a park
Each gully has its own characteristics, shape, deepness, etc., but most of the time the same conditions are present in different ways. Usually, the slopes of the gullies are covered by mixed vegetation, nonetheless, some of them are also eroded and the damage is so big that vegetation can not grow back there. In general, the vegetation is short-medium on the slope but sometimes eucalyptus trees are planted, killing other vegetation of the area.

As mentioned before, Cantana Gallo is in between the urban fabric, therefore, houses are next to them using sometimes the slope as an extension of the house. Not all the gullies have access but few paths can be founded through the gullies, specially in those next to the houses.

The gullies that are not next to houses, are either next to parks or streets, in this situation, gullies are mostly a garbage place, none maintenance is visible and the accessibility is limited.
3.1.5 Integrating-connecting-extending

- access to the gullies
- connection gullies-other spaces
- public space
- parks/squares
- existing green
- gullies
From the analysis showed, it can be inferred that the conditions of the gullies, despite having the same basic characteristics (border, slope, water) vary from one to the other, however, it is common among them the lack of accessibility, maintenance and connection with the rest of the city; with clear exceptions like some of the gullies next to gated communities. Also, it can be noticed that there is a good presence of parks, sport fields and different public space along the area.

Hence, the goal of this project is to change the image of the gully by making it more visible and accessible so people can interact with it; with soft interventions, mainly on the border, the purpose is to enhance the sense of appropriation of the space in order to preserve this natural landscape. At the same time, by using the gullies as an element of a new green system, the aim is to integrate them into the urban fabric by creating connections (green corridors and bike paths) between the gullies, the public space and other green areas.
3.2 The criteria behind the design

The intervention and design proposed for Quebrada Cantana Gallo aim to be an example for other gullies of Quito. The ideal of this project is to use this gully as a starting point of a progressive strategy which goal is to create a new urban green system within the urban landscape.

As known from the previous topics, the gullies have different conditions despite their similarity, therefore, the proposal of a criteria that will be the guide for the design in general terms, which means that no matter in which gully the intervention is done, this established criteria will be the base for the design.

Taking in account topics as accessibility, vegetation, topography, relations, conservation and others, the developed criteria will further on lead the design of Cantana Gallo and its surroundings.

3.2.1 Accessibility-topography-conservation

One way of integrating the gully into the city is by eliminating the walls or other physical boundaries that exist between them to have more access to the gully so people can also be part of them. This accessibility is determined mainly by the steepness of the slope, making the border more accessible, whereas the slope has limited natural paths that follow the topography; the access then is mostly in the higher point of the gully, while the bottom of it is rarely accessible, however, this can change depending on the acclivity of the slope.

Another reason to limit the access to the border of the gully is to enhance the conservation and preservation of species, they are better conserved in the enclosed part of the gully; the accessibility follows a gradient that goes from urban (people can stay and interact, it is connected to the city) to protection area (minimum access, specific points), with a buffer zone in the middle to create an in between zone that act as a cover of the protection area and at the same time gives the user the possibility to go through the gully (Scheme 7) and experience the space.
Scheme 7. Section to describe the accessibility related to the topography and conservation of the gully.
3.2.2 Vegetation-program-views-accessibility

Variety of vegetation is used to create boundaries, divisions and to show the transition from one place to another. The vegetation will be selected depending on the function of the space, for example, to mark the border of the gully a line of trees is used, while as going down to the gully, more dense vegetation is planted. Along the slope, a mix of new and existing vegetation should be used, specially in the eroded slopes that can still be changed (Scheme 8).

By using native species along the gully, different micro-climate, views and atmospheres are generated, it is essential to take into account which species grow in the different climate zones so the vegetation used can grow up.
3.2.3 Vegetation-maintenance

The use and location of the different vegetation is also related to the maintenance of it. It is important to consider who will take care of the gullies and how often the vegetation needs to be cut. Complementing the accessibility and the conservation criteria, the higher point of the gullies will have vegetation that can be easily controlled or that only needs few cuts during a certain period. Whereas, the vegetation along the slope and closer to the water will be wilder, maintenance should not be required here (Scheme 9). Along the paths of the gully some maintenance can be needed but it is preferable to use vegetation that reaches a medium size without human control. The vegetation should be planted when needed; along the slopes there is vegetation that is still alive, some other can be replaced. It is important to consider that only native species should be planted to preserve them.

Drawing 8. Vegetation in time, related with the maintenance

Scheme 9. Maintenance of the gullies
3.2.4 Relation houses-gully

Scheme 10. Section of the different connections houses-gullies
In general, the gullies are close or next to the housing complex of the area, part of this criteria considers the relation houses-gully as a base for the design of the project. The use of vegetation on the border of the gully is not only to mark boundaries, but also to improve the livability of the people on the edges of the gullies; this tree line will also show the access to the gullies and invite the people to be part of them, this way, the relation people-nature and the appropriation of the space is also encourage. When intervening on the slopes directly connected to houses, the gullies can be used as an extension of the edifications so they can be treated as private and can be better maintained. The access to these gullies is direct and less limited in this condition, people can also be connected through paths on the slope and use the gully as a communal area.

3.2.5 Connection-extension

Use the existing public space and the gullies as elements of a green network which will be connected by green corridors using the existing urban fabric. These corridors will provide facilities for cyclist and pedestrians so they can move easily between the existing amenities and the gullies. The purpose of these connections is also to encourage the use of the already existing public space, therefore, the activities of the gullies will be more related to the conservation and preservation of species. (Scheme 11)

To integrate the gullies into the urban fabric, the streets that lead directly to the gullies will be used as the corridors of access. The user should be able to experience how the street extends into the gully and creates points of access to the ravines. Another way of integrating the gullies into the city is with the use of other leftover areas in the surroundings. These areas will be used as an extension of the gully where other types of program can be introduced. (Scheme 12)

By generating the corridors, the extensions of the gully and the extensions of the city, the integration is done in two ways: the gully into the city and the city into the gully. This double integration will reinforce and improve the relation city-nature while providing the citizens better spaces to use.
Scheme 11. Section to show the connection with the existing
Scheme 12. Section to show the expansion of the gully.

Legend:
- **urban fabric**
- **existing public space**
- **gully**
- **extension of the gully into the city**
- **extension of the city**
- **access to the gully**
- **access corridors**
- **access points**

Diagram details:
- Existing facilities
- Extension of the gully
- Access to the gully
- Extension of the city
- Urban fabric
- Existing public space
- Gully
- Extension of the gully into the city
3.2.6 Reforestation-preservation

Replacement of eucalyptus trees is proposed as a solution for fires in dry seasons in the whole city and also as a way to enhance the preservation of native species in their natural habitat, the gullies. The eucalyptus is known for being a tree that does not allow other species to grow next to it because it absorbs all the water from the ground. In Quito, it can be found in gullies and other green areas. Part of the criteria is to promote the reforestation of the eucalyptus forest, which should be done in phases so the whole forest is not cut down completely in the beginning. (Drawing 9)

By cutting the eucalyptus down and replacing them with native species, more diverse microclimates and atmospheres can also be created. The wood of eucalyptus can be used for indoor and outdoors elements, like doors, parquet, furniture, and others. The aim of this intervention is also to use the wood to create the different elements of the design, like seats, wooden floor of belvederes; at the same time, the wooden industry has benefit and it generates work.

Drawing 9. Process of eucalyptus replacement
3.2.7 Purification of water

To complement the plan from the Municipality to clean the rivers and gullies it is important to have a filtration and purification process at the water source of the gully. Helophyte plants can be used for the purification of water. Since water pollution is one of the biggest problems of the gullies, having ponds at different points can also help to make people aware of how important is to keep the water clean, and at the same time, bring back the relation water-people. To have clean water will also benefit the animals and plants who live in the gullies. In the future, the gullies can also be used to retain and storage water.

3.3 Defining principles

The proposed criteria are the base for the design of Quebrada Cantana Gallo and its surroundings, especially when referring to the gullies. From this criteria, the goals and intentions for the area, certain design principles have been created. Considering that the conditions of the gullies are different but with the same basic characteristics, the purpose of the proposed principles is that they can be used in different parts of the gully or different gullies just by adapting certain things, like the dimensions of the interventions or the use of different vegetation but maintaining the same base, therefore, these principles are adaptable depending on the conditions of the gully. The design principles developed on the coming pages are created for the area of study, however, the goal is to use them further on in other gullies so to expand the new green system proposed and integrate it to the urban fabric; the principles are then, not only adaptable but also replicable and expandable and can be used in mostly the whole city, especially if the gully is within an urbanized area; for those gullies on the slopes of the mountains only few of the principles can be applicable due to the complete different context and conditions.
3.3.1 Intervening Cantana Gallo

As mentioned before, the purpose of this project is to intervene first on the gully as an element of the city and from there, expand the interventions to the surroundings to activate new connections and create new experiences within the gullies and the urban fabric.

The intentions for Cantana Gallo is to activate its use and preservation as a natural space within the city. To do it, the accessibility is improved by creating a bike path that will connect the different existing public space on the surroundings, Cantana Gallo and other gullies of the area. By doing this, people will be forced to cross the gullies and by placing there activities more related to the nature, the objective is to create awareness of how important is to preserve these spaces. One of the reasons for the no appropriation of the gullies is the lack of accessibility but also the lack of facilities along them. Due to its complex topography and natural shape, the use of this spaces become more difficult, however, the borders can usually hold certain programs for the people to use the space.

In this proposal, mainly the border is intervened but also some interaction with the gully as an enclosed space in the middle of the city is created. The interventions on the border will be in general botanical gardens, with variety of native and endemic species of the city, natural playgrounds to encourage kids since little to be more related and connected to the nature and areas to stay and interact with nature. (Drawing 10)

To develop this project it is important to work directly with the community of the area, so they can feel the space as theirs to take care and be part of it, their involvement is crucial for the success of the project; the Municipality will also have an important role on the intervention, not only in the execution but also for the maintenance of the area. Other organizations like the schools of the area can be part of the execution of the project, they can help with the plantation of new vegetation, adopt one tree or plant and take care of them, this way less maintenance from the Municipality is needed and more commitment from the community is encouraged to keep the gullies more nurtured and preserved.
Drawing 10. Master plan Quebrada Cantana Gallo and surroundings
3.3.1.1 Appropriation of the space

To change the misconception about the gullies is a process that can take a lot of time, therefore, it is important for this project the involvement of the community to activate the use of the proposed design but also to take care of it. Considering the community as the most valuable agent of the intervention, the design also focuses on how the relation house-gullies should be improved.

Around Cantana Gallo there are two types of houses: one next to the gully, one close to the gully with streets in between. The following principles give several options on how these types of houses can use the gully in benefit of them.

By using the slope as private, the houses next to the slope can make their own interventions, private gardens or explode the area for urban farming. However, general conditions will by applied, like the amount of area that can be used depending on the acclivity of the slope, specially for urban farming. When doing gardens, the use of native species will be necessary. These houses can also create an extension of their edification into the gully, the use of specific materials will be a condition, like for example eucalyptus wood for a wooden deck. (Drawing 11-Drawing 14)

For the houses close to the gullies the slope can not be use as private but other facilities will be implemented on the border of the gully. Areas to stay, to seat, belvedere to enjoy the view of the gully and the city are some of the options for this side of the gully. To make the relation house-gully more clear, trees to mark the border will be planted inviting people to use the space. (Scheme 15)

The use of new vegetation is proposed to generate micro-climates along it, however, some parts of the slope are too eroded that vegetation do not grow up there. This eroded slopes can work as rappel or climbing walls depending on the steepness and soil. For both sides, the use of terraces is proposed, with two intentions: protect the slope from erosion and displacement and to create different spaces to interact with the gully. The two sides of the gullies are visually and/or physically connected to enhance the relation between the surroundings.
improve the quality of space
mark the border

Drawing 11. Border-gardens

belvedere

urban farming

Drawing 12. Belvedere-urban farming
Drawing 13. Paths-extension

Drawing 14. Rappel wall-terraces
3.3.1.2 Accessibility to the gullies

Besides the people living on the edge of the gullies, the rest of citizens should be able to re-establish the connection people-nature inside the city. With interventions at the end of the street as an extension of them into the gully, the project aims to lead people towards the gully; vegetation as landmarks will be used to reinforce and mark the access.

The implementation of a bike path that will connect the gullies with the existing public space will follow this leading street to access to the gully. When there is enough space, green corridors with trees and other vegetation will be done (Drawing 15) along the bike paths. If the street together with the sidewalks are too narrow, vegetation can be used to cover the long big walls of the area (Drawing 16) as a continuation of the green corridors.

In some specific points, the extension of the street into the gully will be a bridge to give the user the possibility to cross to the other side of the gully (Drawing 17). The location of these bridges will follow the urban fabric.
Drawing 15. Extension of the street-green corridor

Drawing 16. Extension of the street-wall vegetation
Natural paths, where the topography can be intervened, are also proposed to have more access to the gullies. These paths can go through wild vegetation, however, they are very limited for the conservation and preservation of the different species living in the gullies. The purpose of the extensions of the streets into the gully (Scheme 16), is not only to integrate the city into the natural landscape but also to generate ecological movement through the proposed green corridors.
3.4 Experiencing the space
One of the most impressive characteristics of a gully is its deepness and the micro-climate that can be perceived when being inside; the project uses these features to generate different experiences and atmospheres while using the space.

The intervention on this part of Cantana Gallo is mainly on the border of the gully. Applying the proposed principles, a botanical garden in the middle of the bike and pedestrian path is created for people to experience the micro-climate while passing through, this will also make people reduce the speed of their movements because of the organic shape of the path; at the same time, by using native vegetation, awareness on why to preserve the gully is incremented.

Bird view points are proposed so people can sit and stay to interact with nature while being in the city, again, another way of persuading the awareness of the preservation of the gully for a better quality of life of the citizens and other living species. The use of existing infrastructure allows the project to have spaces for a variety of uses, multiple use squares are created as part of the program. The slope in this area is steep but some paths are created, these paths are the natural trails that will let people interact more with the gully, its topography and wild vegetation.
The intention of the botanical garden is not only the awareness of preservation of natural species, but also, to give people the opportunity to feel in another space while being in the city. The characteristics of the gullies allow the citizens of Quito, to interact directly with nature in the daily life. With the creation of these “oasis” within the city, the livability of the people of the area can improve and the air of the city is renew. These spaces allow people to rest from the urbanized area and life.
A natural playground made from the eucalyptus wood is design to give space for the kids to interact since little with the nature to encourage preservation. The path allows people to take several routes, a border route to experience the deepness of the gully, the botanical garden path or going down into the gully.
Using the existing abandoned structure of the area, a multiple use square is created to allow people of the area to have different activities there. It is a space that can be use just to enjoy the view or the create events for the neighborhood. The relation with the nature here is more visual than physical and this is the only space along the gully that has a different program than preservation.
3.4.1 Encouraging preservation

The preservation and conservation of the native and endemic species of Quito is a fundamental part of the proposed project, therefore, all the vegetation used is native and depends on the climate zone that the project is located: lower montane thorn steppe.

The goal of using this type of vegetation is to make people aware of the ecological potential that the gullies represent and why it is important to preserve them as ecosystem instead of covering for the extension of the city. At the same time, by using native vegetation, extinction of species is prevented; it is known that it is already rare to find some of them, the creation of nurseries and botanical gardens will help to maintain alive some of these species.

The climate zone where Cantana Gallo is located has specific conditions, hence, specific vegetation grow there, from the list shown before, the project uses mostly trees and to generate different atmospheres (Tableau 2) and medium plants with flowers to make bird view points.

Other plants like shrubs and small plants are used for the limitation of spaces.

<table>
<thead>
<tr>
<th>Name</th>
<th>Dimensions</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yalomán</td>
<td>h=5</td>
<td>mark seats</td>
</tr>
<tr>
<td>Delostoma integrifolium</td>
<td>w=12</td>
<td></td>
</tr>
<tr>
<td>Cholán</td>
<td>h=10</td>
<td>border line</td>
</tr>
<tr>
<td>Tecoma stans</td>
<td>w=5-10</td>
<td></td>
</tr>
<tr>
<td>Guaba</td>
<td>h=7</td>
<td>landmark</td>
</tr>
<tr>
<td>Inga insignis</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Ñukchu</td>
<td></td>
<td>bird view</td>
</tr>
<tr>
<td>Salvia quitensis</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tableau 2: Native species used in Cantana Gallo
4 Expanding the experience
Picture 29. The integration of the gully into the city. (Taken from Agua de Quito, facebook page. Modified by the author, 2016)
Quito ‘is a city undergoing a profound transformation process. The axes directing a radical change toward modernity respond to the problems and needs of metropolitan areas with similar characteristics in the Region. The responses to such needs are doubtlessly summarized within the concept of the right to the city, consecrated in an innovative fashion in our country’s Constitution, conceived to promote citizen access to universal, efficient and sustainable mobility; access to safe and quality public spaces; access to equipment and infrastructures for everyday enjoyment; living in a healthy environment, in a territory that is a place of pacific coexistence for the expression of multiple cultural expressions, inherent to a historic, thousand-yearold, yet still modern city.’ (Barrera, A. 2012, p.14) Quito is a complex city, that as Barrera said, is in a process of transformation, not only with the construction of the metro but also of many other infrastructure projects which are mainly thought for cars. Therefore, the focus of this project on the restoration and integration of the natural landscape with the urban landscape, by exploding the different values of the gullies in order to improve public space, soft mobility and livability of the people. By using the criteria and design principles of Cantana Gallo, the aim of this project is to use this gully as a starting point of the integration of natural landscape within the urban landscape. In this chapter, it is shown how the intervention in Cantana Gallo can be applied and extended to connect the rest of “La Delicia” and in an ideal future, the city. A progressive strategy that goes from local to city scale which involves different stakeholders and interventions is proposed for the achievement of a new urban green of Quito.
4.1 A progressive strategy, from local to the city
The final aim of this project is to use the design of Quebrada Cantana Gallo to extend the integration of the natural landscape into the urban landscape as a progressive strategy that will go from local scale to city scale, from short to long term. Different interventions in specific gullies will be held locally and in short periods of time, to further on, expand them into the different administrative zones and in long term, create a new urban green system that integrates most of the gullies of Quito within the existing urban fabric.

The local interventions can be done at the same time, in that way, the creation of the new urban green will take less time and can be easily connected and integrated. With these local interventions, the aim is to change the image of the gully and to activate the surroundings of it by making people use the space. Whereas when intervening the administrative zone, the aim is to connect the existing public space and the amenities of the area to create a more useful and accessible green network.

In the city scale, the ideal is to integrate the gullies to the city as a new green system that can be use for further uses like water storage. By integrating the gullies, also a better integration in terms of soft mobility and ecological movement is proposed.
4.2 La Delicia, intervention zone

La Delicia is one the eight administrative zones of Quito, located at the northern part of the city. Along this area there can found different amenities like one of the biggest markets of the city called “La Ofelia”. The final bus stop of one of the main lines that connects the city from north to south. It is close to “Bicentenario Park” and the bike journey of Sundays starts in this administrative zone. (Drawing 22)

It is also a strategic point of connection between Quito, its surroundings and the cities of the north of the country, actually one of the two inter-cities bus terminals of Quito is located here. The connection to the Panamericana highway that connects the entire continent also crosses this area.

Additionally, many different parks and public squares are in the area, according to the article “Zona Norte es la más verde” of 2011, La Delicia was the second administrative zone with the highest amount of urban green in Quito. Unfortunately, not all these urban green is in good condition; along La Delicia many leftover areas, besides the gullies, can be found.

Within this project, the aim is to connect the existing facilities of La Delicia with its gullies and the rest of the city.
main avenues

gullies

existing services

urban area

Leftover areas

Polluted gullies

Bus station (country)

Bicentenario Park

Bus station (city)

Bike path sundays
4.2.1 Expanding the experience

Using the criteria of the connection-extension and the design principles proposed, the goal in medium term of the project is to expand the experience of Cantana Gallo to the rest of La Delicia. This expansion can be done in two ways.

a) Extending the already proposed green corridors towards the rest of the existing public space of the area and/or,

b) To intervene in other gully of the area which will also be connected to the existing public space in its surroundings. By doing this, in a longer period of time, all the connections from each gully will reach each other.

For this part of the project a combination of the two options is proposed. The goal is to use the connections created for the integration of Cantana Gallo to reach other facilities, like the market while at the same time other gullies, like Quebrada Grande for example, on the western part of the area can also be intervened (Picture 30). The final goal is to connect the bike path to Bicentenario park, and from there get to the central bike path of the city. These connections will be green corridors that will improve the system of soft mobility and the ecological movement within the city.

To create these connections it is important to study the topography of the city and the urban fabric in order to implement the bike path and in some cases, take out space for the cars. In this scale of the proposal, the Municipality, other organizations and the community play an important role as stakeholders. The Municipality for the execution, other organizations like cyclist groups to support the extension of a bike path and the community, especially the people from the market, to be involved and approve the interventions so they can take care of the new generated spaces.
Picture 30. Expanding the experience of Cantana Gallo
4.3 The new green system of Quito

As the last part of this design project is how to use Cantana Gallo as an starting point of a new urban green system of the city. The ideal is that while the experience of Cantana Gallo is expanded within La Delicia, where Cantana Gallo is located, another gully in other part of Quito can also be intervened. This gully will be integrated within its immediate context and use the proposed design principles as base for its plan. From there, this gully will also continue expanding its connections to the rest of the city.

In long term, the objective is that Cantana Gallo, the existing restoration in the south and the new gullies intervened reach to each other’s connections in order to create a new urban green system of the city. (Picture 31-Picture 33) Hence, each gully intervened will be the local starting point of the progressive strategy proposed with one common goal at the end: the integration of a new urban green system within the urban fabric. A system that integrates the gullies into the city and the city into the gullies and by using the existing facilities of the city, like parks, squares, boulevards, and others, gives the citizens a new and expanded bike path connection and green corridors to enhance soft mobility, but also the relation city-people-nature.
Picture 32. Replying the principles

Picture 33. Ideal future of the city
With this new urban green system and the implementation of extended bike paths and connections through the city, the project pretends to reach the whole community of Quito to be the user of it and get benefits from having more green corridors within the urbanized area. However, the city can also gets benefit itself, not only in terms of mobility by encouraging the use of other type of transportation and giving the facilities to do it, but also in ecological and socio-economical terms.

The gullies of Quito are the “house” of different animals and plants and by encouraging their preservation and keeping alive these spaces, the biodiversity is also protected. At the same time, the gullies can be used for other purposes like water storage in the future when the new drainage system is completed.

And in socio-economical terms, with the implementation of new routes and connections can also be used for the creation of new economic activities along them, this way the city will give other kind of facilities to the users of this system. And on the other hand, by having an extended and integrated system that will always be active, more security along Quito can be generated, especially in the gullies.

For this stage of the project and the continuous maintenance of it, it is important to involve the Municipality as the main executor of the project, the citizens as the users and private companies to engage and collaborate in the creation of this new network, and why not, use it for other purposes.
improve the quality of space
mark the border
border-garden
natural landscape urban landscape
improve the gullies
gully extension street existing public space
improve the city
Conclusions

improve the gullies

improve the city

gully  extension  street  existing public space

natural landscape  urban landscape

Connection existing facilities
The development of this project started as how to change the image of the gullies so people can use and respect them instead of continue treating them as garbage areas. Now, it can be said that the first thing that the people of Quito needs, is to know that the gullies are source of life that should be preserved. It is really important to create awareness on the citizens about all the ecological values of these spaces an how profitable is that for the people and the entire city. The misconception of the gullies as holes in the ground that are for waste disposal needs to change as soon as possible, otherwise, the gullies will never be considered as spaces to stay or interact. Therefore, it can be said that the community involvement is essential for this project, people need to understand what are the gullies, why they should be kept as open spaces and how can they interact with them. Even the Municipality will be the entity doing the interventions, the community needs to be consulted and involved since the beginning to enhance the appropriation of the space, and from there the attachment to the gullies as theirs. Quebrada Ortega is a good example of this process of intervention. The community started its restoration and now they take care of the gully because it belongs to them. Projects and experiences like this, should be taken into account when designing for other gullies.

It can also be concluded that the gullies are extremely complex spaces that because of their ecological values and geomorphology should not be intervened to change them as spaces. The interventions should be done towards its protection and preservation both in shape and habitat. The gullies are spaces of the city associated with different risks, it is important to consider all these different situations when designing and proposing interventions. This project relates more to the erosion, preservation of species and the interaction people-nature, however, it should be extended and take other risks into consideration. Because of its location, Cantana Gallo is not considered extremely vulnerable but there are gullies, especially in the south, that will need more and different principles to use for restoration plans. Hence, it can inferred that the principles are replicable and adaptable for other gullies, but depending on the conditions of other ravines, these principles should be extended and incremented for future uses.

The principles created for Cantana Gallo are adaptable for other gullies, but especially for those within urbanized areas. For the gullies on slopes of the mountains, complete different principles and interventions must be done since the context is extremely different.
The interventions and design principles are more located on the borders of the gully than in the slope or next to the water bed. This is because of two reasons. First, because of the preservation and conservation focus, it is important to have the activities and facilities for people on the borders and the urbanized area so the protected area has no direct influence from the city. And second, because in this specific gully, the shape does not allow to have direct contact with the water, the slope is so steep that there is no a water side; however, in other gullies this can be completely the opposite.

The geomorphology of the gullies is limiting when designing, therefore, for this kind of projects it is essential to be part of the space, understand it and design thinking on the natural processes of the slopes related to erosion. Due to this, the interventions on the slope are minimal and always thinking on how the slope can be protected.

Related to the integration and connection with the existing public space of the city, it is important to mention that the topography of the city can create conflicts when designing. It is important to study deeply and in detail how the connections should be done so the mobility can work as a system of connection within the different heights of the city. In this project, the extension of Cantana Gallo into La Delicia tries to give a guideline on how this route should be, however, it should be re analyzed in terms of mobility-topography.

The same situation is for the entire city; the proposal of the project is how to integrate the new urban green system in the city, and in the local scale these corridors follow specific routes connecting different spaces and using the urban fabric. However, for the administrative zone and the city scale the plan is more blurred and a draft that needs to be studied more for its success.
Future steps

After generating all this different knowledge and base for plans that can be executed in Quito, it can be said that this strategy can be considered as a path that extends both ways. (Scheme 17)

![Scheme 17. Strategy continuity](image)

The continuation of this project is not only about proposing the strategy to the Municipality as consideration for future plans for the gullies, but also about the doors that it opens for future development within this strategy. The next steps can either study in a deeply way all the benefits for the city as a system and how to implement them and may be expand them to other areas of Ecuador, or to focus on a smaller scale and study an specific animal or plant specie in danger of extinction that lives in the gully and how his habitat can be improved, protected and preserved for this specific specie to be alive.
References
- Municipio del Distrito Metropolitano de Quito. (2011) ...en las faldas inmensas de un monte... Las laderas occidentales de la ciudad de Quito. Empresa Publica Metropolitana de Agua Potable y Saneamiento Ambiental (p. 10)