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SUGESTED DEVELOPMENT OF QUITO

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By

Fernando J. Correa Sevilla

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Professor Malcolm FitzPatrick, IQP Advisor

Abstract

Quito is a cosmopolitan city, a complex city with complex problems. This IQP will try to suggest and alternative to the popular settlement problem, one of its principle problems. The alternative, to present urban expansion, discussed in this project develops a satellite city and supporting measures, such as implementing a complete infrastructure and basic services, to increases the quality of life of the future settlers. To perform this it must be done a compressive analysis of the city, its problems and it components. Also an in-dept analysis of the popular settlements must be done.

Acknowledgments

Thank you, Professor FitzPatrick for shearing your support and knowledge with me. Also thank you for giving me an opportunity to be useful and active in the roll of being a good citizen of Quito, by making me realize that there are critical problems that have been over looked, and something must be done to solve this problems to give a higher quality of life to the people of Quito.

Thanks to the municipality of Quito for shearing the data needed to complete this Project.

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Chapter 1: Introduction, Background and Project Statement

1. - Introduction

Every city in the world has it own history of planning and development. Since each city grows over time, there is no perfect city. Each city is set and determined by its natural constraints. One problem is that 400 years ago people did not have the knowledge that we possess now.

It is inevitable that every city has not been developed in the right way, since its beginning each city has had to adapt to overcome over the years the problems that were encountered, as well as to incorporate acquired new technologies.

This project is not a criticism of the past development methods of Quito, but an analysis of its past in order to understand its present conditions and constraints, and only by understanding both past and present can we understand why this city has grown in such a manner, and by using this information we can try to set a better plan of development as we move towards the 21st century.

What are the problems that Quito is facing today? Its goal is for the city to be in an environmental harmony, in order to give its citizens better quality of life.

Quito's main problems are in the areas of transportation, zonification, resources, endangerment of the environment for human and the ecosystem, and population expansion with uncontrolled immigration and settlements that contribute to an explosive growth of the population in Quito. The only way to solve these problems is to study the past, analyze the present, and then search for a correct way of planning the future so that we do not commit the same mistakes. It is only by knowing the past and understanding the present that we can begin to see how to create a better future for our city.

The goal of this project's is to determine a plan to increase the quality of life of the people of Quito by creating a Satellite city that will accommodate the people of the popular settlements.

1.1. - Overview of the past

Spaniards arrived in Ecuador in the late fourteen hundred and early fifteen hundreds. In the Spanish tradition they established the new city of Quito over the ruins of the defeated Inca-Quitu-Cara city. Since then and until 1900, the city has grown in an orderly fashion.

Originally, the country's economy was based on agriculture. Farms surrounded the city; the farm workers lived near the farms and the landowner lived in the center of the city. This pattern of growth continued until the city reached it natural boundaries, the mountains surrounding its valley. Then the city had to continue developing only in a longitudinal way, along the valley.

In the 1970's oil was found in Ecuadorian soil, and the petroleum boom was created. This caused a transition from an agricultural Ecuador to an oil producing Ecuador. Ecuador's economic growth caused the Quito to grow, improving services and becoming more modern; however, the planners did not consider the massive attraction of people from other provinces and the surrounding countryside. This produced an excessive migration. Then the question became, "We have so many people but the infrastructure and services were not planned for such growth, so what are we going to do?" The new immigrants could not wait and continued to move into Quito, settling in the peripheral areas.

1.2. - Overview of the present

Lately, the city has been struggling to keep up with the 20th century. Although the rate of growth has decreased, the problem still exists. The principal problem today is the uncontrolled illegal settlements of people in the surrounding areas. In these locations, settlers have little or no services and infrastructure, such as water, electricity, sewerage, transport and garbage collection. The results are that people are living in precarious conditions with extremely low quality of life.

Another problem is the spatial growth due to the natural restrictions of the land. The city has two choices: develop vertically, or migrate to the surrounding valleys. Zonification is another problem because some residential zones are far from the job producing zones, which are industrial and commercial zones. Transportation is another problem. The current increase of population causes a great need in public or private transportation, but the linear layout of the city causes too much traffic congestion.

1.3. -Criteria and Problem Statement

It is important to establish that urban areas are entering into a new era, and that cities become modern in a world of globalization. Quito must find a way to be competitive and enter the 21st century, and have a higher quality of life for its settlers. The objective for this project is to make Quito a better place to live and to be competitive with other cities.

This can be achieved by suggesting an alternative plan of growth for Quito.

There are two choices that the city has, one is grow vertically and the other is to expand into the surrounding valleys (not the hillsides) as satellite communities. Analyzing these choices is beyond the scope of this project; this project is to solve one of

the major problems that Quito is suffering, popular settlements(this problem will be discussed in detail in the following chapter). In particular this project concentrates on a more humane perspective, which should provide a higher quality of life its settlers.
The regional government should analyze whether the city should develop in a horizontal manner or develop vertically, if it's not already working to solve this problem.
To solve the of the popular settlements in Quito is the main concern of this project; one needs to study the past growth and what have been the driving forces for the city to develop that way. Then it is necessary to study the present situation and the natural and unnatural restrictions.

1.4. - Overview description of Quito.

From a topographical point of view, Quito is situated in the Ecuadorian Andes, in a valley between the Occidental and Oriental Mountain ranges, called the valley of Quito. Quito has an urban (city) surface of 19,136 Ha, and a suburban (areas surrounding the city) surface of 387,448 Ha. The city is located at 2,800 meters above the sea level. The present city of Quito has an estimated population of 1,361,228 (1997) people and 258,439 (1995) in the suburban area (Quito en cifras, 1990). The city of Quito is divided in to 20 parroquias (parroquias are subdivisions in a zone), and the Metropolitan Quito (not counting the city) is divided in to 24 parroquias. The city of Quito has a rate of growth of 2.99%(1982-1990) (Quito en cifras, 1990)

Immigration and the excessive growth are the main problem in the city of Quito. It is estimated that in Ecuador the urban population will grow by 70 % of the total population by the year 2000, meaning that most of the people will be living in the large

urban conglomeration (Migration rates has been from 2.5 % and 1.1% per year, between 1982-1990(Quito en cifras, 1990)). Migration is a problem because these poor rural people do not have enough resources to afford housing in the city, and they do not have the qualifications for jobs that will provide them with the income. To find a place to live they invade land, or buy it from illegal land dealers, and settlers overright on this land. However this land has not been urbanized, meaning it lacks infrastructure and services, forcing the "squatters" to live in a substandard way.

Lack of services and infrastructure is a compound problem. One crucial example is the sewer system, which in Quito is a combined system; this means the same system handles both storm water and sanitary water. In rainstorms, some parts of the sewer system cannot handle the volume of the storm flow, so that the sewer system overflows into the streets. In other parts there is no infrastructure at all, and the sewer drains on the surface of the streets.

Another problem is zonification and land usage. In Quito the industrial and commerce zones are widely separated from the workers' residential areas. The poorest people live in the peripheral areas of the city. Because of the great distance it is expensive for these workers to travel to their job site, but they have no other choice.

In planning one finds that every factor is related to every other. Nothing can be taken for granted, as everything is an interrelated dynamic system. In term of zonification of the job locations, people need to travel to get to their jobs. This takes us to another crucial problem, transportation. Because of the linear growth pattern of the city, people need to go in both a north-south and south-north directions for long distances. Because west/east direction is so physically limited, severe traffic congestion is created in the north-south axis. People also need transportation from the surrounding valleys. At present

the common method of transportation is the trolley bus, which is almost at full capacity. The traffic itself creates pollution, which leads us to our last problem the city faces, the environmental issues. Excessive traffic causes great emission of CO_2 and the large population creates tons of garbage. The garbage disposal fields are not sanitary enough and there is a lack of collection of garbage in the peripheral areas, making the inhabitants throw the garbage wherever they can (usually into nearby ravines), creating health and environmental issues. The entire sewer system empties (untreated) into the rivers that provide water for people and for agriculture. Agriculture water and drinkable water is then contaminated as well.

Chapter 2: Quito Past development and why popular settlements are a problem

This chapter examines in depth the facts and past situation of Quito's development. The problems that this IQP attempts to solve are analyzed in depth:
- Why do we have popular settlements?
- What is the past and current situation of popular settlements?

2. - Historical statistics

By the year 1779, in fulfillment of the Royal Order of November 10 of 1776, the first general census of population in Quito was done. The only information available from this census is the summary of this data.

The summary shows that there was a population of 60,987 people. The population distribution was 22,487 (36.87%) people lived in urban "Parroquias" (parish, American equivalent as counties) and 38,500(63.12%) people lived in rural areas. At that time, there existed five urban parroquias and thirty rural parroquias. In the year 1781, there were a total of 24,285 people in the urban area.

By 1825 the total population decreased because of illness and wars to 53,284; 13,374(25.11%) people lived in urban Quito and 7,888 people lived in the rural area. (Quito en cifras, p13) For the year 1840, the "canton" Quito had 79,161: 20,777 people lived in the urban area and 58,384 in the rural area. In 1858, there were 27,900 people in the urban area of Quito; in 1886, the population of the urban area increased to 39,600; and in 1894 the population increased a little to 39,911 habitants. For the year 1906, there were 51,526 habitants in "canton" Quito, of which 22,763(45.09%) were men and 28,763(56.97%) were women. (Quito en cifras, p14)

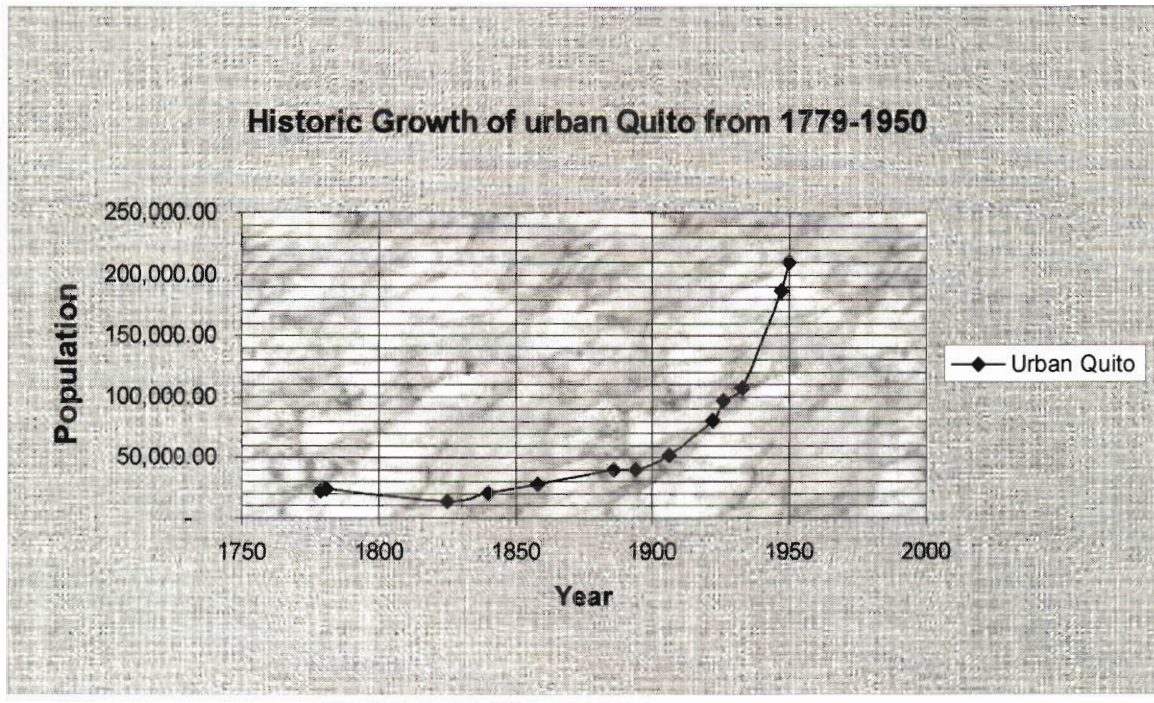
A summary of the Bulleting Data (1934) and census data (1947,1950) reflects the large population growth from 1774 to 1950(Tables 1). This increasing growth rate is reflected in the slope of the graph of graph 1.

Historic growth of Quito

Year	Urban Quito

1779	22,487.00
1781	24,285.00
1825	13,374.00
1840	20,777.00
1858	27,900.00
1886	39,600.00
1894	39,911.00
1906	51,526.00
1922	80,702.00
1926	96,524.00
1933	107,192.00
1947	187,077.00
1950	209,932.00

Table 1: Growth of Quito



Graph 1 :Growth of Quito

2.1 - The Urban expansion in Quito

Quito has suffered due to the different ways of urban growth. From its beginning, it had to overcome social, economical, and physical barriers, resulting from an unorganized but adapting way of development.

2.1.1. - Colonial Époque

Quito started with a concentric radial form being the result of residential segregation by the Spanish "Criollos", this segregation was an expression of the Spaniards control over the Native Indians as a primary form of oppression.

The historic center was located where the current city's center is located. The city started from its central point (the major plaza) to the peripheries in a hierarchy socially form. The Indian settlement was outside of the city.

The "Criollos" were localized in the first inward ring, usually with big properties. This ring reached the peripheral zones, where the common people would be in settlements in small land slots. This form of settlement would start a crisis because of the obsolescent territorial organization of that time. The density was about 276 inhabitants/Hectare; an urban crisis was created due to the way the city was laid out (radial-concentrical form), because the hard working lands surrounding the city put a lot of pressure on the increasing development of Quito.

2.1.2. - The First years of the Republic

In these first years (around 1800), small craftsmen, manufacturers, commerce, bank capital, and dense residential areas started to appear. In this new urban epoch, land development in a linear form of organization, as defined by geographical and topographical factors, appeared, In this time period, land value reflected the city's development in a longitudinal form.

The form of property, the "Hacienda", generated a conflict in the expansion of the capital. The city was the politic and administrative center, but the highland "Hacienda" was the nucleus of the economic production, as well as the home of its owner and the workers.

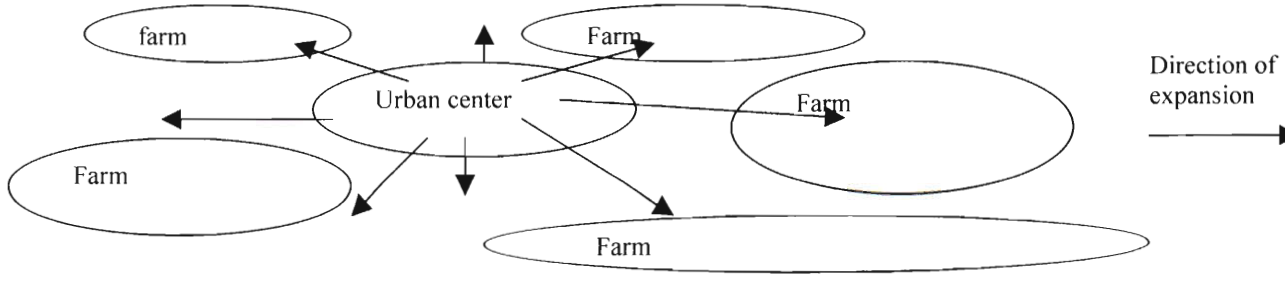


Figure 1 : Urban expansion

The urban center had the first urban restoration in this period (early 1800) and there appeared a new spatial sense: a social-class separation where the north was for high-income people and the suburbs were for the low-income people. This separation was a product of a social-stratification in the urban soil, meaning that people started looking the locating to settle were their social class belongs; mainly high class in the northern part, and low class in the south. This social-economic division still remains today, where the north part is better off than south is worst because of the traditionalism way of thinking of the settlers. In this period, the first migration of the high-income families left the center of the city to locate in the northern part, with a new logic of urbanizing the agricultural land.

2.1.3. - Urban Activities

From 1833 to 1840, there was a significant social division where native Americans were pushed once again to the outside or suburbia part of the city. As a result, the years from 1880-1900 showed a disorganized layout, which did not clearly differentiate, between land uses, with the commercial and industrial uses mixing with the residential areas.

In 1914, there was an increase in production activities and, consequently, a tendency to differentiate spacing (zonification by regulation and economic diferentiation). It can be seen clearly a pre-modern society, strongly dependent on an agriculture economy. (Quito en cifras, p16)

2.1.4. - The industry of construction

The economic crisis after the twenties resulted in a decrease of traditional exports, the impoverishment of the whole population, and a drastic increase in the migration of people from the countryside to the city.

In later years (late thirties), a relative recuperation of the economy appeared to elevate the level of life through the redistribution of the wealth from the agriculture to the mercantile sector. At the same time, industry was also developed as a way out of the crisis. This development resulted in the appearance of the construction industry as a productive sector, which analyzed the urban spaces and evaluated the land based on its components giving a value to the land according to what it had. This context developed a longitudinal – multi-nuclear territorial organizational form, with high specialization of the land, which presented a new way of urban segregation on land (usage). As a result, three social zones became formed: in the north the Mariscal Sucre, in the center the Historic Center, and in the south the Villa Flora

2.1.5. - Regulatory plans

Jones Odriozola (an Uruguayan) created the first regulatory plan (1942) to control the growth of the city. This plan re-evaluated the zoning, hoping to redirect the growth to the north; it articulated a hierarchic model as speculative, and segregated uses of urban land development. "Ciudad Jardin" is an example of this hierarchical model, which as an experimental development pretended to generate spaces with habitants classified socially.(Coleccion Quito Metropolitano, Land market, p18) A part of the regulatory plan

was that the mutualists (enterprises that buy big pieces of land to sell settlers) and the government sectors became stronger, which in the future would mean the development of new housing programs. In this period, there appeared the real state developers, a new social agent for land production as the basis of urbanization.

2.1.6. - The oil exploitation

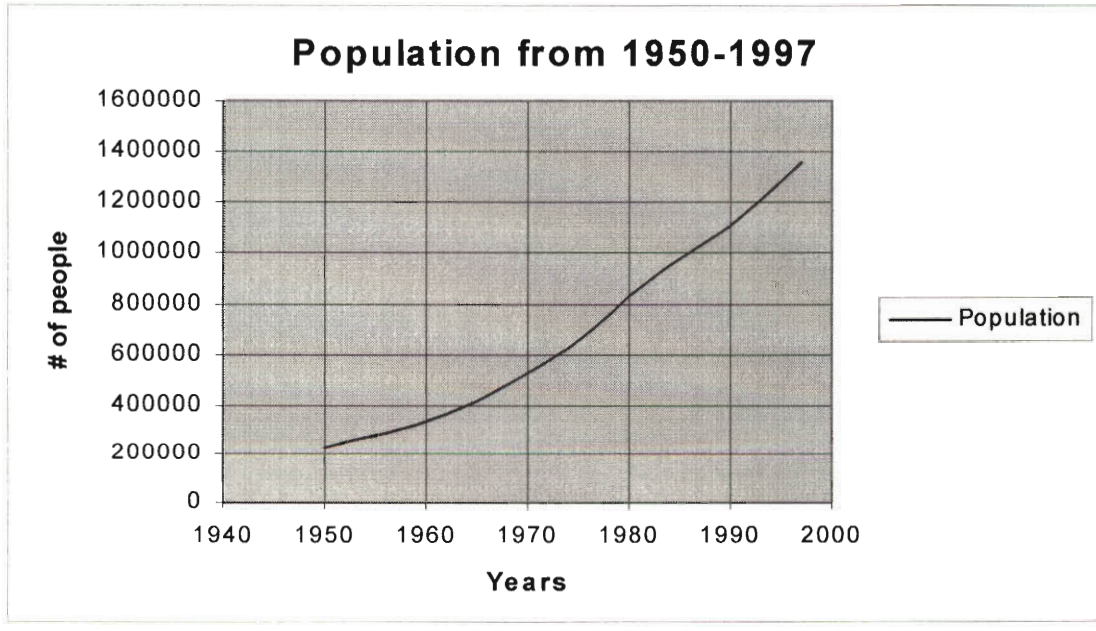
In the 70's, urban development acquired more importance because of the industrial development and the wealth produced by the exportation of ground oil. This new economic income meant the expansion of industry and commerce, followed by an increase of residents in the city.

This growth (the highest rate of growth ever encountered by Quito) struck the urban center, causing it to fall into chaos and leading to an urban crisis, simply because the city could not absorb the immense migration in that short time. The city was immersed in an uncontrolled process of expansion and urban renovation, dominated by the development of the urban areas.

In this period, there appeared irregular territorial organization, with a new form of industrial "implantation" (the plants in the peripheries zone and offices in the center of the city). The result was the urbanization of the valleys that surrounded Quito and the con-urbanization (where the urban mass grows and nearby towns are incorporated) of nearby towns. However, Quito kept its general characteristic: an expansive, speculative, and segregated form of growth, dominated by a contradicting "Hacienda" – City. This contradiction basically is the tradeoff of substituting city space for farmlands of agriculture usage.

Year	Population
1950	224344
1962	362111
1974	624094
1982	890355
1990	1105889
1997	1361228

Table 2: Growth of Quito 1950-97

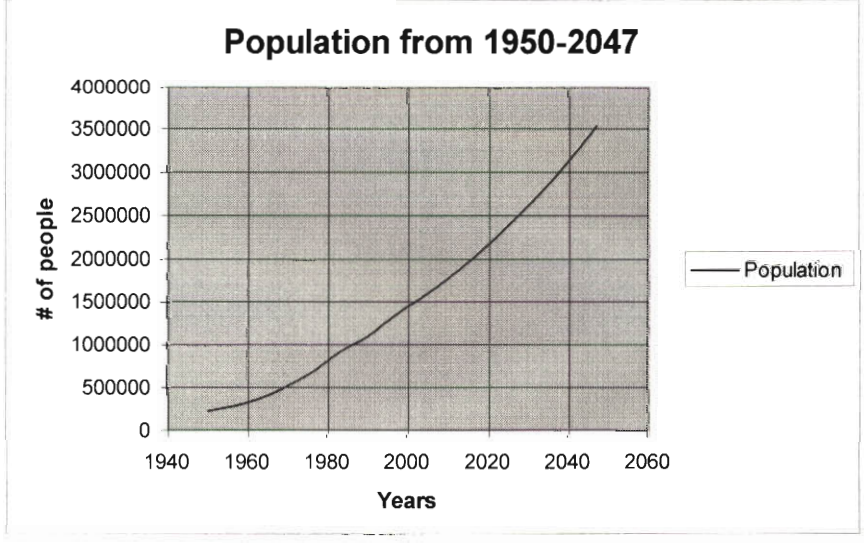


Graph 2: Population 1950-1997

The above graph and chart describes the data of the population from the year 1950 until the latest data (1997)

Year	Population
1950	224344
1962	362111
1974	624094
1982	890355
1990	1105889
1997	1361228
2007	1,674,311
2017	2,042,660
2027	2,471,619
2037	2,965,943
2047	3,529,473

Table 3: Growth of Quito 1950-2047



Graph 3: Population 1950-2047

2.2. - Problem of popular settlements

2.2.1 - Popular Settlements

The popular settlements are the only feasible option for many settlers of land. These settlements are not the optimum (maybe they are the worst type of settlement), but the bad economical conditions of the people influence their existence. In 1978, the UNESCO declared historic Quito "cultural patrimony of the Humanity". Even though it is a protected area, the historic center presents a daily drama due to the poverty of its occupants and the deterioration of its habitat. The historic center houses were owned by the farm owners, and would have several rooms for the servants, family and slaves. With the passing of time, more and more people occupied the historic houses in this zone, increasing the density of the zone and making the problem of popular settlements even worse. Now these new settlers occupy the houses, which are providing shelter for several families, not one. Many times one family will be living in one room. This overloads the infrastructure, which was not meant to serve so many families, and decreases the living conditions to a minimal.

These was also an increase in density of the settlements in the area surroundings the city. This contributes to the problem, because the indiscriminate cutting of the trees to build an un-orderly development leads to increased run-off, poor living conditions, and the destruction of the ecological areas.

These problems are generated because of inadequate housing for the people. The "popular settlements" main reasons to exist are the following:

-Search for shelter

-Search for a better standard of living

-Search for greater job opportunities

The majorities of the residents are immigrants from the rural areas. Settlers in these zones expect to have their own houses; this dream becomes fulfilled almost all the time, but at what cost? (Asentamientos Populares, p9)

2.2.2 - Popular, the meaning in urban settlements

The meaning of popular is " a representative human group of a society and their ultimate acceptance is specified as a frequent significance of using it as the popular sectors, the connotation of humility that can be interpreted as poverty" (Asentamientos Populares, p11). Marginal is another way of describing the popular sectors. The definition of marginal according to the CONADE is the population that is below the poverty level and has low cleanliness and limited access to services and infrastructure". (Asentamientos Populares, p11)

2.2.3 - Popular Peripheral Settlements in Ecuador

The settlements in the peripheral areas began in the 70's and continue until the present day. This zone had no authorization to urbanize. With the economic boom in the 70's and as immigration started, people moved to the city in hopes of achieving a higher quality of life. Over the years, this zone has evolved from having no services to just a few.

According to the INEC[1] in 1950, Ecuador's population was 71% rural. In 1982, Ecuador's population was 51% rural and 49% urban. In 1990 the rural population decreased to 44.86%, and the urban increased to 55.44%. By the year 2000 Ecuador's population is estimated to be 70% urban. The majority of this increase in urban growth is predicted to go to popular settlements.

2.2.4 - Historic Center Restoration Plans

This are plans to restore the Historic Center. The Metropolitan district created a multi-centric structure in the city, which enables the decentralization of the functions of the space. This affects entire of the city. The participation of the Social Urban Entities (SUI) is the foundation of today's city and future development. (Asentamientos Populares, p67) SUI's general objectives are the conservation and preservation of the urban structures and its elements. For success of the foundation of any further development must be controlled by all including the settlers (participation is necessary), and the public and private institution. The plan's particular objectives are to improve the physical and social aspects of this historic area; the objective also includes protecting, restoring, reviving and orienting the residential use. The implementation of this plan can create more employment, but the participation of the community must be towards the restoration of the historic zone.

[1] These are the primary sources of information, INEC (national Ecuadorian institute of census) (1950) is primarily in charge of demographic process; and the National Board of planning (1954) quantifies the population in the country. (Quito en cifras, p19)

2.2.5 - Historic Zones

The Master plan of integral rehabilitation of the historic areas (or PMRIAHQ) has structured the historic zones of Quito as follows:

a) A central Historic Zone: the area constructed in Quito until the beginnings of the 30's. This zone is subdivided in two areas:

   1) from its founding until 1914

   2) from 1914 to 1932

b) The historic groups in Parroquias such as Chillogallo, Cotocollao and Guapulo, and historic centers of rural Parroquias. (Asentamientos Populares, p13)

2.2.6. – Peripheral Settlements

The peripheral settlements occupy inadequate land with no infrastructure or basic services and are, usually in the hills, mountains or places outside the city. In Quito, land possession by invasion is minimal; instead the occupation of the land is done by illegal subdivision of it. Landowners sell lands that do not have any infrastructure. Later the government has to urbanize and add basic services for the settlers. Selling lands that do not have any infrastructure allows the landowners to make more profit off the land. Another problem is when land, intended to be used for agriculture, is subdivided and then sold by these ghost land dealers; clandestine urbanization becomes a malpractice. (Asentamientos Populares, p77)

In the subdivision of agricultural land use, all terrain near the urban perimeters that were legally acquired for agricultural purpose are later subdivided into residential use without the municipality's authorization. Illegal urbanization starts when big land

extensions that are located in the peripheries of the city for agricultural or live stock purposes are then urbanized. The subdivision is done in two forms:

a) The sale of small pieces directly to the user without legal authorization. Because this was not originally planned, these pieces of land are not adequate for future development, meaning they lack basic services or infrastructure, and having topographic irregularities.

b) The sale of big pieces of land to intermediaries or Cooperatives. Usually these intermediaries are not the owners, but act as the agent and their function is to sell the land to third parties.

2.2.7. - The characteristics of the population in the Popular Peripheral Settlements(APP)

The following table describes the general characteristics of the peripheral areas

Pheripheral areas Characteristics(1990)				
Men	Women			
52.10%	47.90%			
	Education			
iliteracy	primary level	secondary	Higher education	
9.70%	78.70%	-	-	
	Economic activities			
Economic Estable	stable job	no ocupation		
60.00%	30%	30%		
	Principal activities			
construction	crafts	personal servises		
23.75%	19.30%	16%		

Table 4: Characteristics of the peripheral areas

34.1% (1990) of the population has migrated to the urban conglomerate and has no occupation or is sub-employed. The majority of settlers are from the Central Provinces of Ecuador in search of better job conditions. (Asentamientos Populares, p88)

Around 200,000 people, which represents about 18 percent of the total population are located in these APP, The following chart shows more general information about this area.

APP Characteristics(1990)				
Total population	Men	Women		
63503	51.00%	49.00%		
	Education			
iliteracy	primary level	secondary	finishes secondary	higher level
6.10%	36.70%	23.60%	6.50%	2.50%
	Principal activities			
construction	Communal servi	manufacture	commerse	
37.90%	22.20%	13%	12.7	

Table 5: characteristics of the APP

29.2 % of the total population that has migrated to the APPs.

2.2.9. - Infrastructure and Equipment in popular settlements

According to the Center of Investigation CIUDAD (1988), in these areas 5% of the population has drinkable water and 70% have sewage system. Where the zones are very dense only 10% have sewage services and 40 % drop their waste in the ravines. According to the Sewage Municipal Company (1991), out of 202 APP, 101(50%) have no sewage system.

2.2.10 - The poverty situation in Quito

In Ecuador, 60% of the population lives in poverty. Quito is one of the main urban conglomerates; there are more than 1,500,000 people living in the city, which is about 12% of the whole country and about 64% of the Pichincha province's population. The demographic characteristics are that 84%(1,351,000)(1990 census) of the population is concentrated in the urban zone. The average density is 58 hab/Ha. The rest of the people live in the suburban zones with an average density of 0.67 Hab/Ha to 80 Hab/Ha. In 1990 the rate of growth of the population was 2.7% (Coleccion Quito Metropolitano, Quito, Ciudad y Pobreza, p7). Over the years there has been a decrease of city's growth rate, from 2 % to 1.6%, between 1982 and 1990; migration to the city also has decreased from 2.9% to 1.1%.

2.2.11. - Land market in Quito

Various factors that have influenced the land values in Quito are: the uncontrolled growth of the urban area, with a critical deficit in services and infrastructure; the lack of or indiscriminate use of urban land reserve; and the type of occupation that is given to the land. Low density land use, sub-usage of infrastructure, land speculation, and urban social segregation are also factors. Social segregation is when different social classes,

especially the upper class, do not want to have lower social classes next to them. Because the high class has political and fiscal power, lower classes are excluded from this section of the city.

2.2.12. - The urban space

The spatial urban infrastructure and its link with the growth of the city have played a very important role and have become a sign of the urban extension. The city has to base the capacity to support additional population on the projections and estimates of growth to provide vacant soil (unused land spaces which has infrastructure in it area). The incidence of planning in the different extensions of the spatial limits influences the availability of land. The expansion and availability of land may be achieved by the planning and formal production of legal land. The municipality develops and plans the urban space; this entity sets the urban limits and urbanizes the space (Coleccion Quito Metropolitano, Land market, p26)

2.2.13. - Informal and marginal land production

Informal development occurs in a spread manner, not always following the current urban norms, and is often developed through housing cooperatives. Enlargement of the settlements is made possible by clandestine invasion of land. Half percent of the urban settlements are of the marginal type; these lands amount to almost the same quantity of land as the legal urbanization does.

2.2.14. - Land and Vacant areas in the city

In 1993, only 62.7% of the land in Quito was occupied. The most representative use of the land is residential, on 5,734 Ha; only 5% is used for industry. Free areas (no infrastructure) amount to 37.3% and vacant land occupies 21.73%. Quito is becoming a metropolis with a residential character but lacking new undeveloped residential zones, and little space for multiple and commercial uses (Coleccion Quito Metropolitano, Land market, p43). Vacant land area in the capital is divided as follows: residential has 3200 Ha, industrial has 490 Ha, multiple usage (normally a mix of commerce and residence) has 215 Ha and commercial has 45 Ha (Coleccion Quito Metropolitano, Land market, p44)

2.2.15 - Land Market

The conceptualization of the land market is different from that of the goods and services that are treated in the regular market. The circumstances that define the competition of the land market are: the particularities of the land; the demand-supply of the urban space; characteristics such as the urban location; the access to the land; the endowment of infrastructure and equipment; and type of transportation that is available. The social prestige of the area, quality of the social surroundings, and the definition of norms for the usage of the land are also important for the land value.

2.2.16. - Land supply

The greater supply of the land is in the northern part; land supply decreases toward the urban center, and decreases further in the south zone. The zones land values does not fluctuate to much; the highest values are in the new Administrative and

commerce center. Carolina, Quito tenis, Iniaquito and Jipijapa are located in the new urban center.

2.2.17- Land demand

Constructors and developers provide an important roll in fulfilling land demand; these entities provide the most land in the city because they buy the raw land and develop it, making the real state business bigger each time. The individual owners follow in the chain in demand of land.

2.2.18. - Preference of localization and payment capacity

The whole process of land localization starts with low-income people that can afford only so much for the land, so these people find the cheapest land in the south. People with higher income start looking for land in the northern part of the city. High-income people are able to afford zones in the north, north center, and in the valleys, since this is the most expensive land.

2.2.19. - Effective demand of land

The effective demand is defined as the families with a real capacity to buy land; this corresponds to approximately 11,400 families: 40% of these people are low class, 37% middle class, and 23% high class (Coleccion Quito Metropolitano, Land market, p85). The factors that influence the selection of a specific location in the city are the tranquility perception, good location, homogeneous settlement, better social prestige and

in the valleys, climate. The lower middle sectors look for infrastructure and services disposability, while middle and high sectors look in addition for prestigious sectors.

2.2.20. - Variables in the land prices

The following are the variables in land price:

-Surface: The price depends on the size of the land, usually by m^2. Also the price is associated with the location, specialization, and prestige. The higher these criteria, the higher the price per square meter.

-Social-economic level

-Land use: This is divided into, residential, residential multiple, commercial and industrial zones

-Infrastructure availability

-Density

2.3. - Critical problems In Quito

The following are the most common problems in Quito.

-The elimination of the "Hacienda" from the peripheral sector, causing liberation and unemployment of the agricultural work force and lowering levels of food production.

-The strengthening of activities that are oriented towards a tertiary economy.

-The disorganized occupation of the land

-The economy linked to lower exportation and economy oriented to the local, regional and national consumption

-The disorganized industrial implantation, lack of infrastructure and control of its pollutant agents

-The increment in the migratory flows; jobs, housing, urban land and transport demand

-The infrastructure and equipment deficit (specially in central and peripheral zones)

-The road system not hierarchic, oriented to satisfy the immediate demands

Chapter #3: Methodology

3.1 – Methodology

This project uses the urban development research and data gathered in Quito and further research done in the USA to try to solve one of the biggest problems in Quito: the creation of popular settlements.

The methodology that is going to be used in this project has three phases:

1) The analysis of the past and present growth and development of Quito
2) The analysis of the physical medium
3) The analysis of past and present data of infrastructure.

To conduct the three phases two different approaches will be applied. For phase 1, will use the analysis done of the past development of Quito (chapters 1 and 2). The second approach (for phase 2 and 3), analyzes the current status of physical medium as well as the infrastructure and basic services of the MDOQ.

An urban development model will govern the infrastructure and design process of the Satellite City. Once past, present is understood, the suggestions on how the Satellite City can be laid out, and the components that will be needed to obtain a high quality of life of its settlers can be stated.

Phase one will consists on all the past growth and development data. This data will be taken into consideration and used as a guideline for the new development. Next, population was calculated (chapter 2) taking into account the birth rate, and the death rate. The present and past policies were also researched, along with the past and present spatial pattern of growth. All this data clearly gives a better vision of the situation of the city and the approach we have to take to solve the problem of popular settlements. Chapters 1 and 2 cover the aspects of how the city has been configured.

Phase 2 analyzes the physical medium and the infrastructure of the MDOQ. A "weight chart" will be created as a tool to understand some of the components of the physical medium. The "weight chart" will give an average weight to several components of the physical medium and will display each Parroquia with its average weight. By analyzing the physical medium as well as the infrastructure and basic cervices that are currently available, The best site can be then chosen.

Finally an urban development model will combine all the criteria recollected, in all the capters, and the result of the data analysis will be used to design the Satellite City. The following are the main factor of consideration for this model.

The geographical factors include:

-The topography and land layout of the zone

-Safety of the zone

-The ability of the land and the zone, to support the needs of the development, meaning hydrology network for water usage, organic soil, etc.

-Following environmental norms

The supporting Infrastructure:

-Drinkable water

-Sewage

-Electricity and telephone systems

-Transportation systems

-Waste disposal

To develop the method of growth, the critical resources have to be determined. The critical resources must deal with the major needs of the society (described in chapeter1). The new development must be layout according to the social needs, concerns, and wants.

Urban development model of the satellite city

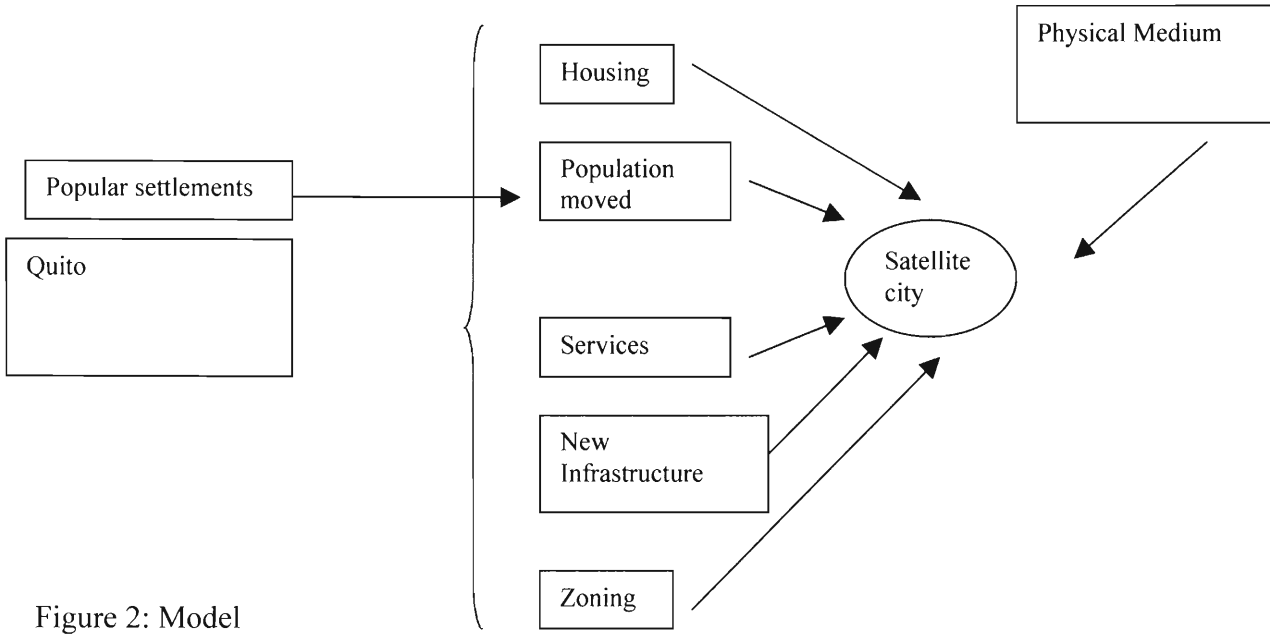


Figure 2: Model

The urban development model is considered for the criteria to set up the Satellite City. Basically the urban development model consists of how to develop a satellite city which will solve the problem that was analyzed in chapter 1 and 2.

In the Urban development model, there are 7 basic areas of urban planing that must be considered:

Zoning, Infrastructure, Services, Housing, Environment, Population and the Physical medium

Establishing zonification is important because the settlement and usage of land for the new development must be in an orderly manner. There is a need to set up differentiation between residential, industrial, commercial, agricultural and green areas, so it can sustain the population.

Infrastructure and services are necessary for the settlers. One of the needs is housing; it will be covered later in the analysis of the model.

The environment is an equally important issue that should be a strong point considered in policy making and development.

Now that a better criteria has been created with all the data analyzed it can be use it to find the best site, in this part the "weight chart" plays and important roll, the Parroquia that has the highest values will be used for the site of our future development. With the data collected and analyzed, a spatial pattern can be planned where the resources can be placed, where they must be, or where there is a lack of them. The final phase (phase 3) for this project is to set a series of suggestions in the different parts of the model. When the best site has been chosen, a virtual spatial model of the satellite city will be developed, and then it can be blended into the real environment. At this point the design of a self-sufficient, productive settlement with a high quality of life should be the result of the study, hopefully fulfilling the original goal of this project.

Chapter 4: Data Analysis

4.1. Data Availability:

All the data has been acquired by resources and from people: statistics and database were received from the Ecuadorian Subsecretary of urban planning, the municipality of Quito, and a series of publications published by the municipality. This section analyzes the data and creates a "weight chart" to evaluate each of the different parts of the physical environment and infrastructure.

4.2. – Physical medium

The physical medium is defined as all the physical surroundings of a specific site, such as the hydrologic network or soil stability. The first step is to state the physical medium in Quito; by analyzing these characteristics the best settlement location can be established. The following information is data taken from literature reviews and from the department of planning in the municipality of Quito.

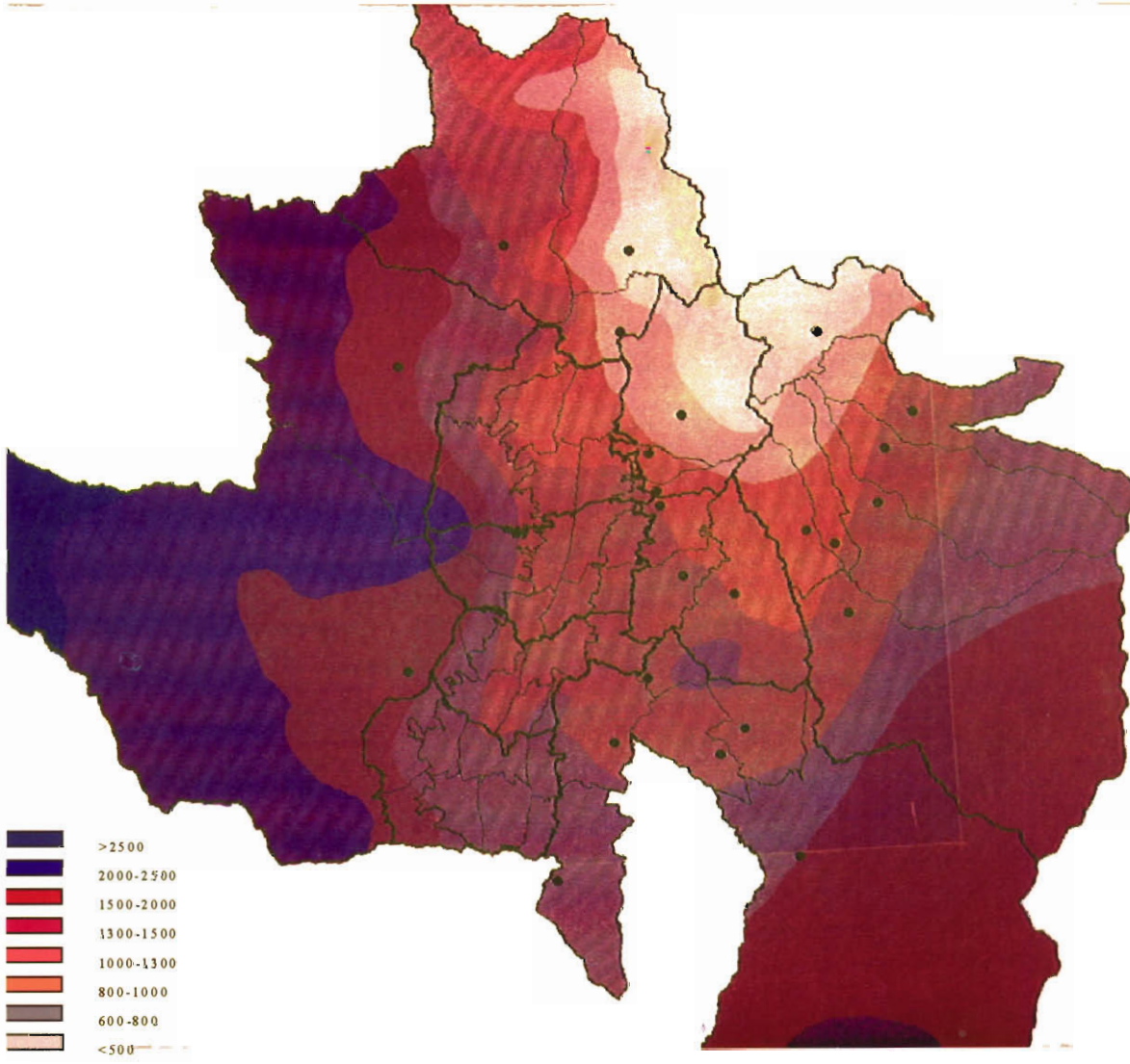
4.2.1. Climate[2]

According to the master plan developed for Quito in 1985:

a) The precipitation in the MDOQ (Metropolitan District of Quito) is of the equatorial type; three zones can be distinguished:
- Inter-Andean dry zone (1500-2800 meter above sea level (masl) with a average precipitation of 554 mm
- Inter-Andean zones (2400-3100 masl) with an average precipitation of 960 mm

-High Inter-Andean zone (occidental cordillera) with an average precipitation of 1400 mm

The following graph shows the precipitation areas in the MDOQ.



Picture 1: precipitation

b) Temperature in the MDOQ varies from 4° to 18° C, and in the valleys from 10° to 16°.

[2] Plan maestro de pichincha- diagnostico, vol 1-H consejo Provincial de Pichincha, 1985

4.2.2. Geology[3]

The MDOQ zone is a river basin that is part of the graven of the Inter-Andean alley, between the canyon of the Guallabamba River and the Tiopullo knot. The MDOQ was formed during the Andean orogensis, and is bonded by the Oriental Cordillera, which is constituted of metamorphic rocks, and the Occidental Cordillera, which is constituted by igneous rocks. The geological formation of the entire MDOQ is of volcanic type. The morphology and geology of the catchment area of the Guallabamba River has a diversity of morpho-structural zones, with relief constituted by metamorphic rocks that form the two cordilleras. Also young volcanic rock forms the oriental Sub-Andean zone.

4.2.3. Physiography

The MDOQ has two major drainage areas, the Inter-Andean alley (Quito River basin) and the spurs of the Occidental Cordillera of the Andes. The Quito River basin is a narrow portion between the Occidental and Oriental Andean Cordilleras (mountain range). The central part or high plateau of the high catchment area of the Guallabamba river, has a height between the 2200 and 3200 masl. There are lower elevations (mountain Ilalo) that determine small valleys and plateaus (esplanades) whose characteristics are as follows:

-Valley of Quito (2700-2900 masl)

-Valley of Los Chillos (fertile, 2550-2700 masl)

-Esplanade of Cumbaya, Tumbaco, Puembo, Pifo, Yaruqui, Quinche (2300-2700 masl)

-Equinoctial peripheral sector (deserted plateau)

[3] INEMIN

-Inter sub-Andean areas, accidental topographical areas (2800-4000 masl)

-The Hydrologic network

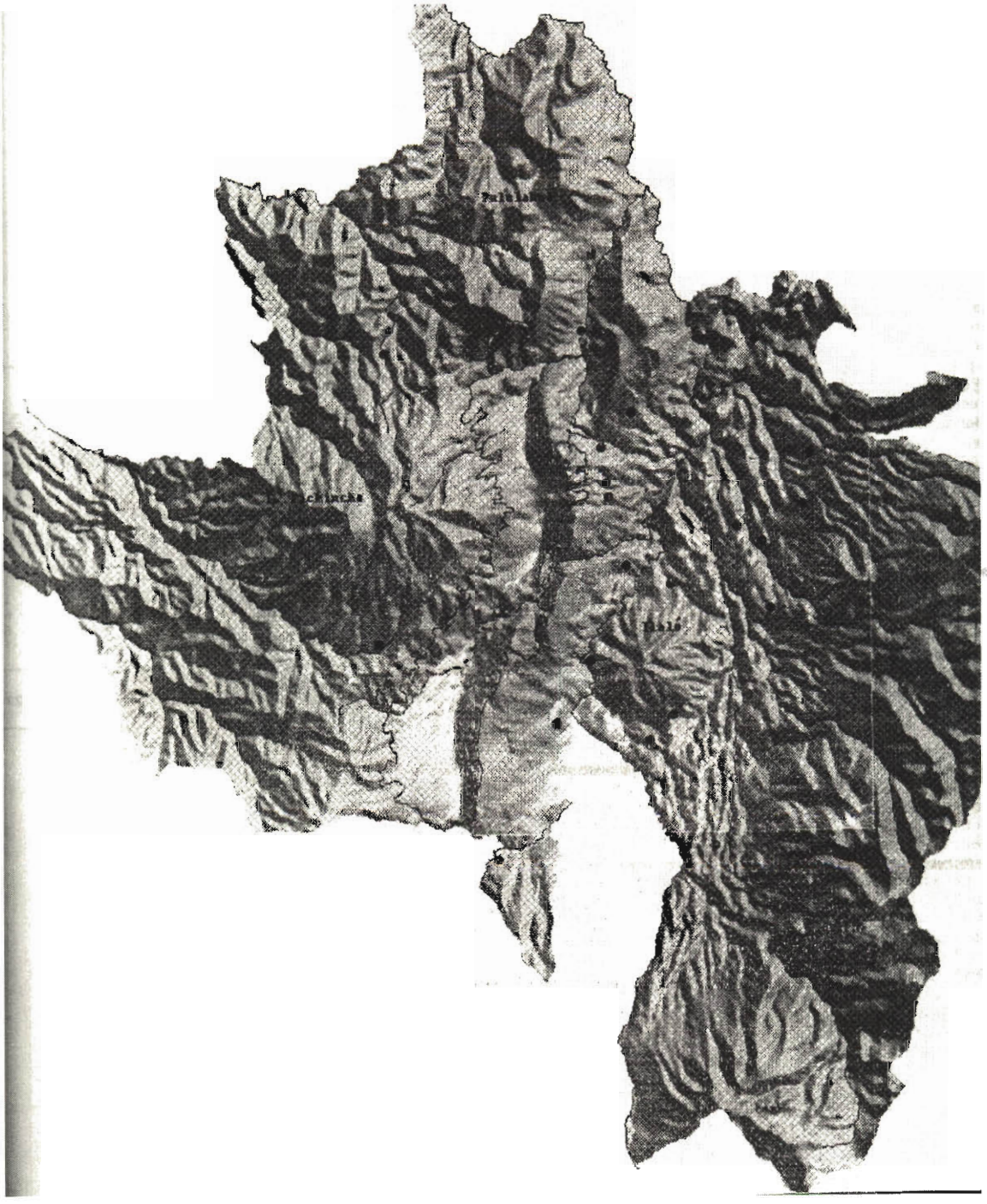
-Pintag zones with accidental topography (2600-4000 masl) are also part of the physiography of the river basins.

The last, the Pintag zone, is divided into:

a) The spurs of the Occidental Cordillera, with its high peaks (Pichincha, Atacaso), and plateaus

b) The Canton Rumiñahui made up of different physiographic units

The following picture shows the topography of the MDOQ.



Picture 2: Topography

4.2.4 Topography: slopes[4]

According to the INEMIN there is the following slope classification:

-Slope 1: Favorable areas < 5% or less than 3°, slopes almost flat

-Slope 2: Favorable zones between 5%- 15% or between 3° and 9°

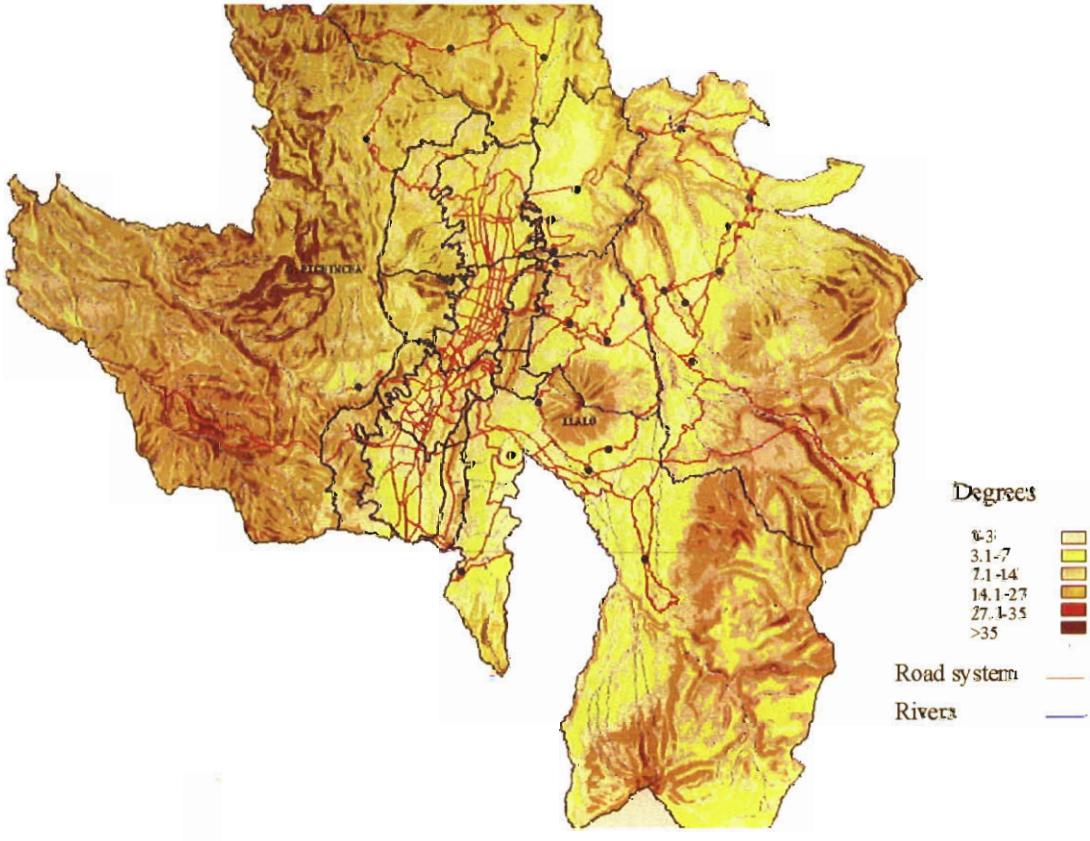
-Slope 3: Medium slopes (acceptable area) from 15% to 25% or between 9° and 14 °

-Slope 4: Disfavorable zones between 25% and 50 % or between 14° and 27°

- Slopes > 50% or >27°; have a risk of landslides.

Favorable slopes for human settlements are from 5%- 15% or between 3° and 9°.

The following graphs show the slope situation in the MDOQ.



Picture 3: Slopes

[4] INEMIN, investigacion de recursos naturales de la provincia de pichincha, Quito, 1985

4.2.5. Geologic faults:

The territory is affected by geologic faults of different magnitudes: The following two are the areas most affected:

1. - Pomasqui- San Antonio zone is affected by a system of faults known as the faults of Pomasqui-Lumbisi, plus some transversal faults that make this zone unstable, especially in the hills of the mountain. This fault also affects the sub-region along the inter-Andean tectonic fossa like Tumbaco, Los Chillos, etc.

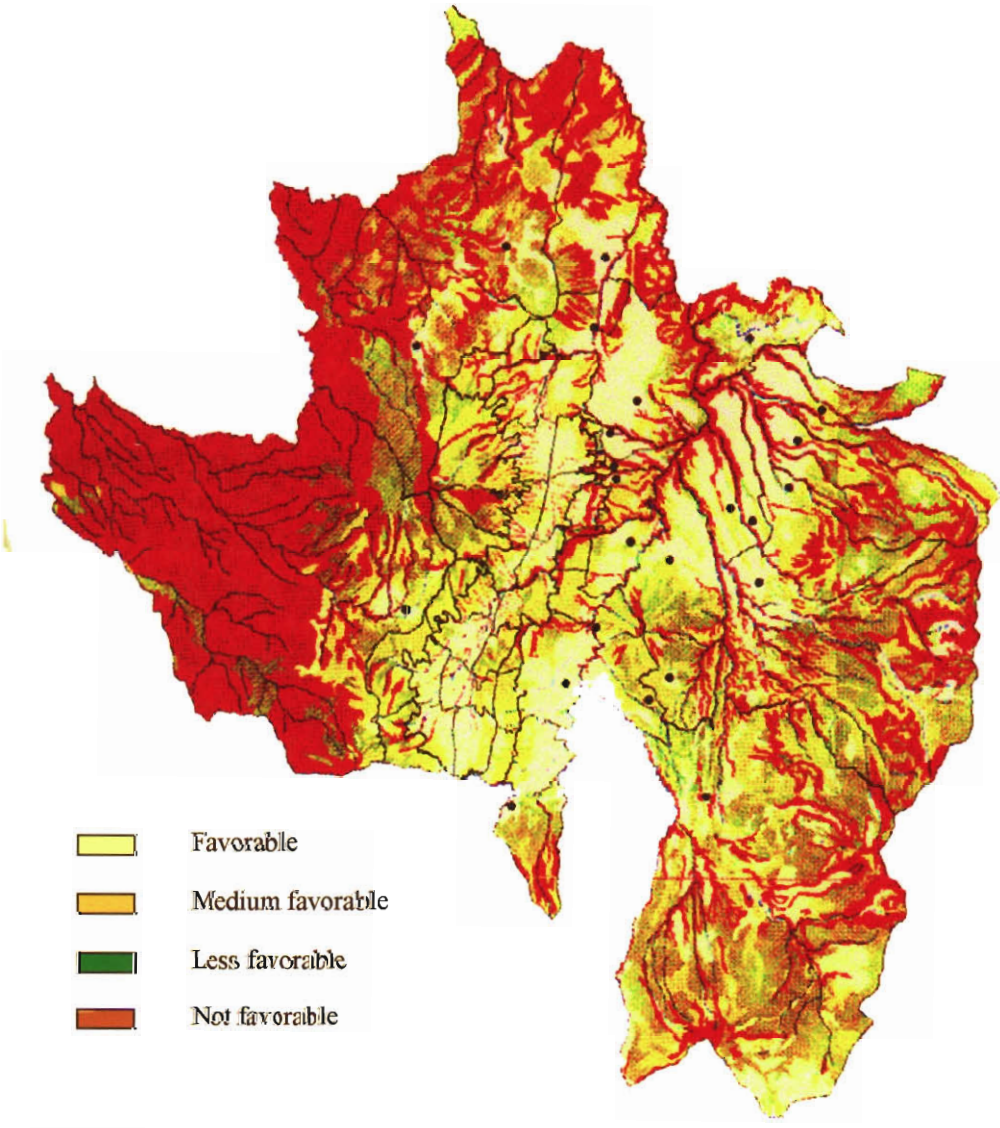
2. - The Machangara fault affects Quito. In the zone of Pintag, there are three important regional faults: one that goes through the town of Selva Alegre, another along the Quijos river, and the last that goes through the Papallacta river.

4.2.6. Geomorphologic stability

The grade of stability of the soil can be divided into 4 basic zones:

- Stable
- Relatively stable
- Relatively unstable
- Unstable

Stable zones are Calderon and Valley of Los Chillos. The relatively stable zone in Quito. The small stable zones in Llano Chico, El Quinche, Checa, Yaruqui, Tababela, Tumbaco and Cumbaya. A small stable zone that is surrounded by highly unstable zones is Guallabamba. The unstable zones are Pomasqui, San Antonio and Pintag.



Picture 4: Soil stability

4.2.7. Soil[5]

Volcanic soil constitutes almost all the soil in the MDOQ. This soil, called Anepis, represents the modal unity characteristic of the soils derived from volcanic ashes, and covers approximately a 90% of the total area. In the Occidental area, zones of Nono, Lloa, part of Calacali, and in the spur of the Oriental Cordillera, the soils of the type

[5] Plan maestro de Pichincha, Diagnostico vol 1. HCPP,1985

Dystrandept are characterized by having a higher percentage of organic material than Anepis. In the area of Pomasqui, San Antonio, and Calacali, there is a sandy soil derived from pyroclastic materials. In the zone of Calderon, Llano Chico, Zambiza, Nayon, the soil Ustipsamment predominates; it lacks water, a low retention of humidity, and has less than 1 % of organic materials. The zones of Cumbaya, Tumbaco, Tababela, Checa, Yaruqui, Puembo, Pifo, and part of Guallabamba have soil with good conditions for agricultural production.

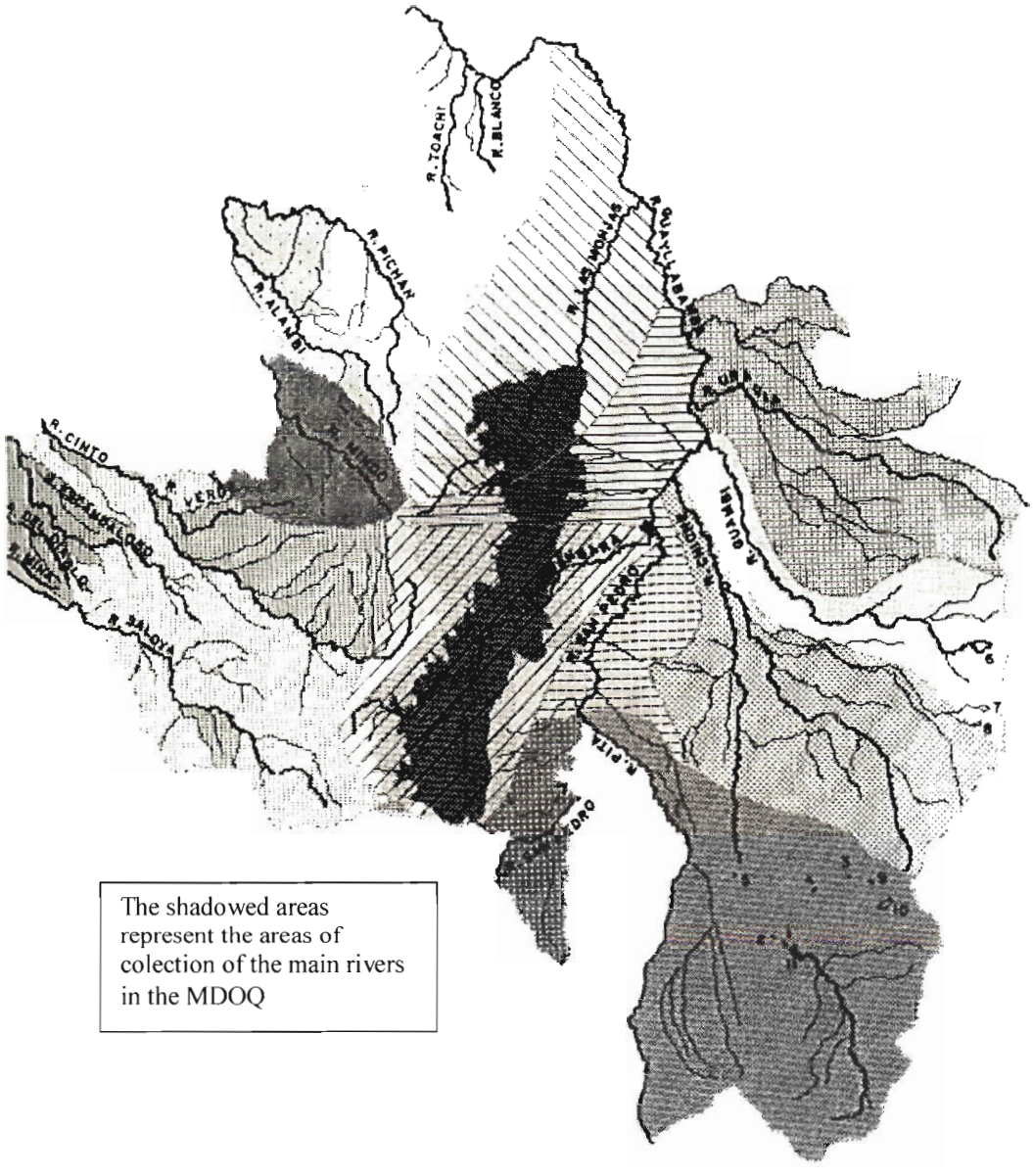
4.2.8. Hydrology

The main water source for the MDOQ is surface water. The rivers that conform the Guallabamba sub-river-basin passes thorough the entire MDOQ, The Guallabamba river is part of the Esmeraldas River one of the main rivers of Ecuador. The different usages of water are:

-Irrigation use

-Hydroelectric power

The following graph represents the hidrologic network of the MDOQ



Picture 5: Hydrology system

4.2.9. Areas of Ecological protection[6]

The equilibrium between the maintenance of the physical-biological system and the development through social and economic activities of the medium is called ecological protection.

The natural areas to protect are the ecological reserve or natural areas of variable extension with little human intervention. The other areas to protection are the forests and the vegetation, which are under threat from development.

4.2.10. Natural Risks

Because Ecuador is situated in the fire belt of the Pacific, there is great volcanic activity and another main risk is landflow. Other risks are floods, alluvions, land sinking, seismic risk, and rockslides.

Active volcanoes surrounding Quito are in temporary rest. A few of the active volcanoes are the Pichincha, Cotopaxi and Pululahua. The areas with higher volcanic risk are Lloa, Nono, Pomasqui, San Antonio and Calacali, and the areas with lower risk are Quito, Chillos and Tumbaco.

The following is brief description of the conditions for landflow and landslides risks:

-Geologic structure

-Slopes grater than 27%

-Unstable soil.

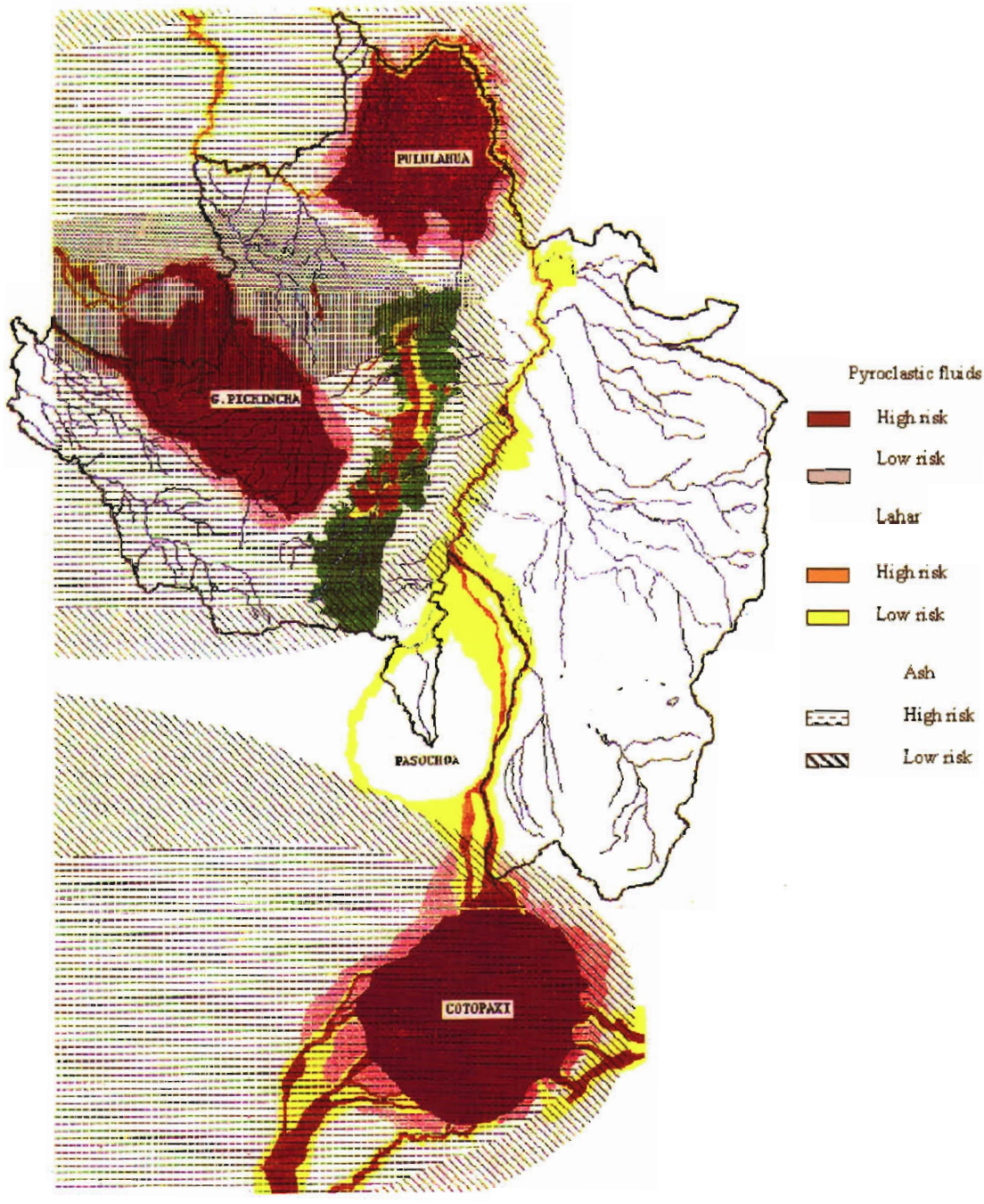
-Amount of vegetation

-Eolian erosion presence

-Antroposity

[6] MAG, Direccion Nacional Forestal

The following graph represents the volcanic risks of the MDOQ zone.



Picture 6: Risk

4.3. Infrastructure

It is not only important to set the physical situation of the area but to also add what type of services and infrastructure must be improved or added.

4.3.1. Drinkable water[7]

The water supply comes from Pita-Tambo, Chilibulo, Toctirco, Las Casas Alto and, the most recent incorporation to the system, Papallacta. The demand without the Papallacta project is 3.541 liters per second, which provided a population of about 860,000 Hab.

The water then is transported from the above sources to the storage/treatment plant.

There are seven treatment plants in charge of the treatment, distribution, and storage of the water:

Puengasi, El Placer, Bellavista, Chilibulo, Noroccidente are plants for the urban perimeter. One plant in Conocoto and two plants in Quinche and Checa serve the non-urban perimeter

The connection to the network is done through 43 supplying tanks.

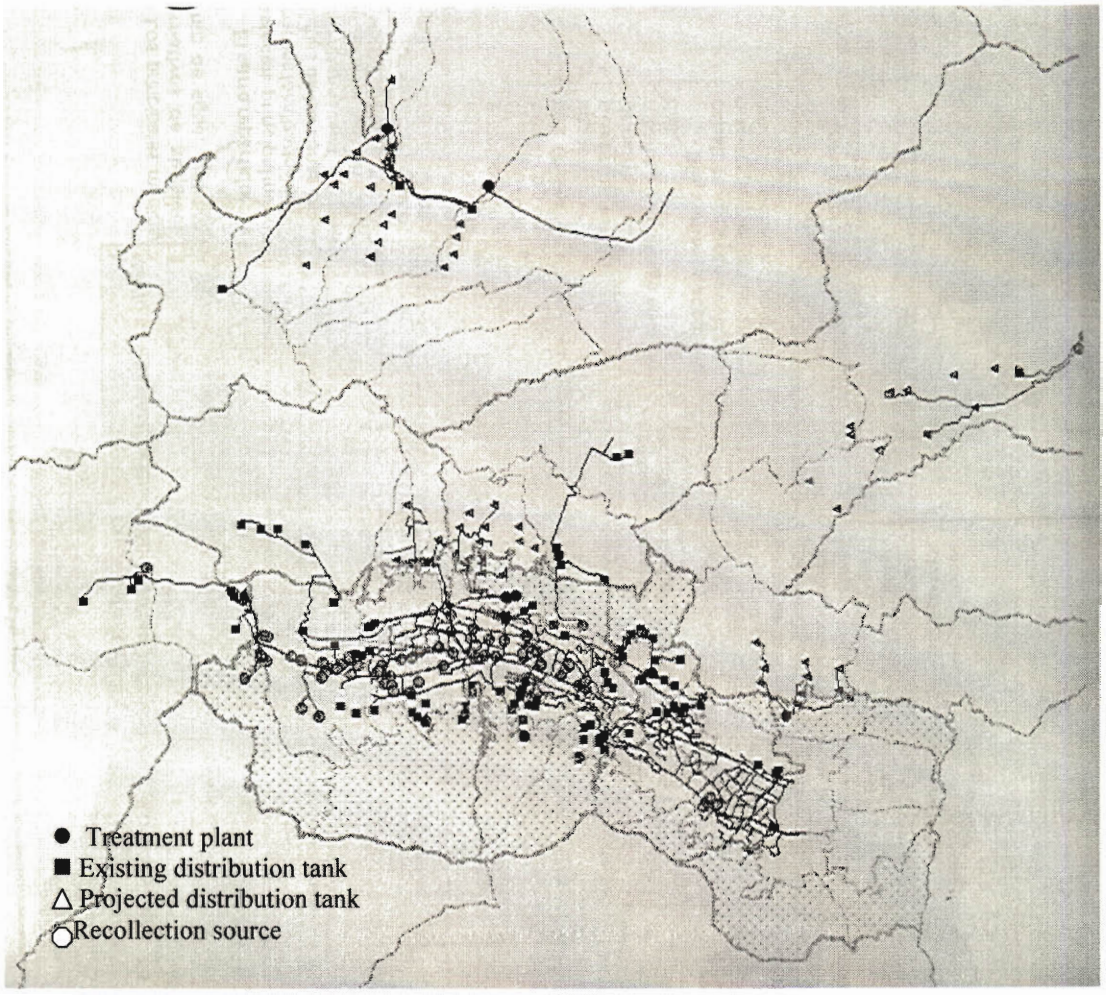
[7] EMAP-Q

The EMAP (Municipal Enterprise of Drinkable Water) has determined that the service quota is of 2860 masl. In 1990, the percentage distribution of consumption was as follows:

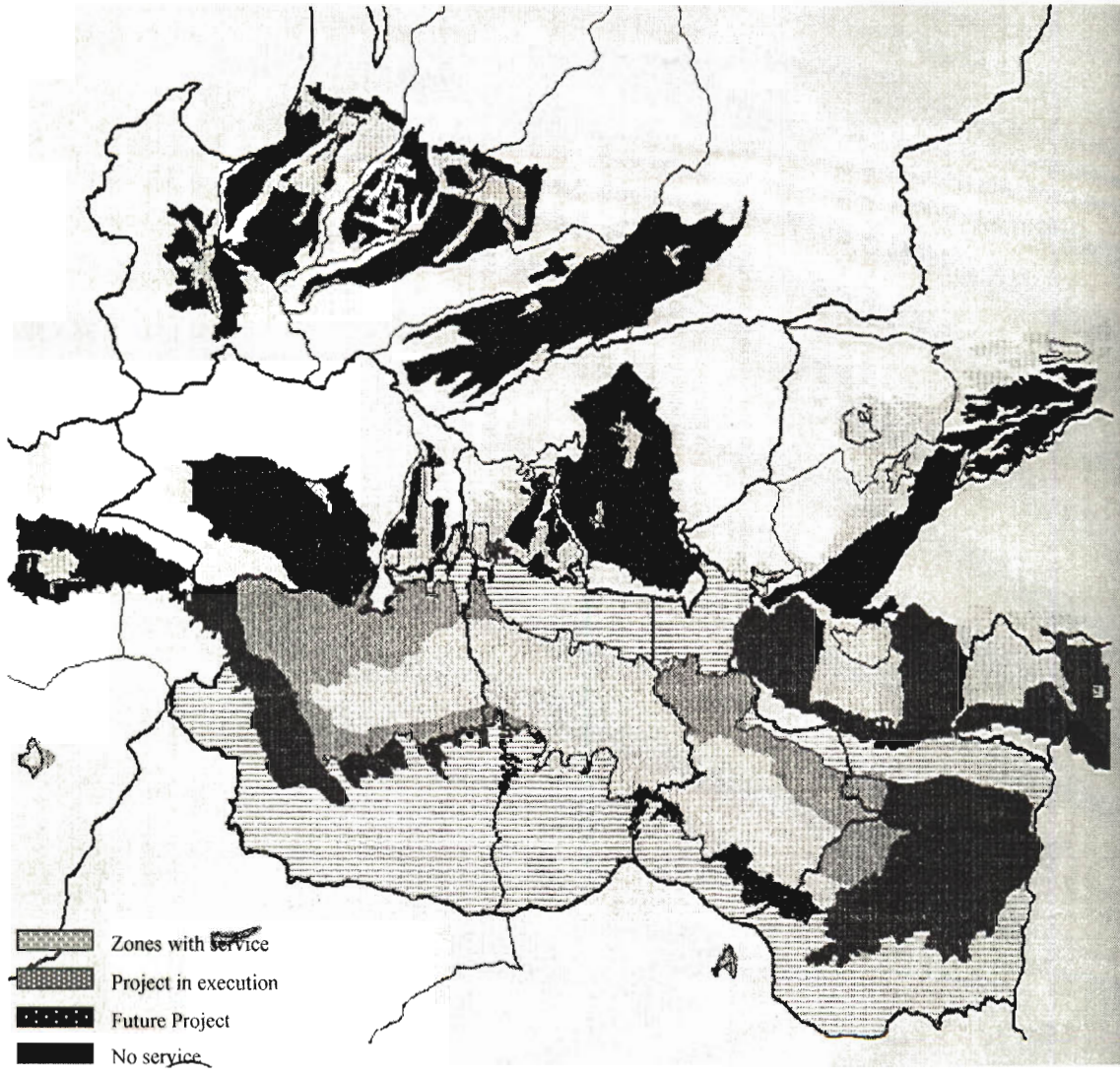
- 60% domestic,
- 7% Industrial,
- 4% Commercial,
- 4% institutional
- 25% no quantified (meaning source not known because quantification has not be made)

Out of 6150 Has of the land which are served by the municipal network, only 32 percent of the area is defined as urban. Other areas use deep wells, while some zones are provided water by tankers, resulting in a dramatic increase in cost.

The remaining 68 percent (non-urban zones) have a deficit of service.



Picture 7: Drinkable water infrastructure



Picture 8: Drinkable water coverage

Map 8 shows the location of the treatment plants and map 9 shows the water coverage

4.3.2. Sewage

Since its beginning, the sewage system in Quito functioned as a combined system to handle the flow of rainwater and sewage. The water from the sewage is released without any type of treatment through big collectors to the Machangara River. The city has been divided in five zones of collection:

-North zone

-Batan Grande

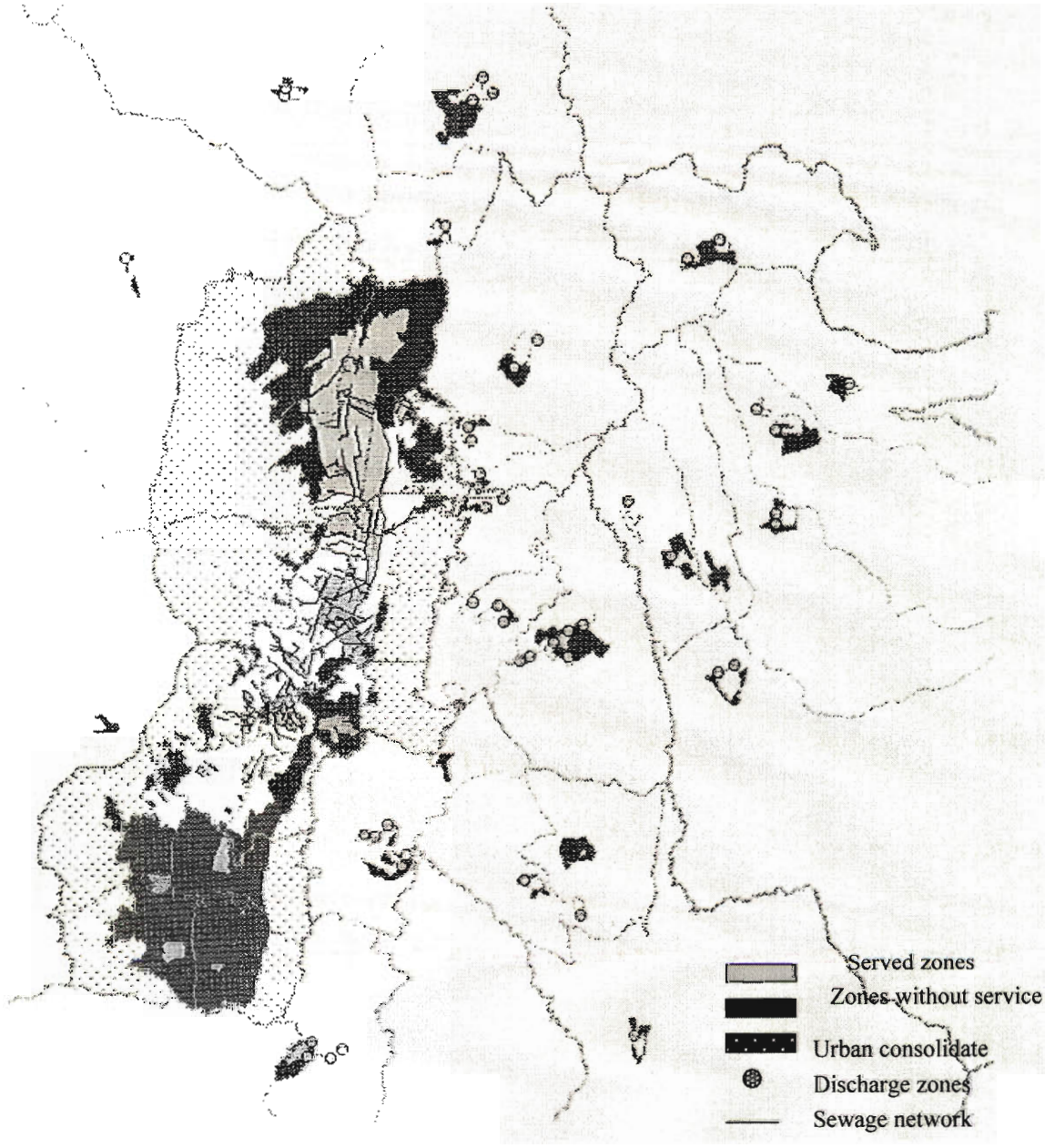
-Anglo French

-El Centro

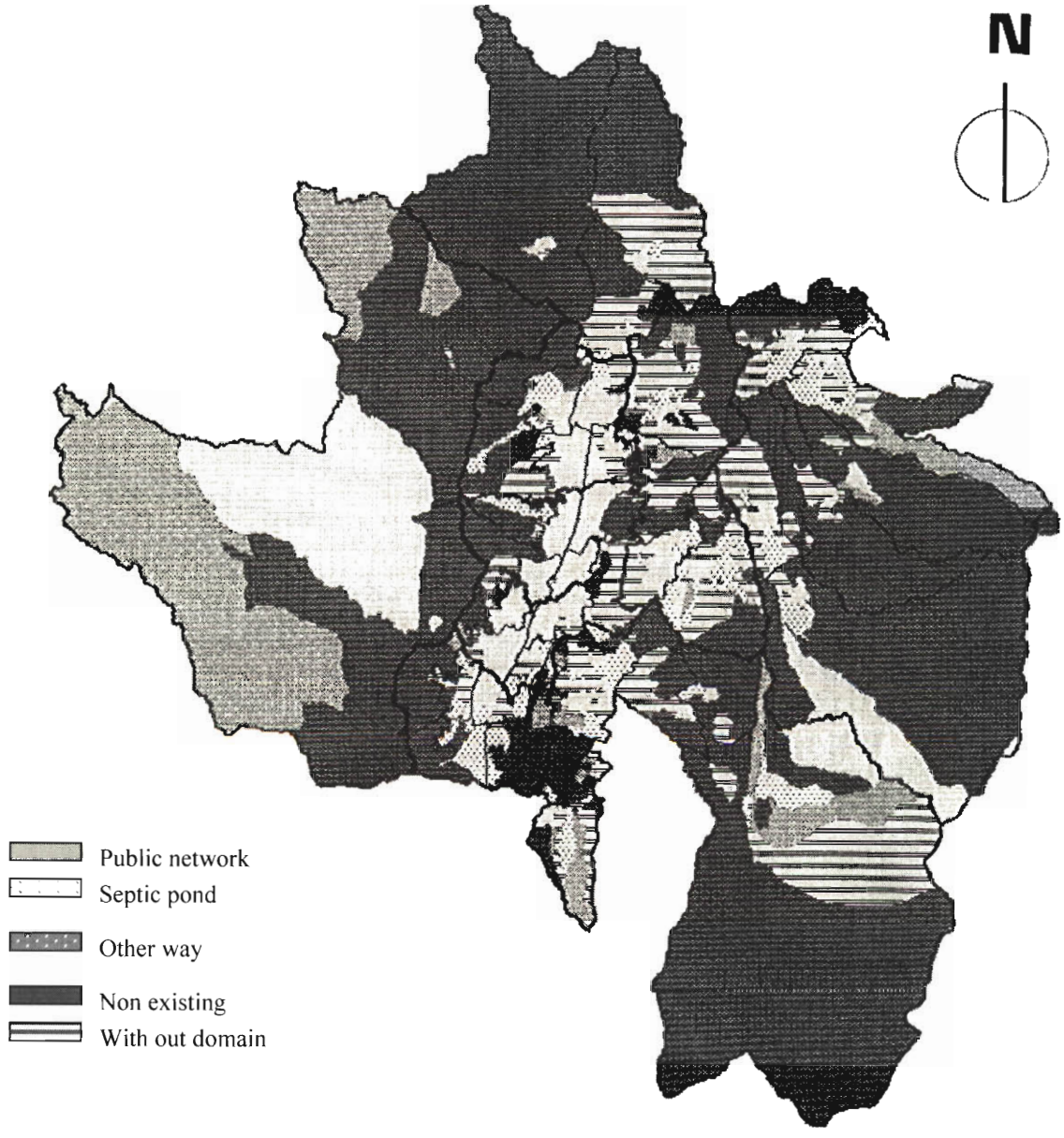
-Zone south

95% of the principal flow discharged is rainwater. The discharge per capita is estimated to be 70% of the flow of drinkable water, which is 2.479 liters per second. 5802 Has are served by the EMAP in relationship with the urban area, which means 68.4 % of the urban space is not served by the sewer system.

The following maps show the situation of the sewage system in the MDOQ.



Picture 9: Sewage infrastructure



Picture 10: Sewage coverage

4.3.3. Solid waste

In Quito, the primary agents that generate solid waste by weight are:

-Population 61.35%

-Industry 11%

-Markets 11%

-Commerce 10%

-Sweepers 5%

-Hospitals 1.7%

In 1992 there were about 858 tons of garbage per day in the urban area. In 1991, there was a low utilization of equipment as well as inappropriate utilization of human resources for the collection and sweeping. Presently, there are sanitary landfills in operation, which have estimate duration of 30 years (2023).

4.3.4. Electric energy

There are 5 electric centrales in the MDOQ

-Hydroelectric Pasochoa

-Gas-diesel (Guangopolo)

-Hydraulic Guangopolo

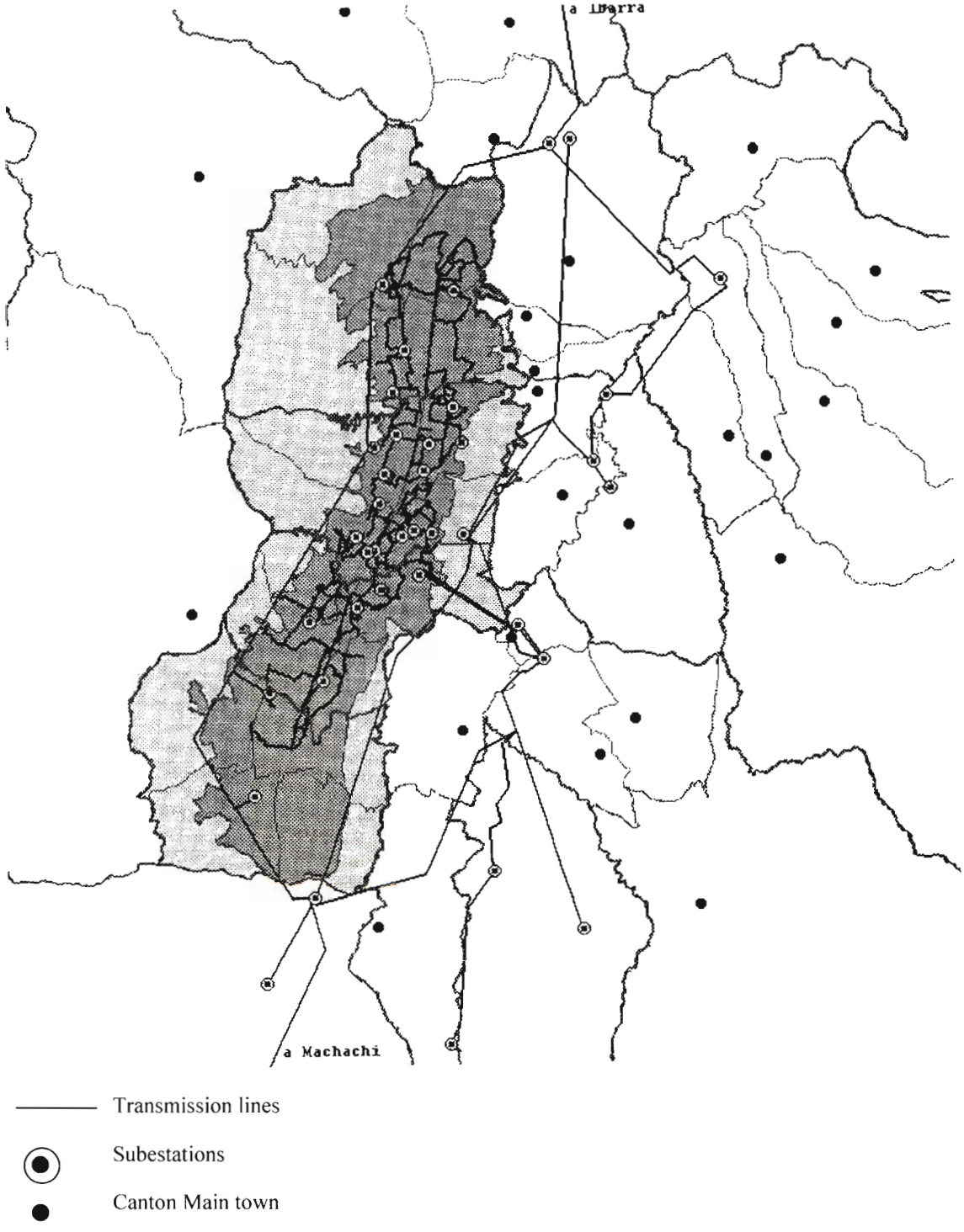
-Cumbaya

-Nayon

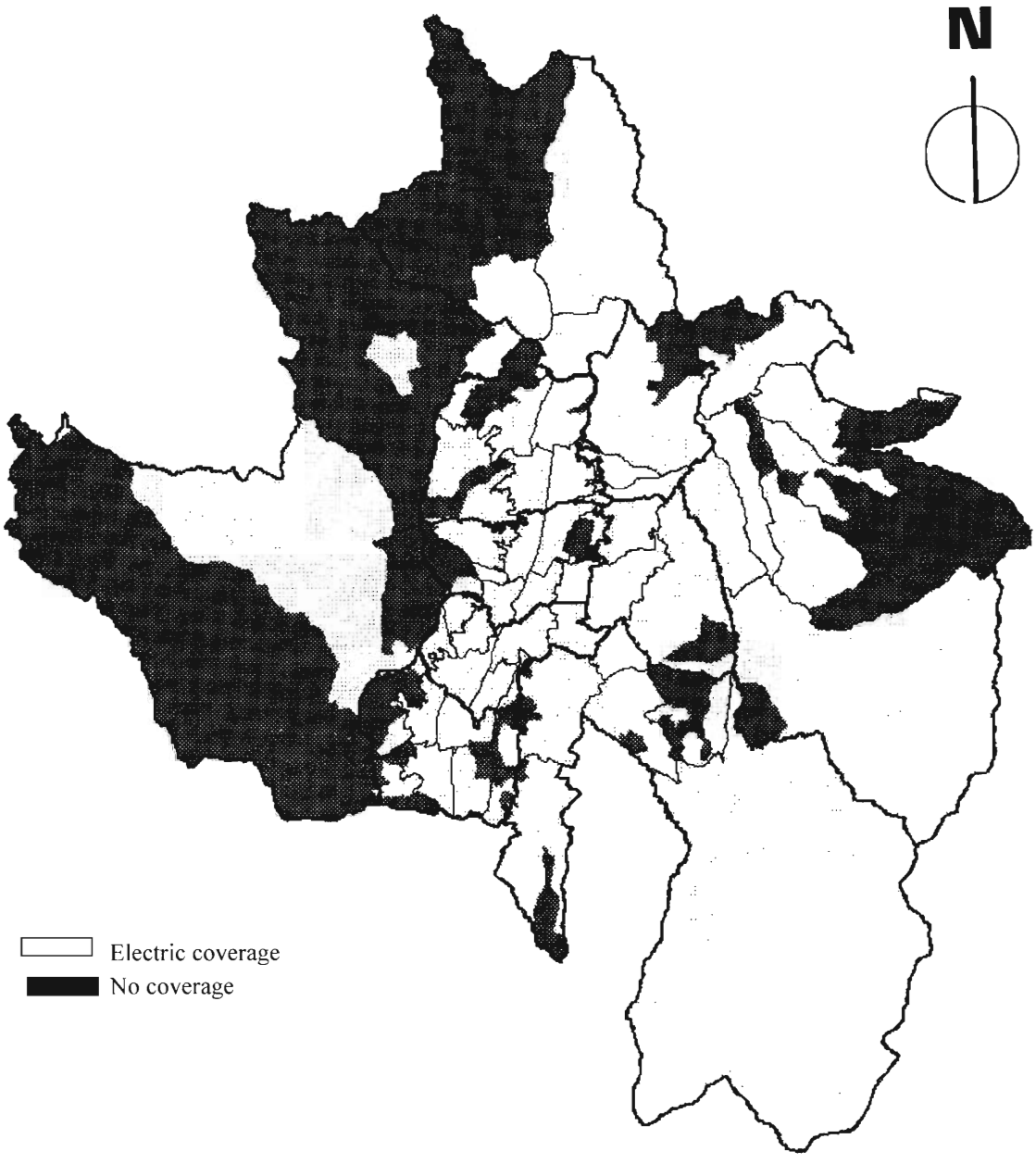
In Quito, the electric system is generated from the three hydraulics plants (30.2%) and Three thermal plants (14.3%); and the rest of electricity is supply by the interconnected

national system (55.5)%. Lines of transmission and sub-transmission transmit the electricity until it arrives to the section is the sub-stations.

In the different parroquias, there are three energy types sources: hydraulic, thermal, and contracted. 14 parroquias (with larger human conglomeration) serve 80% of their population and in the rest of parroquias, less than 50% of their population is served. In the peripheral zone, the supply is less because of the greatness of the surface and the dispersion of the settlements.



Picture 11: Electric infrastructure



Picture 12: Electric coverage

4.3.5. Telephone

Quito has automatic telephonic service for local and nationals phone calls. It has 9 telephone centrals (electro-mechanic and digital) with 643 sectors (1988), which have a maximum capacity of 500 pairs. The 9 telephone centrals with 179,331 lines provide services to 133,393 members, which is 54% of the number of houses. In 1992 there were 8.4 lines/Hab. The locations of the centrals benefit the northern zone more.

Classification of the telephone members

72% residential

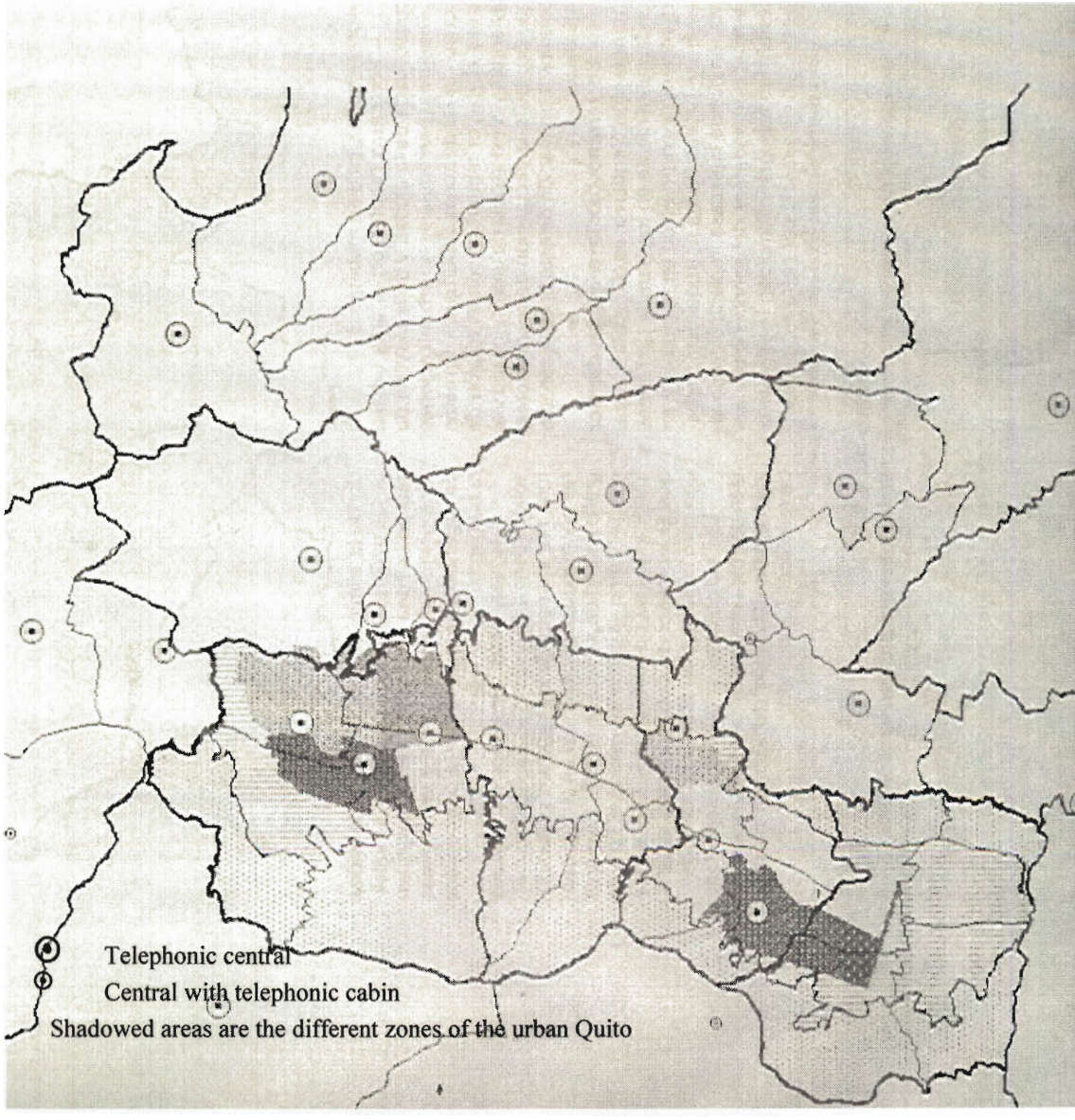
11% commercial

10% industrial

3% vacates

4% others

In 1990 there was a deficit of 150424 lines while in 1992 the coverage was 73%.



Picture 13: Telephone infrastructure

4.3.6. Road and Rail system

In the MDOQ the extension of the road system is 571.6 km, half of it corresponding to tertiary roads, tertiary roads are the ones that are use inside towns. The remaining 25% correspond to primary network; primary network is mainly the road system that interconnects the city to the different towns. The system extends 101 sections and 59 sub-sections; 35.7 % of the 571.6-km is asphalt covered and 20 % is ballast covering

Half of the network presents bad conditions, while 60% of the asphalt road is a primary road system

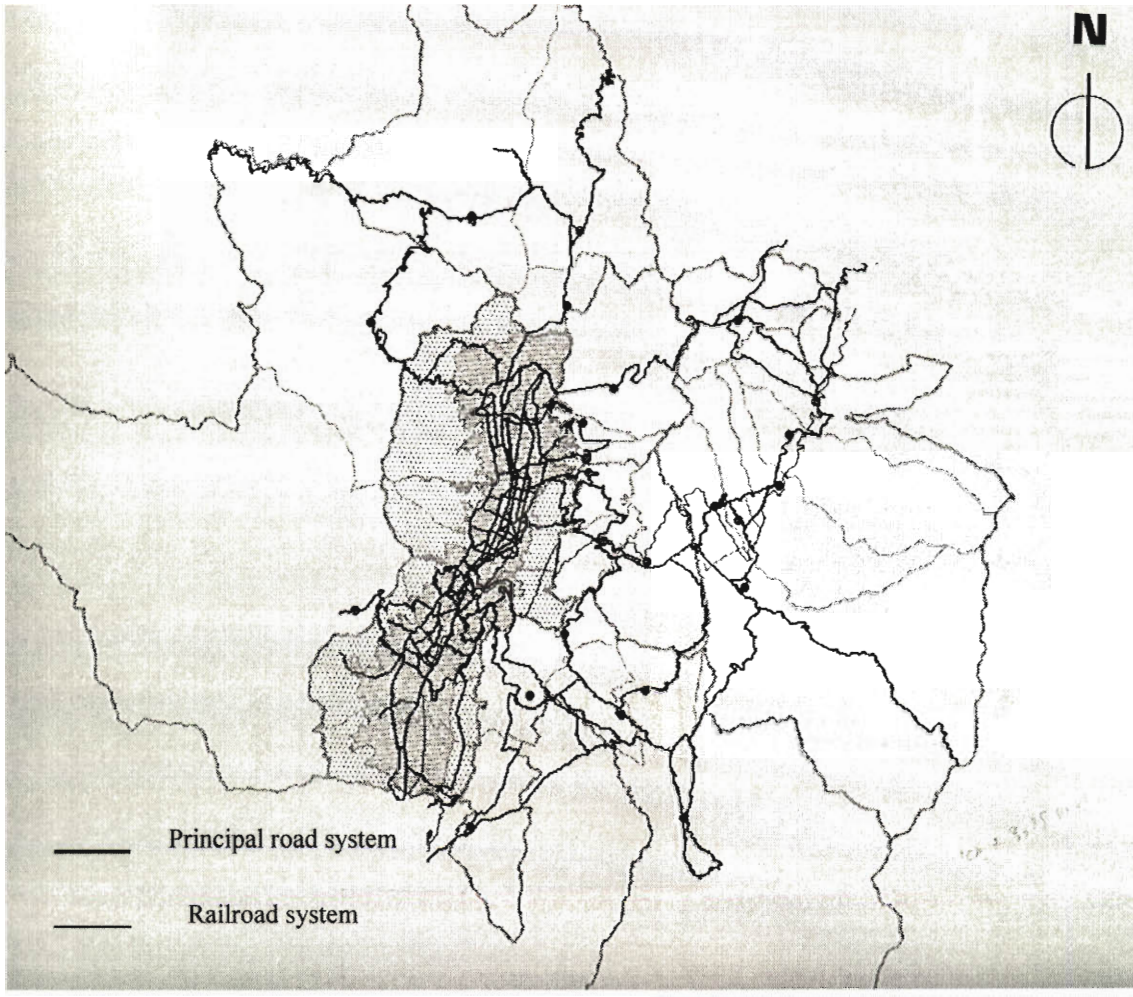
4.3.7. Transport

There are 39 cooperative companies of transport (1990) with 1730 buses and 350 shuttles. This service is used by the 80% of the population. The different transport organizations do not respond to the needs of the population. There was no technical study for determining the cycles that must be performed by each bus for real demand and supply.

The Municipality Transport Company (1990), gives service to 9 routes, 70 articulated buses (more capacity), and 24 normal buses. This service has a higher service than the normal cooperative; 39 companies provide micro regional transport (inter-parroquial) with 831 units.

These buses and shuttles also go through the city causing traffic jams and using stops that should be reserved for the city transport companies (Estructura espacial metopolitana, Temas y probleams criticos,1990, Infrastructura, p177). Taxi service is provided by 4252

units from 141 cooperatives.(Estructura espacial metopolitana, Temas y probleams criticos(1990, Infrastructura), p177)



Picture 14: Road system

4.4. - Suitability of the physical environment

The compilation of all the data and research leads to the selection of the optimum location for the development. The different factors have been weighted in a chart to give a clearer understanding of the spatial distribution in terms of physical medium.

Table of the physical medium-Slope

Suburban Canton	Parroquia	Average slop
Pululahua		
	Calacali	4
	San Antonio de Pichincha	3
	Pomasqui	2
Carapungo		
	Calderon	2
	Llano Chico	2
	Zambiza	3
Rumihuaico		
	Nayon	1
	Tumbaco	3
	Cumbaya	2
Los Chillos		
	Guangopolo	4
	Alangasi	3
	La Merced	4
	Conocoto	2
	Amagauna	3
	Pintag	5
Oyambaro		
	Guayllabamba	3
	El Quinche	2
	Checa	3
	Yaruqui	3
	Tababela	5
	Pifo	5
	Puembo	3
Ungui		
	Lloa	5
	Nono	6

Slope grading	
Weight	Grade
1/6	0-3
2/5	3.1-7
3/4	7.1-14
4/3	14.1-27
5/2	27.1-35
6/1	>35

Most favorable for urban development, Max allowable slope is 9 grades

Table 6: Slope

Table of the physical medium-Precipitation

Suburban Canton	Parroquia	Weight for average rain precipitation
Pululahua		
	Calacali	3
	San Antonio de Pichincha	7
	Pomasqui	7
Carapungo		
	Calderon	8
	Llano Chico	6
	Zambiza	6
Rumihuaico		
	Nayon	6
	Tumbaco	5
	Cumbaya	5
Los Chillos		
	Guangopolo	5
	Alangasi	5
	La Merced	5
	Conocoto	5
	Amagauna	4
	Pintag	3
Oyambaro		
	Guayllabamba	9
	El Quinche	6
	Checa	5
	Yaruqui	5
	Tababela	6
	Pifo	4
	Puembo	6
Ungui		
	Lloa	2
	Nono	3

Weight for range of precipitation in mm

weight	mm
1	>2500
2	2000-2500
3	1500-2000
4	1300-1500
5	1000-1300
6	800-1000
7	600-800
8	500-600
9	<500

Table 7: Precipitation

Table of the physical medium-Geomorphology

Suburban Canton	Parroquia	Average Geomorphology weight values
Pululahua		
	Calacali	1
	San Antonio de Pichincha	3
	Pomasqui	3
Carapungo		
	Calderon	2
	Llano Chico	1
	Zambiza	2
Rumihuaico		
	Nayon	2
	Tumbaco	2
	Cumbaya	2
Los Chillos		
	Guangopolo	3
	Alangasi	2
	La Merced	3
	Conocoto	1
	Amagauna	2
	Pintag	3
Oyambaro		
	Guayllabamba	3
	El Quinche	2
	Checa	2
	Yaruqui	2
	Tababela	1
	Pifo	3
	Puembo	1
Ungui		
	Lloa	4
	Nono	4

Weight for values for soil geomorphology

Weight	Legend	Description
1/4	A	Favorable
2/3	B	Medium favorable
3/2	C	Less favorable
4/1	D	Not favorable

Table 8: Geomorphology

Table of the physical medium-Risk

		Average weight values			
Suburban Canton	Parroquia	Lava	Lahares	Ash	Combination
Pululahua					
	Calacali	10	10	10	15
	San Antonio de Pichincha	10	10	10	15
	Pomasqui	5	10	10	
Carapungo					
	Calderon	-	5	5	-
	Llano Chico	-	5	5	-
	Zambiza	-	5	5	-
Rumihuaico					
	Nayon	-	5	5	-
	Tumbaco	-	5	5	-
	Cumbaya	-	5	5	-
Los Chillos					
	Guangopolo	-	5	5	-
	Alangasi	-	5	5	-
	La Merced	-	-	-	-
	Conocoto	-	5	5	-
	Amagauna	-	5	5	-
	Pintag	-	-	-	-
Oyambaro					
	Guayllabamba	-	5	-	-
	El Quinche	-	-	-	-
	Checa	-	-	-	-
	Yaruqui	-	-	-	-
	Tababela	-	-	-	-
	Pifo	-	-	-	-
	Puembo	-	-	-	-
Ungui					
	Lloa	10	10	10	15
	Nono	10	10	10	15

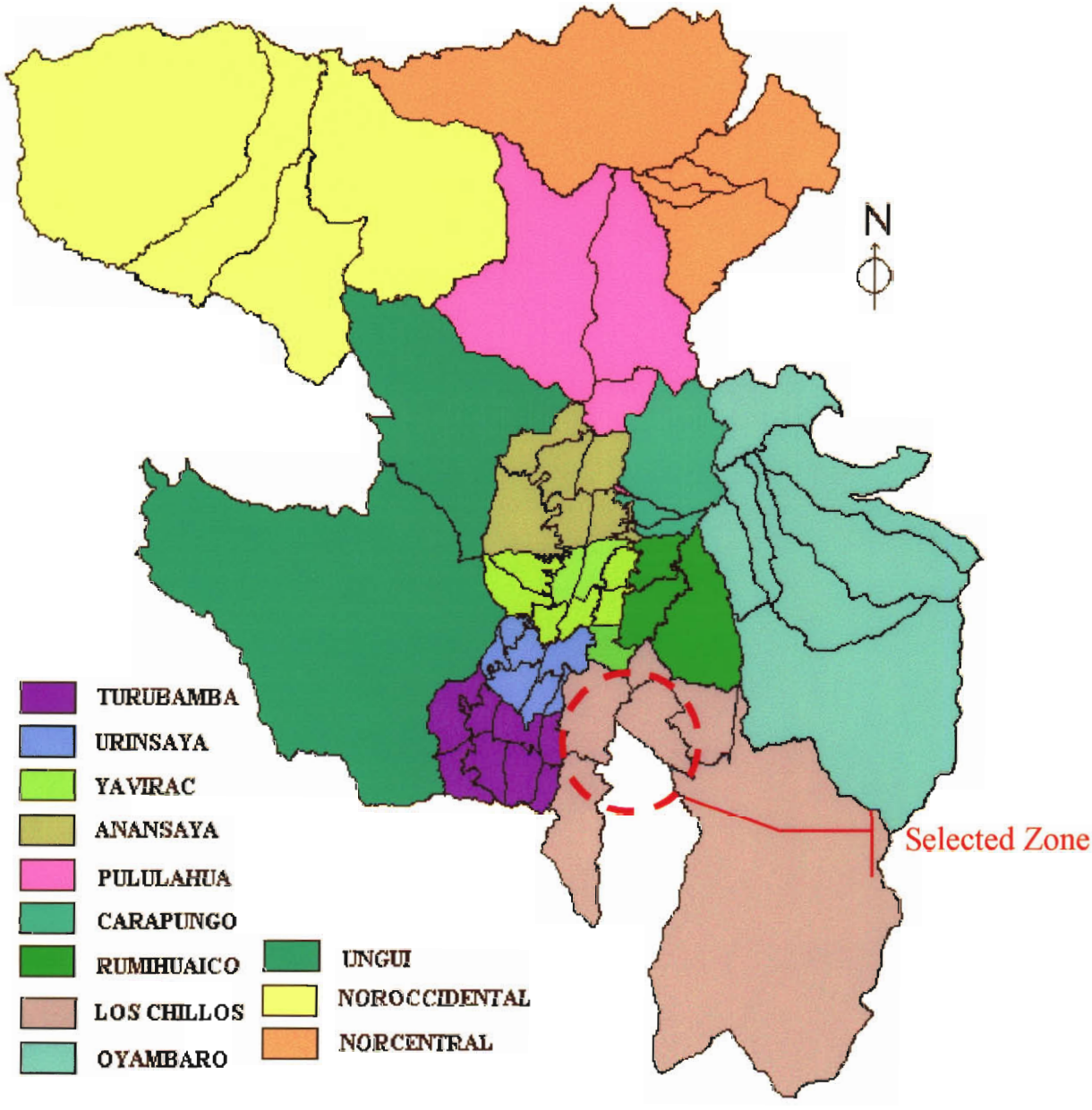
Weight values	
weight	risk
Lava	
1/10	High risk
2/5	Low risk
Lahar	
1/10	High risk
2/5	Low risk
Ash	
1/10	High risk
2/5	Low risk
Combination	
3/15	

Table 9: Risk

Total weight table

Canton	Parroquia	Lava	Lahares	Ash	Combination	Average Geomorphology weight values	Weight for average rain precipitation	Average slop	Total weig
Pululahua									
	Calacali	10	10	10	15		1	3	4
	San Antonio de Pichincha	10	10	10	15		3	7	3
	Pomasqui	5	10	10			3	7	2
Carapungo									
	Calderon	-	5	5	-		2	8	2
	Llano Chico	-	5	5	-		1	6	2
	Zambiza	-	5	5	-		2	6	3
Rumihuaico									
	Nayon	-	5	5	-		2	6	1
	Tumbaco	-	5	5	-		2	5	3
	Cumbaya	-	5	5	-		2	5	2
Los Chillos									
	Guangopolo	-	5	5	-		3	5	4
	Alangasi	-	5	5	-		2	5	3
	La Merced	-	-	-	-		3	5	4
	Conocoto	-	5	5	-		1	5	2
	Amagauna	-	5	5	-		2	4	3
	Pintag	-	-	-	-		3	3	5
Oyambaro									
	Guayllabamba	-	5	-	-		3	9	3
	El Quinche	-	-	-	-		2	6	2
	Checa	-	-	-	-		2	5	3
	Yaruqui	-	-	-	-		2	5	3
	Tababela	-	-	-	-		1	6	5
	Pifo	-	-	-	-		3	4	5
	Puembo	-	-	-	-		1	6	3
Ungui									
	Lloa	10	10	10	15		4	2	5
	Nono	10	10	10	15		4	3	6

Table 10: Total weight table



Picture 15: Selected Site

Given this weighting system, the best area is that which the least total weigh. The optimum location is located in the suburban Zone of "Los Chillos" in the parroquias of Conocoto and Alangasi(see above map). This area compiles with the physical requirements for an optimal settlement; the following are the descriptions of this area in the different aspects considered for the Satellite City.

4.4.1-Climate

This zone is located in the inter-Andean zone (2400-3100 masl) where the annual precipitation for our location is 1000- 1300 mm per year. The average temperature is about 13 degrees Celsius, with a fluctuation of 12 to 16 degrees Celsius.

4.4.2-Physiography

The site is located in the Los Chillos valley (2250 – 2700 masl), which is located in the Quito River Basin, a small area between the Occidental and Oriental Andean Cordilleras (mountain ranges). It is a high catchment area for the Guallabamba River. Our site is near a lower elevation (Ilalo) which separates the valley selected from the valley of Tumbaco.

4.4.3-Topography and slopes

The site has a homogeneous relief undulated with small dissectations containing slopes of 3 – 7 degrees while ideal slope for human settlements are between 4 and 9 degrees. The exception to this relief is the inactive Ilalo volcano where there are some high slopes that are greater than 27 grades. (This volcano has a height of 3,169 m)

4.4.4-Soil stability

Most of the soil in the MDOQ is an Anepis type of soil. This soil is constituted mainly of volcanic soil derived from volcanic ashes, but in the selected site there is a higher percentage of organic soil good for agriculture conditions.

4.4.5-Areas of ecological protection

The only area designated for ecological protection is the Ilalo volcano.

4.4.6-Hydrology

Two main rivers, the Pita River, and the San Pedro River cross the site selected. Small tributary rivers also cross this site. The valley of Los Chillos aquifer underlies the whole valley.

4.4.7-Natural risks

Ecuador is located in the fire belt of the pacific, where there is great volcanic activity. The MDOQ is surrounded by multiple risks, but because our development needs to solve some urban problems that the capital is confronting, the site can not be set in a risk free location because of the distance people have to travel. There are two risks involved with the site selected:

- Area of loss Chillos is affected by micro faults created by the inter-Andean tectonic fossa. Also
- The Chillos valley is subject to low volcanic/lahar risk.

Chapter 5: Analysis, Results and conclusions

5.1 - Results

It is important to consider the improvement of the quality of life of any community or settlement. Planing not only the urban interaction but also the social and environmental interaction must be done, for an important roll in the development phase. For this project urban, environmental and social planing must be merged to produce the desired quality of life. The results of compressive planning are going to be divided in three stages. They are problem-solving, development of the satellite city and conclusions.

5.2. - Problem solving

It is important to understand the ideology and mentality of the future settlers of the area to be developed. The future settlers are low-income workers. They are not well educated and they are the basis of the work force pyramid.

In a developing country the basis of the economic system for the different industries is the work force. By increasing the quality of life for these people, the different industries can be expected to have a healthier and more satisfied work force. Solving this problem will increase the growth of the economy of the different industries. By providing a more suitable place to live, the chances of health problems among the population are decreasing.

The majority of the people have immigrated from different provinces of the country into the Quito for a better way of life, incorporating into urban area more homes like the ones in the settlers' hometowns. This concept should be carried on for new settlers would not feel like strangers. Most of the people have a hard time getting used to

a new way of life, simply because it is so different from their hometowns. Social planing needs to be taken into account in planing a development of new projects.

With the coming of the new century, environment concern is one of the priorities. Because Ecuador is behind on its environmental concerns, this project makes environment as a priority. The popular settlements are to be recognizes as an obligated alternative form of land use, because the newly arrived settlers do not have the economic resources to do anything better. In 1978 the UNESCO declared historic Quito "Cultural Patrimony of the Humanity". Even though it is a patrimony, the historic center presents a daily drama: the poverty of its occupants, and the deterioration of its habitat. The same thing happens in the surroundings of the city; there is indiscriminate cutting of the trees to build an un-orderly development without the proper conditions in which people may live. This problem is generated because of the lack of adequate housing for the popular sectors (settlements).

The popular settlements main reasons to exist are the following:

-Searching for refuge

- Searching for a better standard of living

- Searching for greater job opportunities

-Searching friendly communities, since the majorities of the residents are immigrants from the rural areas

Settlers in these popular settlements hope to have their own houses. This dream becomes fulfilled, but at what cost? (Asentamientos Populares, p9)

The peripheral settlements occupy inadequate land for development, usually in the hills, mountains or places outside the city with no infrastructure or basic needs.

In Quito land possession by invasion is minimal. Instead the occupation of the land is done through illegal subdivision of land (detail description of this can be found in chapter 2). Another cause of the peripheral settlement problem was the elimination of the "Hacienda" from the peripheral sector, causing liberation and unemployment of the agricultural work force and lowering levels of food production.

Any possible solution to the above problems necessitate the following:

- The strengthening of activities which is oriented towards a tertiary economy.

-Discouraging the disorganized occupation of the land

-Linking the economy to exportation and oriented to the local, regional and national consumption

-Organized industrial implantation (improving infrastructure) controlling of its pollutant agents

-Decreasing the migratory flow, thoroughly decreasing the pressure on jobs, housing, urban land and transport demand

-Infrastructure and equipment deficit (specially in central and peripheral zones)

-Create a road system that is not hierarchic, but oriented to satisfy the immediate demands

5.3. - Develop of Satellite City

The development of the Satellite City must consider the key factors of zoning, infrastructure and equipment for a more suitable, organized and higher quality of life for our future settlers. Factors to be considered in our development are zoning specification, transportation, water, electric energy, wastewater management, solid waste management, telephones systems, and education.

5.3.1. - Population and education Projections

Quito has a population of 1,361,228(1997), of which popular settlements consist of 18.27 % of the whole population. Therefore the satellite city needs to accommodate 248,700 people (18,27 % of total population). Assuming that there is an average 4 people in a family, two grownups and 2 children. There will be 62,175 families. Consequently the city will need 62,175 households.

There will be a total of 124,350 children, only one third of which are in the age to attend school. This means the schools must accommodate 41,450 children. Assuming that each school will accommodate 40 children per grade and that there will be 6 classes per grade, there will be 15 schools.

To have a complete development analysis, a projection of 25 years will be used in this report.

In 2035 there is expected to be a total population of 2,843,200 (see chapter 2) people of which 519,460 will be living in the peripheral settlements. This means that the Satellite City will need to accommodate 129,865 families in 2022.

5.3.2. - Zoning

The satellite city will be divided in to the following zones: low residential, medium residential, residential /commerce, industrial, agricultural and green areas (see appendix 1 for reference in the location of the different zonings).

5.3.3. - Residential

Residential is going to have two types of zoning for housing, low density and medium density, it was chosen low and medium density because we want to give our settlers more space, the less the density volume of consumption of basic services the less services

5.3.3.1. - Low density residential

This zoning is going to be composed of single family units (see appendix of floor plan and side views). All houses will have a maximum of one story.

The total area of the property land is 308 m^2 per family this was determined to be enough area for a residence with some green spaces. Low density residential will house 1/3 of all the families. It will house a total of 20,725 families with a total 6.4 km^2 or 640 Ha, giving us a density of 129.5 people/Ha.

For the 38 years projection 1/3 of the total population of the peripheral areas will be housed also. There are going to be 43,288 families in a total area of 13.33 Km^2 or 1333 Ha. The density is going to be 130.19 persons/Has.

5.3.3.2. - Medium density residential

This zone is going to be composed of two family units (see appendix 1 for floor plan and side views). The units will have a maximum number of two stories.

The total area of land is 308 m^2, and will house the other two thirds of the population: 41,450 families will occupy 6.38 km^2 or 638 Has, giving a density of 259.8 people/Has.

For our 38 years projection, the satellite city will provide housing to 86,577 families giving us a total area of 13.3 Km^2 or 1330 Has. The Density will be 259.7 people / Has.

5.3.3.3. - Industrial zone

This zone is going to be developed as light industry, as well as having the surrounding quarries and mine extracting industries.

5.3.3.4. - Commerce-residential

The center of the city is to be composed of buildings consisting of commerce on the first floor, residences on the above floors. The maximum story levels in this zone will be four.

5.3.3.5. - Agricultural

The surroundings of the city will be configured with land extensions for agricultural use. These areas will expand with the city, always being in the borderline of the city.

5.3.3.6. - Environmental protection, and green areas

We are going to designate environmental zoning protection for places that consist of native vegetation, or are too risky for people to live in. Parks, the green belt, and green strips along any rivers will also be protected. Basically green belts are areas with vegetation, that are used to insulate different parts of the city from other parts of the city.

5.3.4. - Transportation

Transportation is one of the key factors for the success of the development. For the site selected one advantage is that important inter-provincial roads pass though the area nowadays.

5.3.4.1. - Buses

A bus station will be placed in the development. The bus system will consist of inter-city shuttles, which provides main bus transportation for the city, and micro regional buses, which will travel to the capital and to other parroquias.

5.3.4.2. - Trolleys buses

To facilitate the transportation of our settlers we are going to have a trolley bus station in our city. This will serve as transportation to the capital, (express service) to the new airport zone, and the various towns on the way towards the capital.

5.3.4.3. - Road system

The main road system that passes through our site of development are the expressway and the primary, secondary and tertiary suburban road system.
The proposed development is going to be attached to the existing road system for better access by the extension of the primary roads into the city. All road systems will be of asphalt. The express way will consist of a two-lane highway. Primary system will consist of two-lane street. The main road system for our development is secondary roads made of 2-lane asphalt roads, separated by a white line. Tertiary roads will be of asphalt mainly used in neighborhood roads in our development.

5.3.5. - Drinkable water

The lower elevation of the site benefits the development because all the water is supplied by gravity from the current drinkable projects available for the MDOQ (See appendix 3

for water). Another advantage is the aquifer of Los Chillos that is beneath the site, which can also provide underground water supply.

The development must be as autonomous as possible; therefore it is important that it is near a river. The idea is to create a water-dam upstream of the river housing a water treatment plant. This plant will recollect water from the river, treat it, and distribute it to the city. Depending on the amount of collection from the dam , it can also provide water for the surrounding towns. As a back up system, there is going to be pumping sub stations that will provide water in case the main distribution plant from the treatment fails, or is under maintenance.

A network piping system will connects each house and building to the distribution tanks of the main system. Consequently the development will have a suitable network of drinkable water for its population.

5.3.6. - Electric Energy

Fifty percent of the electricity distribution for our settlement is going to be provided from the interconnected national system. Thirty percent is going to be provided from the substations of transmission and generation of Guangopolo, gas diesel, Los Chillos and Sangolqui (see Appendix of electric energy, for the location of the substations).

The other 20% (up to 40% in case of lack of sufficient electric energy) will be created in the project-dam, where energy will be produced by hydrolic generated engines.

Adequate infrastructure will be provided for the transmission of the energy from the different networks to the energy transformes in each neighborhood.

5.3.7. - Sewage-wastewater management

A suitable development must have an excellent sewage-wastewater management, along with other environmental concern. For the development, a network of sewage and rainwater collection will be provided. Using two separated systems, each building will be connected to the main network, which will then be connected to a wastewater treatment plant. Rainwater and wastewater will be connected into different stages in that plant. A more detailed and complete treatment needs to be provided to the wastewater due to toxins. All the water treated will be discharged into the river or used for agricultural purposes. The sewage systems for the agricultural zone will consist of a communal septic tank for a certain number of lands.

5.3.8. - Solid Waste management

The city will have sanitary landfills, where collector cars will have daily routes to collect the solid waste in the morning. There will also be sweeping teams for the parks and roads.

5.3.9. - Telephone system

Communication is important for the settlers. Therefore, a telephone central will be placed in the city, interconnecting all the houses. The entire network is going to be of a high resistance wire. The connection to the capital and the rest of the telephone central will be interconnected with fiber-optic cables (see Telecommunication appendix).

5.3.10. - Security

Our development will have police and fire stations to control crime and keep the public safe. In each neighborhood there will be police tolls to maintain public safety.

5.3.11. - Public recreation

The city will have four main parks, plus a central park a the green belt surrounding the city and the river. At the neighborhood level, there will be small parks for the recreation of the settlers to that particular neighborhood.

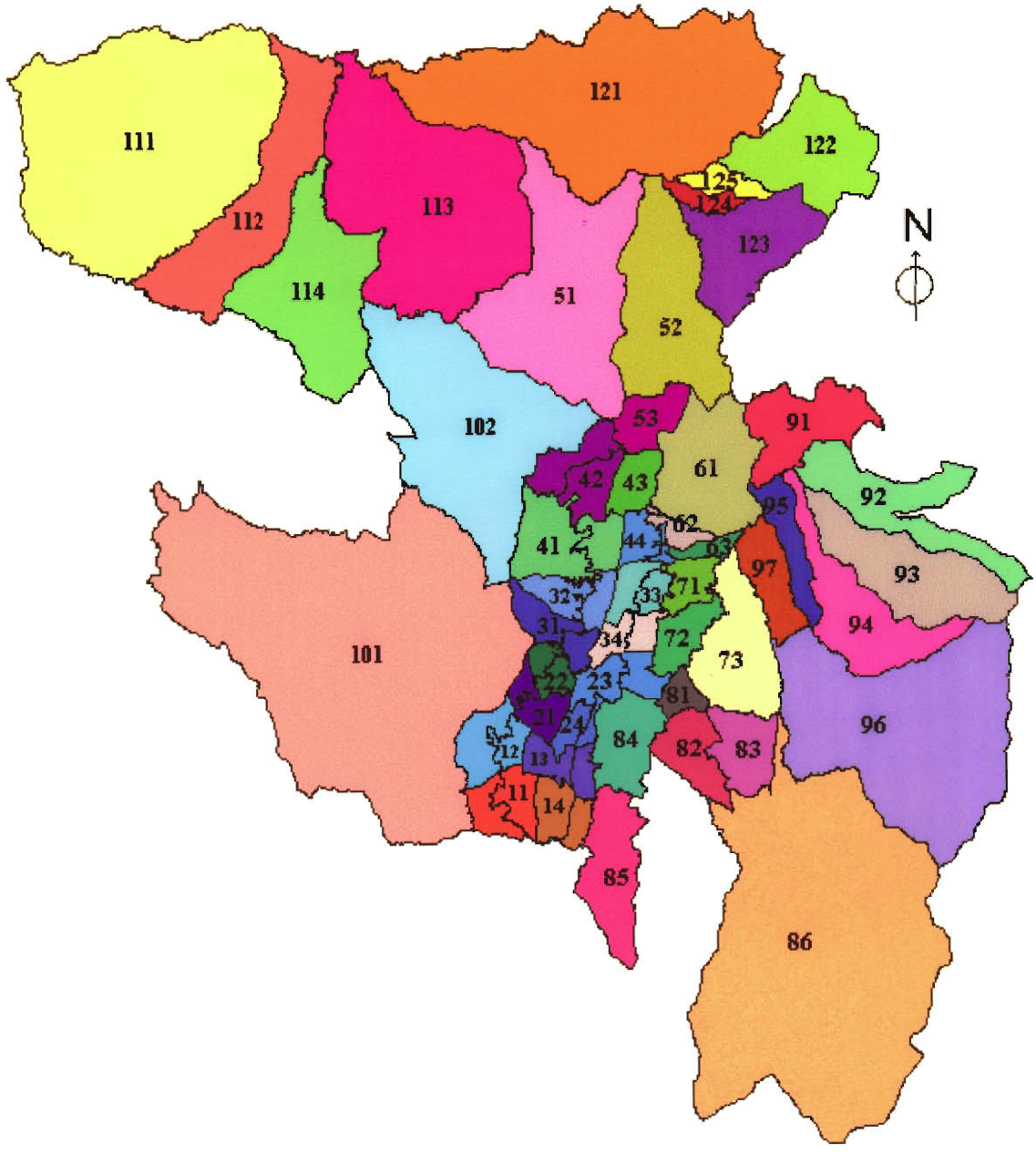
5.4. - Conclusions

The success of this development depends on the necessary interaction of social, environmental and urban plan. This project will help create for the first time a large scale planing of a satellite city in the DMOQ. By implementing this project, one of the greatest problems the DMOQ has will be solved. Not only will this project solve the problem of illegal popular settlements but it will also help the people that are in such terrible conditions obtaining a higher quality of life. First, the people's dream of having their own shelter will come true. In addition they are going to be living in a more planned city, which has the entire infrastructure and equipment for them to be in a fit and healthy environment.

The aim of this development is also to try to make the city as autonomous as possible by implementing all the areas of discussion in this project. Also, by adding another town without the proper infrastructure and basic services, the resources of the existing towns will be diminished, affecting the whole DMOQ. By making the city autonomous the resources do not have to be shared. This development has its own job generating zones, which are created by projects such as the recollection of solid waste, small industries, surrounding agriculture fields, treatment plants, and some commercial zones. Some people will find jobs in the city while others, which already have jobs, will

be using a safe and practical transportation system (trolley bus or buses) to the capital or to the different industries that will surround the new airport.

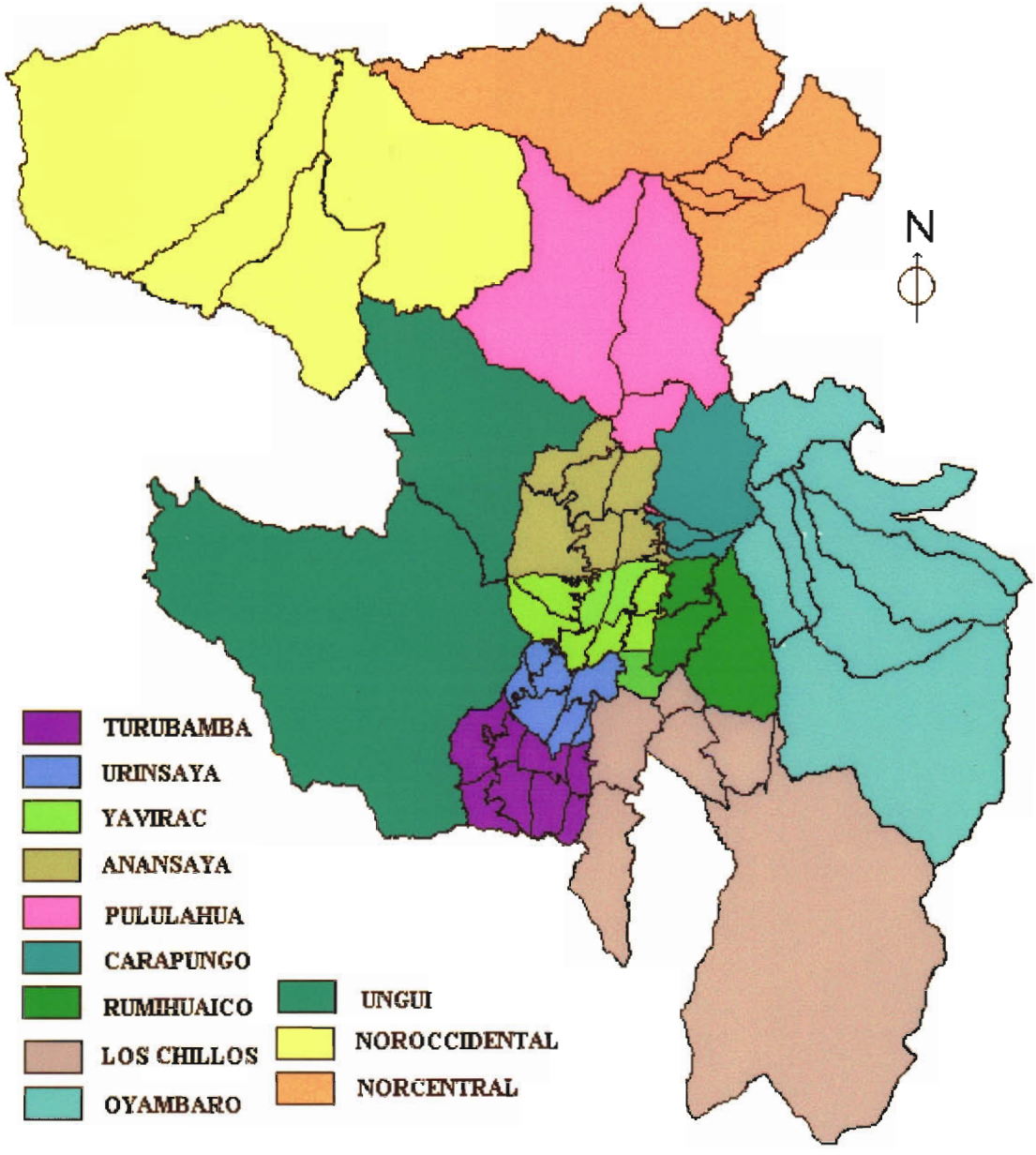
Appendix 1 The MDQ



Picture 16: The MDOQ

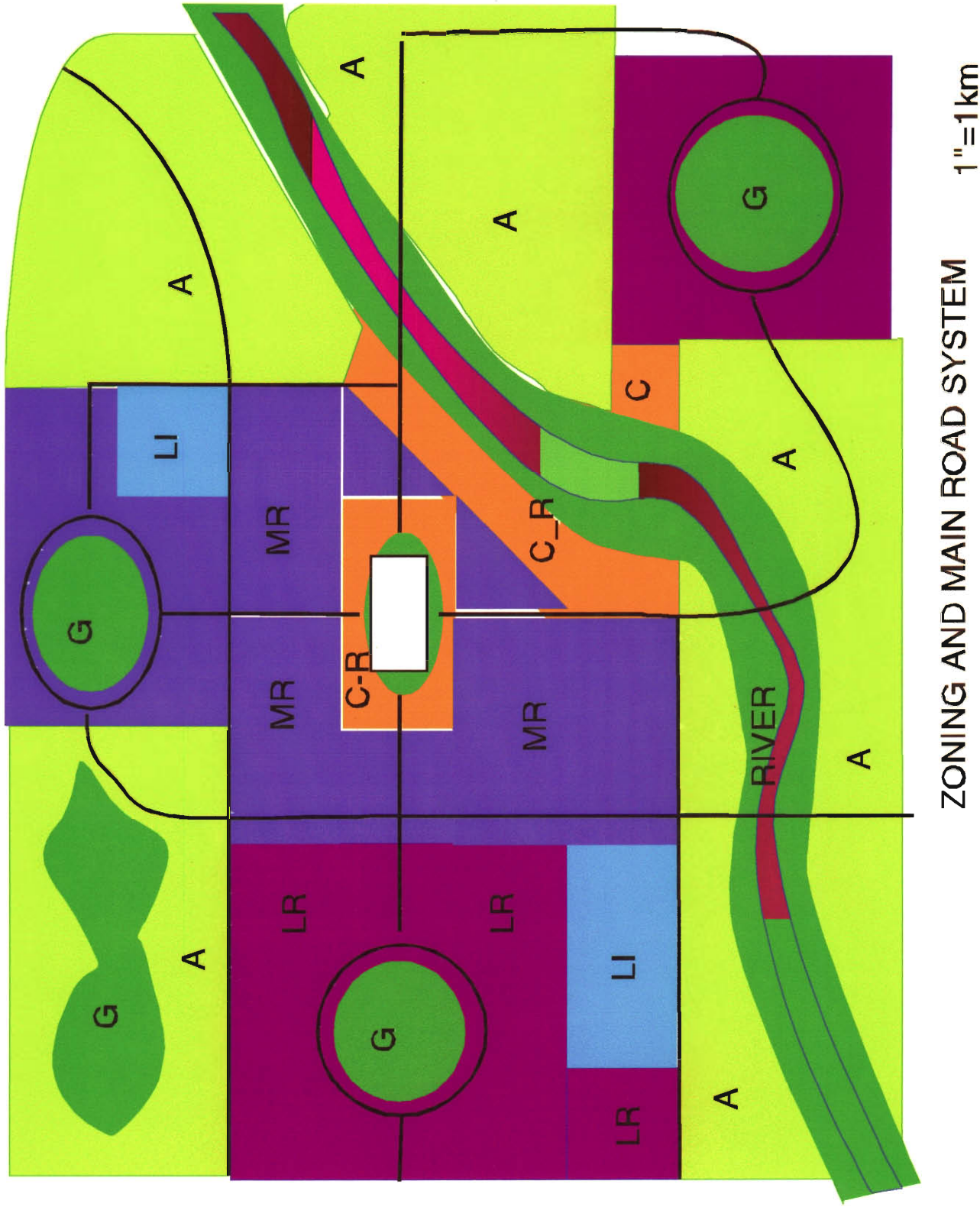
05	Pululahua
51	Calacali
52	San Antonio del pichincha
53	Pomasqui
06	Carapungo
61	Calderon
62	Llano chico
63	Zambiza
07	Rumihuaco
71	Nayon
72	Tumbaco
73	Cumbaya
08	
81	Guangopolo
82	Alangasi
83	La merced
84	Conocoto
85	Amaguana
86	Pintag
09	Oyambaro
91	Guallabamba
92	El Quinche
93	Checa
94	Yaruqui
95	Tababela
96	Pifo
97	Puembo
10	Ungui
101	Lloa
102	Nono

Table 11: The MDOQ parroquias



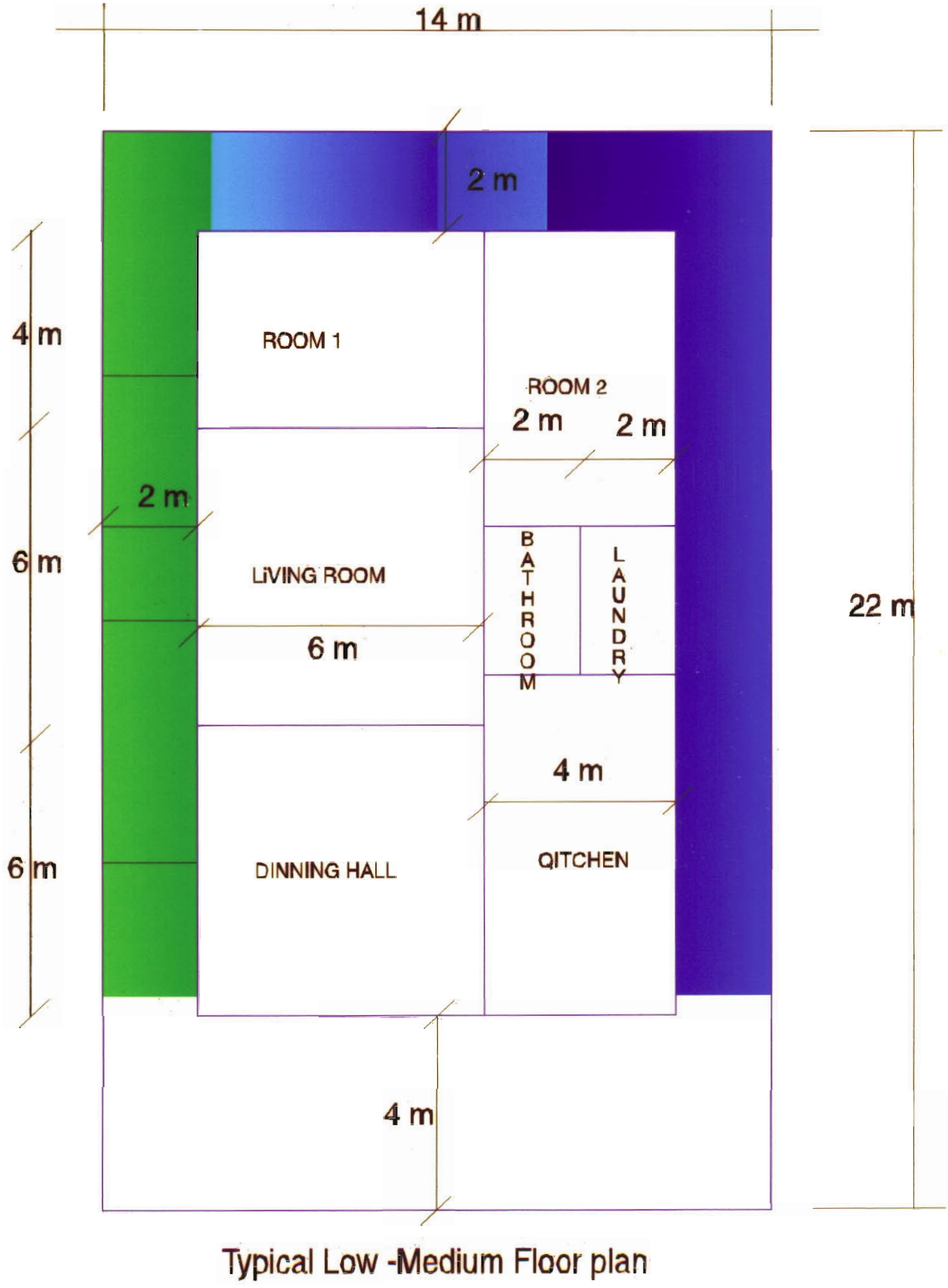
Picture 17: Macro political division of the MDOQ

Appendix 2

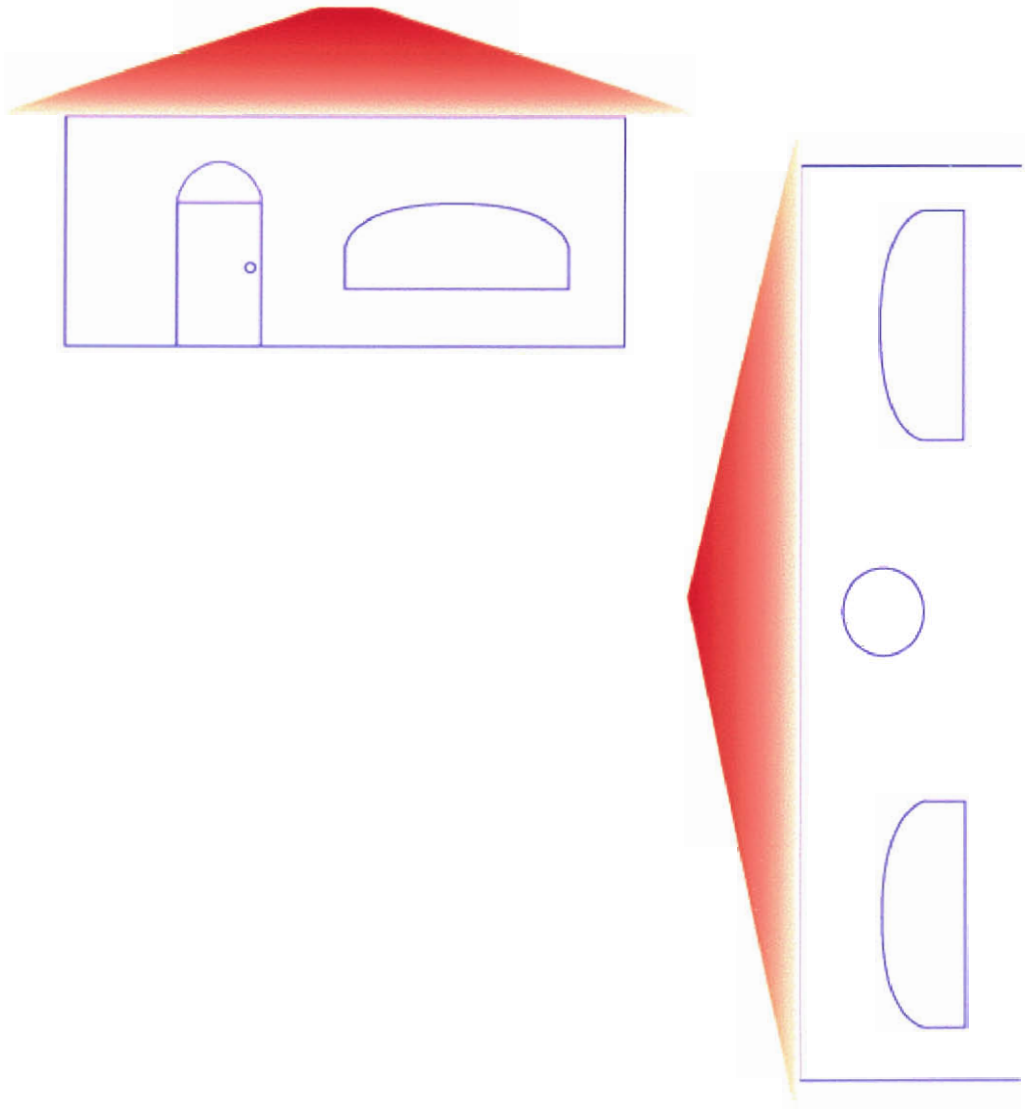


Picture 18: Virtual Satellite city

Legend: G (green Areas), A (Agriculture), LR (Light residence), MD (Medium residence, LI (Light industry), C-R (Commercial –Residential) and C (Commercial)



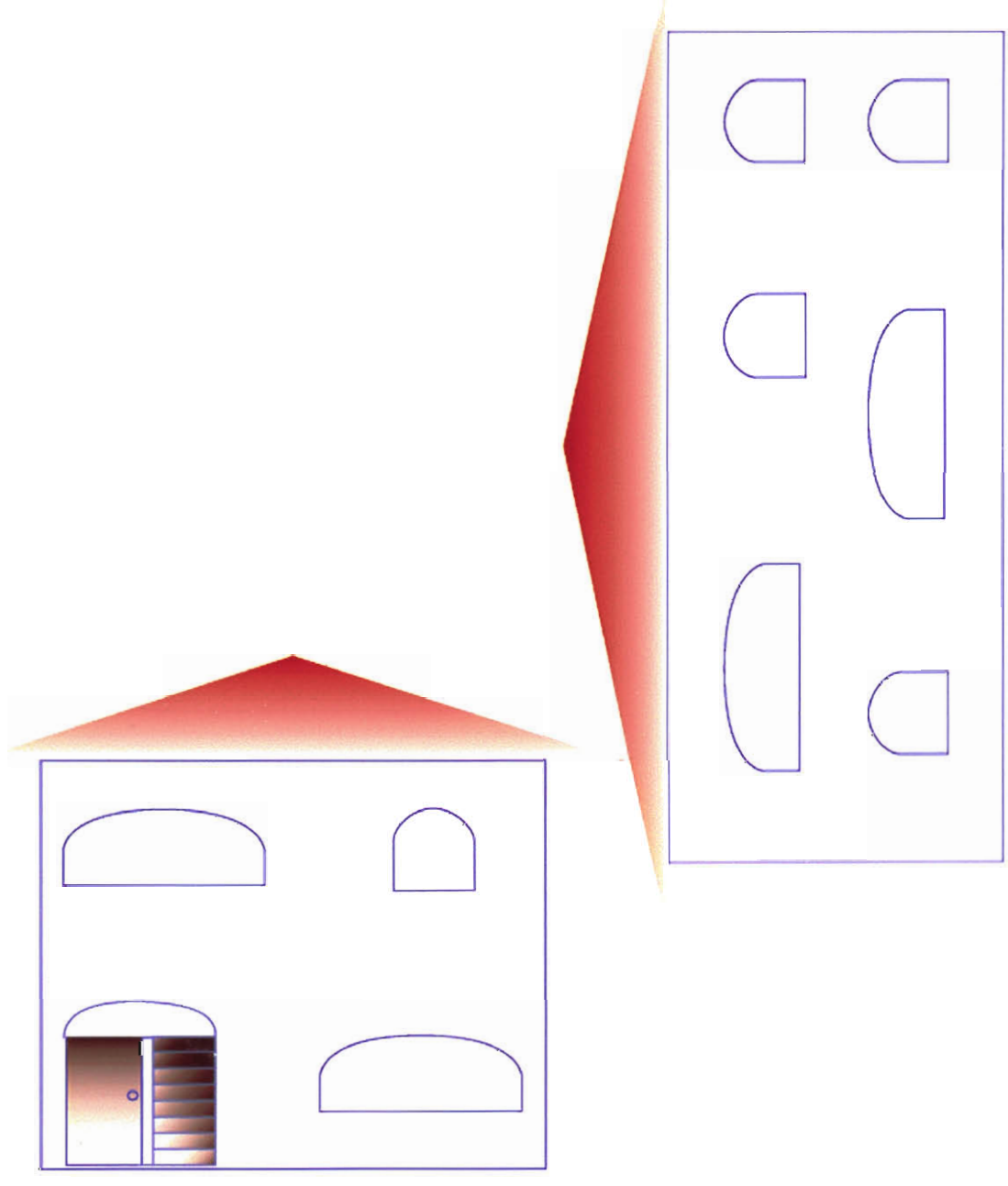
Picture 19: Typical floor plan



Low density housing side and front view

Picture 20: Low-density housing

Medium Density Housing, Front and side view



Picture 21: Medium density housing

Bibliography

- Quito Actual Phase 1: Plan Districto Metropolitano, Quito en cifras, Direccion de planificacion, I.Municipio de Quito(Ecuador)1990,
- Coleccion Quito Metropolitano, Land market, Direccion de planificacion, I.Municipio de Quito(Ecuador)1990
- Quito Actual Phase 1: Plan Districto Metropolitano Asentamientos Populares, 1992 Direccion de planificacion, I.Municipio de Quito(Ecuador)
- Plan maestro de pichincha- diagnostico, vol 1-H consejo Provincial de Pichincha, 1985
- Coleccion Quito Metropolitano,Quito, city and poverty, Direccion de planificacion, I.Municipio de Quito(Ecuador) 1991
- INEMIN, investigacion de recursos naturales de la provincia de pichincha,Quito,1985
- MAG, Direccion Nacional Forestal, 1988
- Estructura espacial metopolitana, Temas y probleams criticos,1990
- Historic Center of Quito (1990),Society and Urban space, Direccion de planificacion, I.Municipio de Quito(Ecuador), 1993
-