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ANALYSIS OF THE RELATIONSHIPS BETWEEN NATURE, MORPHOLOGY, AND PERCEPTION OF CHANGE IN BOGOTÁ CITY (COLOMBIA)

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ABSTRACT

The changes in urban morphology, evident in their housing typologies, the increase in housing density, the volume of occupation, the equipment implantation of various kinds, and the structure of public space, raise a number of questions about the factors that favor them. In addition, its relations with environmental problems create the need to structure other ways of managing this change, in order to avoid the deterioration of the urban life quality. This research was based on emerging methodologies to the city's organizational approach and the complexity involved. The objective of the research focused on knowing the patterns that connect urban dynamics in the relationship of social perceptions about change, their relations with the city, and the role of nature in environmental sustainability. The methodological approach was based on a historical review of the change processes generated in Bogotá city (Colombia), a survey of inhabitants of the city belonging to different socioeconomic strata, visits to different points of the urban territory, and interviews. The results of the research focus on understanding the

problems of the relationships between the dynamizers of urban reality and the paradox in perceptions about the role of nature in the city.

INTRODUCTION

City, Organization, And Change

This article shows an effort to understand how nature and the processes of change are perceived by the urban inhabitants in order to find the aspects that are necessary to take into account in the planning processes of the territory. It is not possible to understand the city without recognizing the multiplicity of relationships that make its existence viable. The city is a living organism and we can see it in our daily life, when we tour the city and in general when we live in a certain urban environment. This organization is related to processes of transformation that mark stages of emergence, boom, and decline. Authors such as [1] and [2] have shown arguments in this respect. The conceptualization that considers the city as "emerging probability of a living organism" is highlighted [3]. As a living organ, it is composed of subsystems, where of course it is the human being, who has configured in various ways relations with the city.

Nevertheless, these relations in some of their manifestations are not synergistic, since in these processes of birth, rise, and decline, urban inhabitants are affected by their own processes of appropriation and urban transformation, which have effects of injustice and spatial segregation. In general, they are affected by an inequitable distribution of urban burdens and benefits. The city in its dynamics emits information to its inhabitants that are transformed into perceptions about the feeling of the city. Knowing the relations between the city-nature and the processes of change must allow building symbiotic-synergistic relationships. For this reason, it is important to detect what happens with the processes of urban self-organization, as they are favored, and that prevents them from really becoming concrete in the current city.

Bateson [4], points out the importance of understanding the fabric of existing relationships in our reality, and establishing the pattern of connecting. The same applies to understanding of both the processes of change and the perceptions about the city, and with greater emphasis on the moment, we live in the face of the pandemic generated by COVID-19.

The city in general is the clearest phenomenon of the attempt of humans to separate themselves from nature, first through large walls that marked the distance with the rest of the world, then through sophisticated technological mechanisms and through public policy decisions. Many of the urban problems and emerging environmental problems correspond to ruptures between the different components of relationships, and how can be approached from a perspective inspired by [4]; they are emerging problems of our perceptions about the city, about ourselves, and of relationship with nature. We do not know this essentiality in the relations between us as a species, nature, and the city. Thus, the problem is not in those who live in the city, neither in the urban structure nor in nature but in the relationship that is established, because

sometimes it seems that the city is a strange artifact, that nature is non-existent or that human beings are predators of nature.

Indeed, there are broken links, the problems of perception affect us, and a holistic structure has been broken through different means, the political, the economic, and the technological issue. The problem is to analyze only part of the relationship, which leads to an excess of fragmentation and simplification, a dangerous path and apparently easier to take, instead of looking from a complex and more integral perspective at the city. In the city, we act as the specialists, who dissect and look at the part without understanding its relationship with the whole. Hence, many of the change processes that occur from the local areas are not considered, or its total impact power is minimized. The processes of transformation are manifested in the morphology change of a neighborhood, but they are evidencing changes that manifest themselves in other areas or affect the entire system.

In living dynamics, change is essential for humans, change can be painful because in every process of change something disappears and reforms into an amalgam of old and new. In the city, change is also necessary, if the change does not happen, it would reach obsolescence. In general, we must move in a delicate balance between stability, change, and flexibility, where the different components of the relationship interact synergistically.

RESEARCH METHODOLOGY

The categories of the research are related to the construction of the territory and geographical space that is the support for these change processes. The concept of urban transformation, which in its dynamics affects the conservation or deterioration of nature and social perceptions, related to the life quality, tranquility, and the environmental quality deterioration. The research instruments used were as follows: field observations, interviews, and a questionnaire focused on inhabitants of Bogotá city (Colombia), filled out by 108 citizens. These inhabitants were of the different localities, of them, 33.3% self-considered males and 66.7% self-considered females, which corresponded to different age scales and inhabitants of the six socio-economically stratified zones of the city. Through their responses, we managed to get closer to their feelings about the transformation processes that are happening in their neighborhood, the role of nature in the development of its urban life, and its perceptions of future changes that will take place in the central area as a result of the pandemic caused by COVID-19.

RESULTS AND RELATED CONSIDERATIONS

The main results found in the research are presented below, following the logic of the components of the relationship between natural substrate, processes of urban change (morphology), and perceptions of the inhabitants.

First Component: Natural Substrate for The Implantation of Bogotá City

The form of the present city of Bogotá, is not the product of chance, in it are immersed historical geo-processes referring to the natural substrate in continuous relation with imaginaries, perceptions, and decisions of politics at

every historical moment. Undoubtedly, these characteristics of the natural substrate had to mark urban morphology, initially because of the natural restrictions imposed on urban occupation. Later, because they had to point out a determinant for the implementation of the occupation model through territorial planning processes. It is evident that with exceptions in the city's planning process, this issue of nature care was not the central axis of urban design.

Some elements that allow understanding the natural characteristics of the territory where the city is implanted are framed in its geological origin. From the perspective of the natural substrate, it is highlighted that the city of Bogotá is located at the south-eastern end of the savannah that bears the same name, which is an extensive basin formed by the orogenesis of the eastern mountain range. The soils of the savannah are diverse and their characteristics together with the climatic behavior gave rise in the Pliocene, more than 3.5 million years ago, to the great lake that allowed the emergence of the Savannah of Bogotá (Colombia). Some of the soils of the savannah have been considered of great importance for the food production, mainly those corresponding to the Tibaitatá formation. In several studies it has been pointed out the unsustainable of urbanize these soils [5-7]. This process of forming the highlands left for this area a very important evidence, the existence of wetlands and lagoons areas. The city of Bogotá, according to the Wetlands Foundation [8], has 15 recognized wetlands and 24 unrecognized. According to [9], we have lost about 98% of the city's wetlands, since at the beginning of the 20th century we had 50,000 hectares of wetlands and today we have only 727.1 hectares declared as District Ecological Parks.

The city extends mainly over the flat zone of the savanna, from the Bogotá River to the lower part of the hills that border it to the east and south. This sector is drained by the tributaries of the left bank of the Bogotá River, and in them stand out the Tunjuelo River, San Cristobal River, Fucha River, San Francisco River, Arzobispo River, and Juan Amarillo River, among other small tributaries. These characteristics should be considered as determining factors for urban structuring. However, the city has grown apart from a profound reflection on these considerations.

Second Component: Process of Structuring the Current Urban Morphology

The second factor in the relationship is the process of city building, on which there is a vast literature. The first thing to mention is the occupation of the savannah by prehistoric man in the tardiglacier, with evidence of tools made of bone. Later, from the 2,500 B.P. traces of agriculture and ceramics were evident [10]. According to [11], vestiges of 5,000 B.P. of the sedentary and horticulture processes have been found in the area, with non-floodable terraces bordering on bodies of water, along with constructions of temporary occupation. It is also noted that in the period from the 8th century B.P. to the 8th century A.D. more sophisticated agricultural and ceramic activities are evident, called the period of blacksmithing, with the presence of quinoa, maize, salt production, textiles, and metalwork. Subsequently, there is evidence of population growth and the presence of organized population groups, including the Panches, Tapaces, Muzos, and Muiscas. The latter dominated the central part of the savannah

coexisting with other population groups. Muiscas settlements can be assimilated with urban settlements from their form and function. Around these settlements, recreational sites had been arranged for the main chiefs, and the existence of roads that connected with lower-ranking villages.

Another antecedent to mention in terms of the morphology of the city is according to [12]. The ordinances of Felipe II promulgated in 1573, and from which the norms to be followed by the new Hispanic-American cities were established, and that contained the characteristic reticular layout. The tradition of these ordinances dates back to the instructions of Fernando El Católico in 1513 and those of Carlos I de España in 1521 and the Council of the Indies in 1524. The same author points out that in America the urban plots were regular in their layout, but with evidence of variations for the cities of Lima (Peru) in 1535 and in Santa Fe de Bogotá (Colombia) in 1538, where the traditional grid gave way to a grid. This characteristic of the morphology in ancient Bogotá meant more than the urban conformation around the central square, since it is structuring also outlined a form of spatial segregation, then in these early years the different administrative and ecclesiastical powers settled on the sides of the square, as well as the social groups with greater purchasing power.

The city began to expand from the growth of depopulated parishes near the cathedral located in the central square, and whose neighborhoods are preserved today, Santa Barbara and San Victorino [13]. The city is born in the central area from the grid, there are provided the necessary services for its inhabitation, however, evidence that, at the beginning of the XX century, this provision is insufficient, mainly in the peripheral areas where lived the population with the lowest income. According to [14], in the first decade of the XX century, Agreements 10 of 1902 and 6 of 1914 were issued, the aim of which was to promote the expansion of the city following the model of territorial organization that the Spaniards had imposed in XVI and XVII centuries. Their descendants in different parts of the country continued this in the following century.

Colón [15], points to the dizzying growth process of the city in the years from 1914 to 1944, when more than 2,800 hectares were added to the approximately 800 hectares existing in 1914, attributing this dynamic to the confiscation of church and state assets in the second half of the XIX century. This urban expansion aimed to solve a growing problem in the city and that was pointed out in 1889, when the mayor of the time pointed out the importance of building a poor neighborhood to replace the very precarious sites that some inhabitants had, where there was no access to essential public services. In the studies of [15], it was found that along with the problems associated with the existence of this type of settlement, the effects of speculation on the land suitable for the expansion of the city were evidenced.

The tendency to continue with the pattern of organization from the central area, continued in the city of 1930 to 1940. Karl Brunner, designs a road plan for the central zone, which is characterized by a fragmented and focused urbanism for the central zone, with a city vision that favors the high-income sectors [14,16]. By these years, the city already showed symptoms of imbalances in its territorial organization marked by a disorderly growth affected even more by the violent

events of April 9 (1949). At that time, the city began a process of reconstruction partly guided by the proposal of Le Corbusier's Pilot Plan, frustrated in its implementation by the events of political instability related to the military meeting of 1953. Cortez [14], points out that this plan contained an approach to a regional perspective, which sought to limit western urban growth, establish guidelines for south-north growth, and maintain the trend of use in housing in the eastern hills strip. However, the plan could not be implemented effectively because the central areas were still being considered and the city had already begun to exceed the planned development limits.

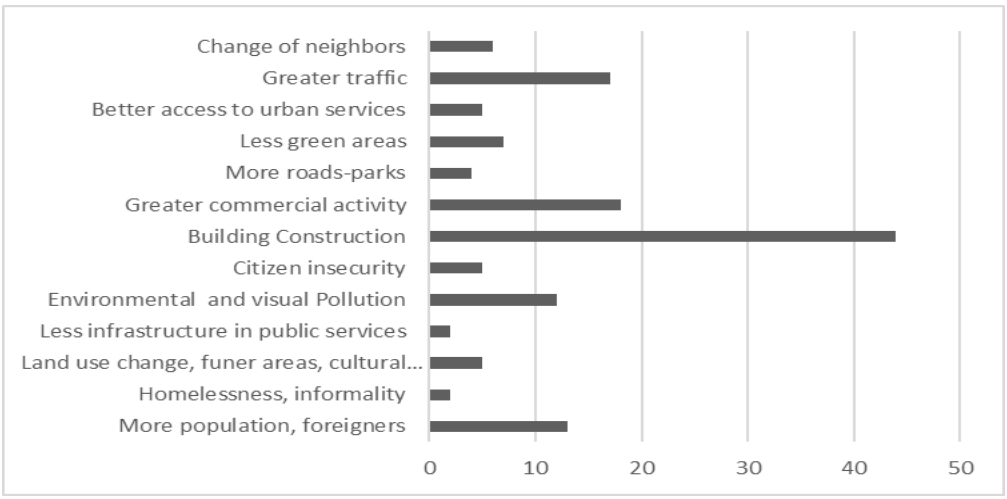
According to [15], in this first half of the XX century, the substratum for the growth of the city was very dissimilar in its physical conditions. The milestones that marked this differentiation were, firstly, the Eastern hills sources of raw materials for construction. Secondly, the territory between the area of street seven (Carrera Séptima) and the Northern railway (Avenida Caracas), with a flat topography that allowed the north-center communication of the city, with water supply, and aqueduct service. Thirdly, the western area, flat, with high water tables, and the presence of wetlands.

According to [15], these elements associated with location and access to networks, marked the trend of occupation of these sectors indicated; the latter linked to land prices and urban morphology that was structured until today, where the income level marked access the places with greater favorability to implement the settlements. In this way, people with low purchasing power occupied the areas with the potential to provide materials for construction, and that began to be perpetuated until today. In an investigation into the relationship between urban mining areas and spatial injustice, this relationship is evident for the case of the Yomasa area in Usme, where settlements have been generated around mining for the manufacture of bricks. In addition, there is the case of the generation of risk scenarios in the exploitation of other building materials in some areas of Ciudad Bolivar, also in the south of the city, associated with low-income settlements [17]. It should be noted, that the grid primal, is still preserved in some planned sectors of the city, and that gives rise to the organization by streets (layout from east to west) and streets (layout from north to south). However, in much of the peripheral areas and in the municipalities that were later annexed to the city, this grid may be non-existent in some sectors, where the urban structure is so spontaneous that the directions begin to vary quite confusing for the unsuspecting citizen.

Third Component: Current Perceptions About the City

This section shows the perceptions of citizens regarding the city and particularly about the changes that have occurred in their neighborhood environments and about the city in general. Figure 1 shows the main changes perceived by the inhabitants of Bogotá, what persists, as a factor of change is the intense real estate activity related to the construction of buildings in the different urban sectors, a dynamic transversal to all socioeconomic strata. There is also a greater presence of shops and restaurants, and thus factors associated with increased population and traffic; this has the effect of greater pollution. In terms of women's perceptions, there is a decline in green areas and gardens in some sectors.

When asked about what are the contributions of this natural substrate, which paradoxically plays as an attractive wild card for the sale of real estate projects and other times is a determinant that can constitute an obstacle to these same developments, the people perceptions surveyed (men and women) focus on the issue that their presence is beneficial for health, life quality, oxygen provision, and other ecosystem services. These issues are essential to the quality of urban life, however, despite their importance they are not considered to be determining factors in these transformations of urban morphology. In this regard, [18] points out that urban area denies their socio-ecological status by being perceived as places where nature ends and the artificial begins. This rupture in perception prevents finding what the underlying problems are with regard to nature and, therefore, we can say, that the pattern that connects nature with urban morphology and social perceptions is broken. The research carried out by [19] on environmental perceptions in the city demonstrates the importance of considering these sociocultural manifestations in order to understand the way the city lives and the change processes are projected.



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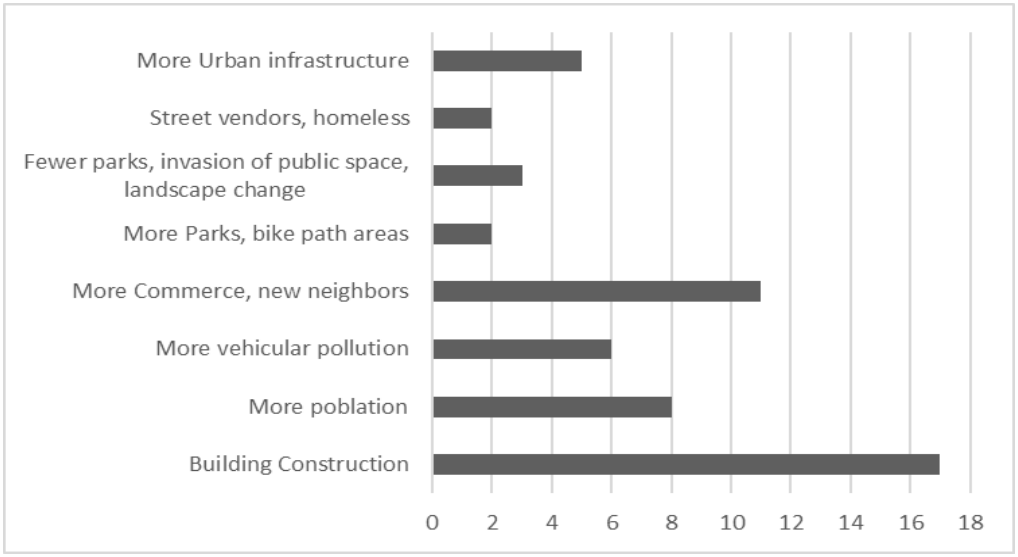

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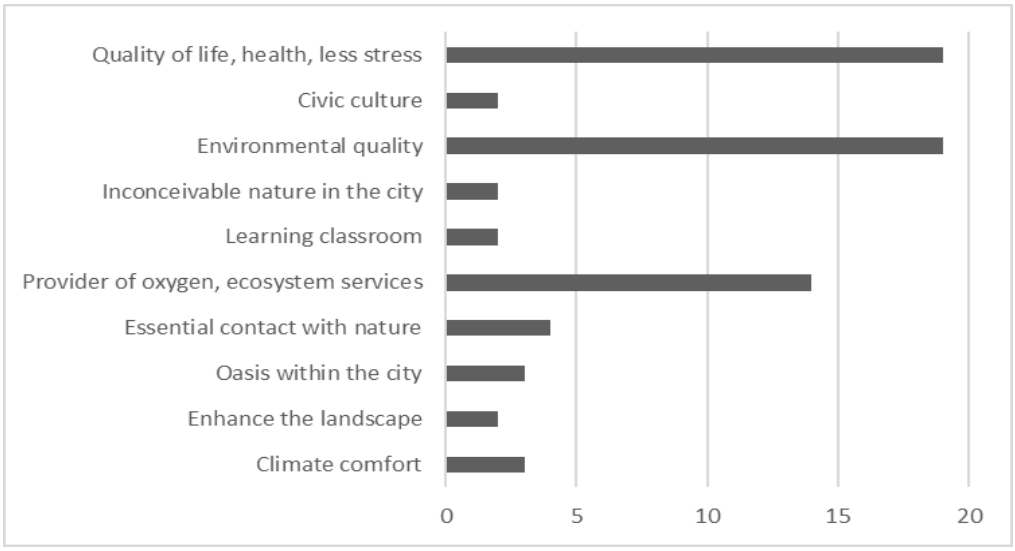
Figure 1. Perceptions Of Changes in The City. A) Feminine Perceptions And B) Male Perceptions.



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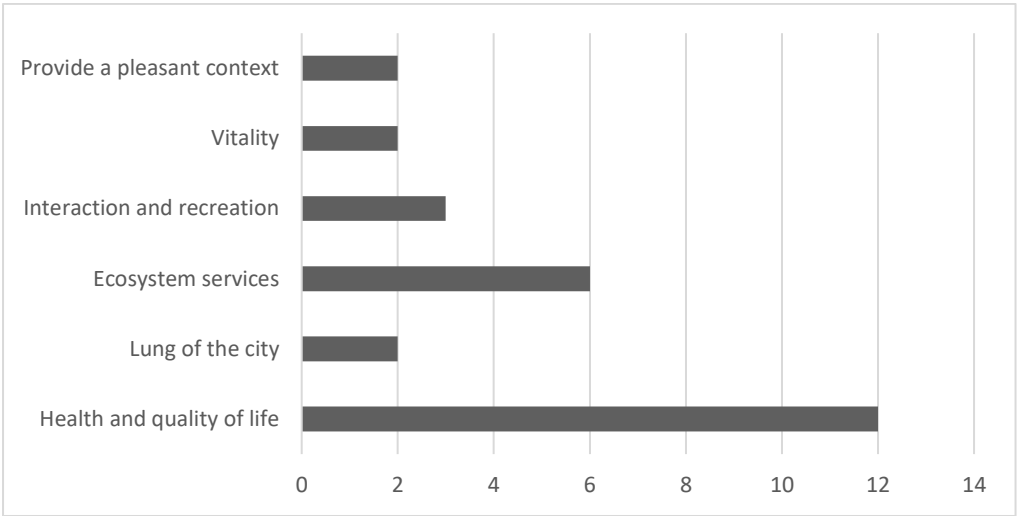

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Figure 2. Perceptions About the Contributions of Nature. A) Feminine Perceptions And B) Male Perceptions.

When asking respondents about positive and negative aspects, they perceive about the city, 30% of women's responses focused on traffic as a negative aspect, and 13% of the responses say they do not perceive anything positive about the city. In addition, 6.0% talk about insecurity, 3.2% talk about the lack of citizen culture, 1.9% point to pollution, and another 1.9% refer to the presence of begging in the city. From the positive aspects, 5.7% talk about the whole city like, 8.3% talk about green areas, wetlands and mountains, and 3.2% talk about ethnic diversity and landscapes. Moreover, 2.5% talk about architecture and style contrasts, and 1.9% refer to urban dynamics in general.
As for male perceptions, 27.7% of the responses point to road congestion as a negative aspect, 15.2% of the responses report that they do not find something

positive in the city, and 9.7% report insecurity and indigence at traffic lights. In addition, 6.9% report pollution, 4.1% the transport problem, and 1.4% poverty. As for the positive aspects, 8.3% refer to the landscape and diversity, 6.9% refer to the fact that in the city there is a great diversity of offers that are not found elsewhere, the architecture 2.7%, road options 4.1%, and eastern hills and bike paths 2.7%. The results show the importance of some components of the public space of Bogotá as a positive factor, which can be enhanced for a change of general perception about the city, among them the issue of differences in urban architecture, the Eastern Hills, the trees of some sectors, and the urban diversity. For [20], the appropriation dynamics of public space is essential in the maintenance of it and in the generation of a sense of belonging, when this takes place, the issue of the aesthetics of space becomes relevant.

Undoubtedly, a powerful factor of change in all spheres of urban life both in Bogotá and in the world is COVID-19. These changes are barely visible now, but they will certainly result in the medium term in a series of transformations within the city and in the general structuring of territorial relations. The results of change perceptions generated by the pandemic are showed in Figures 3 and 4.

The highest number of responses from a female perspective points to the non-use of public transport, secondly, improve connectivity, and thirdly, to go less to shopping centers (Figure 3). For the male perspective, the main change is the reduction in the number of visits to shopping centers. The non-use of public transport and the increase in the use of bicycles occupy the second line, and in third place, is the issue of the incidence of information and communication technologies (Figure 4). There are other factors in male and female perceptions that, although they do not have a representative percentage in the responses, give signs of possible future transformations. These include changing places of residence, changing cities, moving from apartment to house, and buying cars.

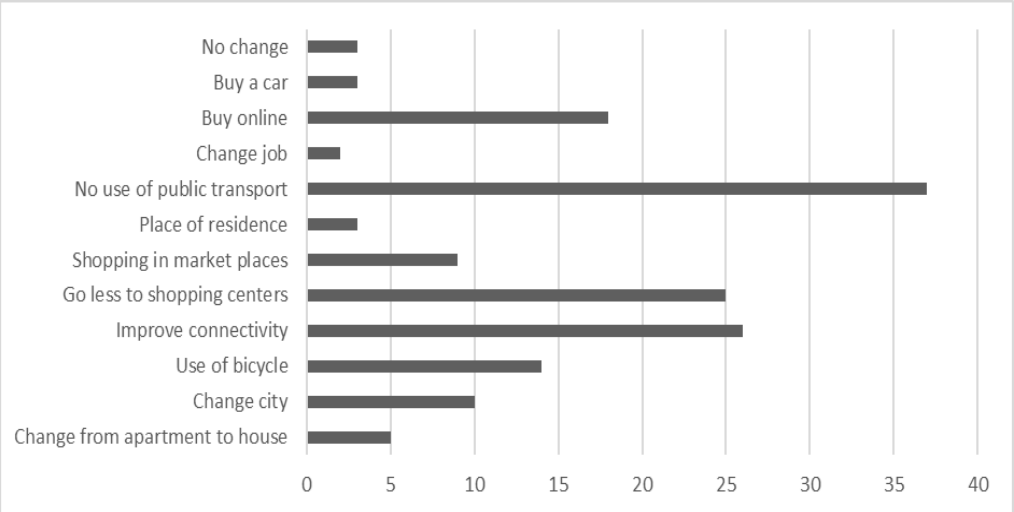

Figure 3. Female Perceptions of Changes Generated by The Pandemic.

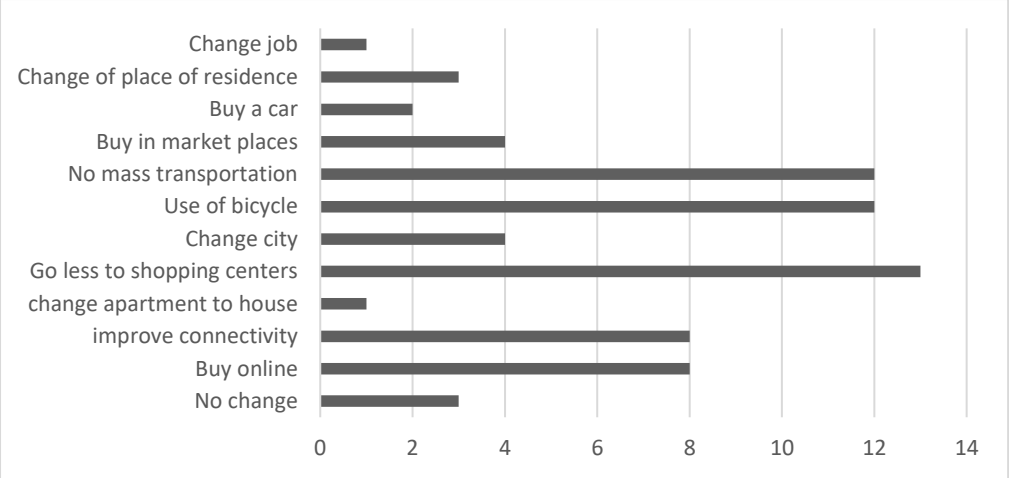

Figure 4. Male perceptions of changes generated by the pandemic.

GLOBAL DISCUSSION

There are ruptures in the relationships between the urban morphology, natural substrate, and perceptions of the respondents about the city. Nature was a determinant of the city's occupation model, given that, when considered as a source of resources, some sectors were condemned to a degradation of their land and morphological changes, which coupled with the presence of low-income populations, and they led to problems of segregation and generation of vulnerable areas. In fact, natural characteristics did not play a significant role in urban growth planning, but they did mark the trend of land speculation processes.

These ruptures are manifested in the relationship of the inhabitants with the city. In the sample studied, it is striking that a significant percentage of the responses indicate that they do not find anything positive in the city, and that most of the answers about the positive of the city refer to some natural component. These answers allow us to speak that the pattern that can connect toward the future, with the changes planned, is to emphasize more on a model that favors the natural component of the city, which allows achieving the connection between the urban morphology and a perception of urban vitality, in the sense of generation and life care.

CONCLUSION

Despite the importance of the various manifestations of nature for the quality and conservation of life in the city, in the structure and urban dynamics they occupy a secondary role, since other attributes related to functionalities and equipment of an economic and mobility nature are privileged. Thus, the perceptions of the population about the importance of nature are subordinated or weakly taken into account in urban planning processes.

It is necessary to give greater relevance to the role of nature in urban environmental sustainability, establishing a more obvious connection between the feeling that urban inhabitants have about the problems of the city that affect them, the instruments, and objectives of urban planning. Therefore, the relevance in participatory planning, to generate processes of co-responsibility

and appropriation of the city. Hence, the need to apply instruments such as ethnography and other qualitative methodologies to approach this knowledge.

Conflict Of Interest:

The authors state that there are no conflicts of interest.

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