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Study of Pedestrian Zone According to Superblock Criteria in the Casco Antiguo of Panama

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Abstract: The Casco Viejo of Panama is an area with great potential to develop a pedestrian zone, as it is an attractive area for travelers to visit. For this development to be carried out safely, it is recommended that the site is analyzed based on superblock criteria to ensure pedestrians can move through the streets in a free and accessible way regardless of their physical condition. Hence, it is necessary to evaluate the current state of the road infrastructure, as we did in this research. The methodology consisted of field visits where information was gathered on the distribution of space so that ideal routes for pedestrian tourists could be ensured. We surveyed the state of the sidewalks, their physical condition, minimum widths, heights, their accessibility, and the presence of obstacles that block movement from one point to another. We also assessed the characteristics of the roads, safe crossings and signs, the current management of parking in illegal areas, and the system of public transport routes. The results describe the current problems, which are, firstly, the issue of poor pedestrian and cyclist mobility due to the lack of space available on public roads as a result of poorly parked cars and the placement of bollards. Secondly, free movement is impossible for the disabled due to the absence of ramps and railings, which prevents the integration of this group in the area.

Keywords: superblock; sustainable mobility; accessibility; pedestrian; private vehicle; urban mobility; pedestrian zones

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1. Introduction

The Historic Center of Panama was declared a World Heritage Site in 1997, and similar to other historical centers of the region, it presents a continuous deterioration. That is why the Inter-American Development Bank, in its Emerging and Sustainable Cities program, included priority issues such as urban mobility, territorial planning, and the recovery of vital spaces in the "Metropolitan Panama Action Plan: Sustainable, Human and Global", seeking to connect the city with the wider area and give it new life with the management of public spaces, alternative transport, and parking [1].

It is well known that Latin America has made successful urban planning efforts with clear visions of development, but unfortunately, these plans are often poorly implemented, which generates frustration and distrust of planning processes in the population. Opting for short-term measures promoted by local governments, however, is not the way to sustainable urban development [2].

The main objective of this study is to analyze the feasibility of the implementation of a pedestrian area according to superblock criteria in Casco Antiguo.

This zone in Panama is trapped in a vicious circle generated by three general mobility problems that are related to each other [3]. These problems are as follows: First, the amount of public space occupied by private vehicles parked on-street, and sometimes obstructing

the ramps intended for people with reduced mobility, which prevents these spaces from being used for the safe movement of pedestrians and cyclists. Second, the lack of an internal transport system that accesses the Casco Viejo, and third, the lack of a road infrastructure that promotes non-motorized trips. Instead, safety problems are created by dangerous crossings, and the degradation of the space prevents access by the metropolitan area's transport. The latter makes private vehicles the primary mode of transport to access the Casco Viejo, generating a high demand for parking, which is not managed efficiently. This results in high numbers of cars parked on the streets, invading the available public space, and thus initiating the vicious circle again [3].

We have large cities with agglomerations of people who demand spaces to live together, and that makes transportation systems less sustainable [4].

This exponential and horizontal development of cities over large areas of territory has widened the distances that must be traveled to carry out daily activities of work, health, education, and leisure, which brings with it changes in the mobility of people and increases the dependence on private vehicles, either due to the remoteness of the destination or the inefficiency of public transport systems [4].

At the beginning of the 20th century, the increase in sales of personal cars combined with the gentrification of the populations in cities led to an unsustainable situation that triggered a project to develop the Radburn residential superblock in New Jersey [5].

In Latin America, the disabled find that in cities priority is given to motor vehicles over their right to use the roads or public spaces for mobilization via non-motorized means of transport, i.e., cycling or on foot. Central and South America share this reality since their legislation, infrastructure, management, and road safety education are scarce or not given the required attention, which results in limited and inappropriate road safety for the population to enable them to move about in daily life by an alternative means to vehicles [6].

For Rueda [7], vehicles generate the main problem in the city—i.e., the public space—and prevent the city from being for citizens, turning it into a space for cars.

Meanwhile, Jacobs [8] describes how people label vehicles as the leading causes of problems generated in cities failing at urbanism, though the destructive effects of vehicles are not a cause but an effect of our inability to build functional cities.

In any case, vehicles are a fundamental piece in the functionality of urban life, and their use and necessity for transporting people can be justified. However, what we must consider is how their use can be limited since their abuse generates various problems, such as the need to create new public spaces for pedestrians and cyclists. The use of public space should be ordered and planned to combine different uses, making most public space compatible with both motorized and non-motorized use, by reducing the occupation of private vehicles and the displacement created by this mode of transport [9].

In cities, there are few open public and green spaces at the moment, but recovering these spaces for recreational, family, and community uses allows for the adaptation to climate change by utilizing green areas, creating new ecosystems, and improving the aesthetic attraction [10].

The current COVID-19 pandemic has caused changes in current mobility, making it necessary to guarantee sustainable and accessible mobility to the different primary services, seeking a safe, inclusive city that remains healthy [11].

Walking improves physical fitness, helping to reduce the number of people with overweight problems and diseases such as diabetes, hypertension, and heart disease [12].

Walkability is related to the space where it is developed and the characteristics that public space can offer. This activity guarantees a healthier city since pedestrian trafficability is an indicator of the quality of life in a city [13].

In this sense, superblocks help post-COVID mobility as they promote walking by keeping people in the same area where they live, avoiding traveling long distances to carry out their daily tasks.

The study will contribute to the achievement of Goal 11 of the Sustainable Development Goals (SDG), "make cities and human settlements inclusive, safe, resilient and sustainable" and the following specific goals of the goal: [14].

In point 11.2: "By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all and improve road safety, in particular by expanding public transport, paying special attention to the needs of people in a situation of vulnerability, women, children, people with disabilities and the elderly" [14].

In point 11.4: "Redouble efforts to protect and safeguard the cultural and natural heritage of the world" [14].

In point 11.7: "By 2030, provide universal access to green areas and safe, inclusive and accessible public spaces, in particular for women and children, the elderly and people with disabilities" [14].

2. Sustainable Mobility

A sustainable urban plan that is proposed for Panama is superblocks based on urban cells of about 400 m × 400 m, where traffic moves to the periphery of the superblock [15].

The proportions of current transport modes must be reversed to create a sustainable mobility model that recovers the space lost per pedestrian [7].

Sustainable mobility is a new way of facing the problems that arise from transport, where the roads can be shared by people engaging in different modes of transport, including the pedestrian. This benefits the environment and improves accessibility [16].

Sustainable mobility, rather than a theoretical definition, is based on a series of actions that must be carried out for the approach to be appropriately developed. These actions are linked to changing how mobility is approached, with the pedestrian as the leading actor [17].

For Banister, sustainable mobility focuses on reducing the number of trips made, promoting the use of alternative means of transport, shortening travel distances, and operating the transport system efficiently [17].

Pedestrian mobility is the most basic means of transport that people use to carry out various activities, i.e., by moving on foot. This activity is linked to a series of elements, such as urban morphology, security, accessibility, and comfort, which promote walking and the use of public spaces [18].

That is to say, the objective of launching a pedestrian zone is to provide safe, comfortable, and quiet routes, as shown in Figure 1, for those who circulate on foot or in non-motorized vehicles. However, journeys must be integrated so that other forms of mobility can be taken too, and adapted to the needs of pedestrians [19]. Figure 1 shows twelve quality criteria for the pedestrian landscape classified in protection, comfort, and pleasure [4].

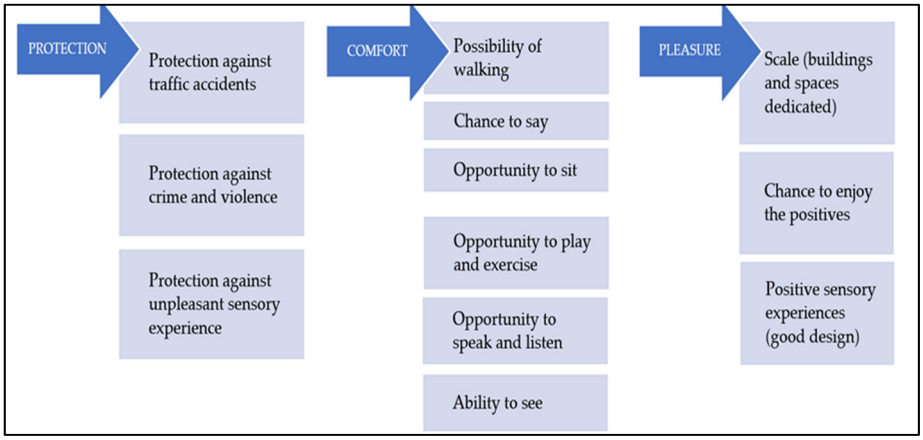

Figure 1. Twelve quality criteria for the pedestrian landscape according to [4].

The existence of natural channels such as rivers or lakes within cities greatly dictates how pedestrian axes are connected since their best development is achieved on the banks of these [20]. Further desirable routes run along the coastal limits, and this creates a need for connection between the pedestrian zones on the coastline and the rest of the city [16]. Other vital connections in cities occur when pedestrian networks are woven through maritime axes toward historical centers that are developed on the coasts [20].

In these instances, we can say that the way to connect citizens, to make them part of the city, and at the same time, achieve harmony with the landscape that surrounds it, is to implement new networks of public spaces. These should not necessarily be green but must correspond with other modes of road use, facilitating pedestrians, cyclists, and public transport [2].

When the pedestrian is the one who has the priority on urban roads, vehicles must adapt their speeds so that both are compatible in the same space. This situation gives the pedestrian a sense of belonging in public places; the squares, parks, sidewalks, and corners are now spaces that the pedestrian dominates [21].

New mobility where the pedestrian is the leading actor is the outstanding feature of superblocks, where through pedestrian zones and cycle lanes, it is possible to unite neighborhoods [21].

The superblock has been proposed to be an innovative land-use intervention that aims to reclaim space for people, reduce motorized transport, promote sustainable mobility and active lifestyles, provide urban greening, and mitigate the effects of climate change [11].

The pyramid of inverted urban mobility demonstrates how this model changes priorities in urban mobility, with pedestrians and people with disabilities suddenly those who have priority, followed by cyclists, then public transport users, with shared transport (e.g., taxis) next, and private vehicles in last place [22].

Cities that focus on the pedestrian aim to facilitate positive environmental factors. They make sure people feel safe, comfortable, and happy [23].

Cities currently devote up to 70% of their public spaces to accommodating motor vehicles [24,25], while no more than 25% represents sustainable design [26,27].

Cities are becoming important areas of human activity around the world [28]. The quality of life of people in cities can be improved if public spaces can be planned and organized based on sustainable design principles [29].

3. Superblocks and Criteria

The idea of superblocks is not new. Throughout history, the essential element of urbanism has been the "block." This allows for road organization according to the geography of cities and enables them to grow proportionally, giving rise to superblocks and mega blocks [5].

Superblocks are the new urban cell used to organize vehicle and pedestrian traffic in mobility networks in a way that takes advantage of the infrastructure and public services available, reduces conflicts and current mobility dysfunctions, and improves relations between neighbors [30].

In addition to the reconfiguration of transport and the liberation and reallocation of public space, the superblock model foresees the development of open and green spaces throughout the city, composed of squares, parks, and green corridors [31].

The benefits are quality spaces with fewer disturbing factors that provide security that positively affects identity formation, the sense of community, and emotional and social wellbeing [32]. Public spaces help to facilitate social interaction, and therefore, contribute to social cohesion [33].

3.1. Size

When long blocks of about 500 m are designed that do not have intermediate streets, problems are generated where pedestrians have to move 250 m from the center of the block to find a bus stop. This creates isolated streets for pedestrians with a disconnect from the adjacent blocks [8].

3.2. Velocity

The most vulnerable road users, such as pedestrians and cyclists, are at high risk of severe or fatal injuries if they are in a collision with motor vehicles. The probability of fatal injuries increases considerably when a pedestrian is hit by vehicles at high speeds; according to research, most pedestrians survive hit-and-runs when the speed of vehicles is 30 km/h (20 mph), but most die if they collide with vehicles with speeds greater than 50 km/h (40 mph) [34].

3.3. Hierarchy of Roads

Typically, cities have a general circulation system, but the area divides into two circulation systems when a superblock is implemented.

The first system is known as the primary road network and is responsible for directing vehicles continuously and with the preference given to private vehicles, while the second system is included with the superblock and prioritizes the pedestrian for the use of public space: all vehicles must adapt to the pedestrian [21].

3.4. Parking Lots

For pedestrians to have priority in the public space, the parking of vehicles on-street must be gradually eliminated and replaced by parking spaces near the leading superblock network [35].

3.5. Accessibility

To measure the quality of a public space, we must observe the transit of a person with disabilities, or reduced mobility in general, since if this population manages to pass continuously and without difficulties from point A to point B, anyone will do so. In that scenario, it can be determined that the area meets at least minimally with the requirements for its optimal use [7].

3.6. New Public Spaces

The space freed from occupying vehicles changes to a new function of daily use such as offering rest, social opportunities, leisure, and street parties, among others. The street now fulfills a role of exchange and relation between its users [35].

The new public space must be facilitated by urban furniture such as benches, pots, and board games. In addition, the streets can be decorated with paint to improve them visually, and at the same time, demarcate different areas [36].

4. Methods

Herein, we describe our chosen methodology (Figure 2) for realizing more sustainable urban mobility plans based on the superblock model [35].

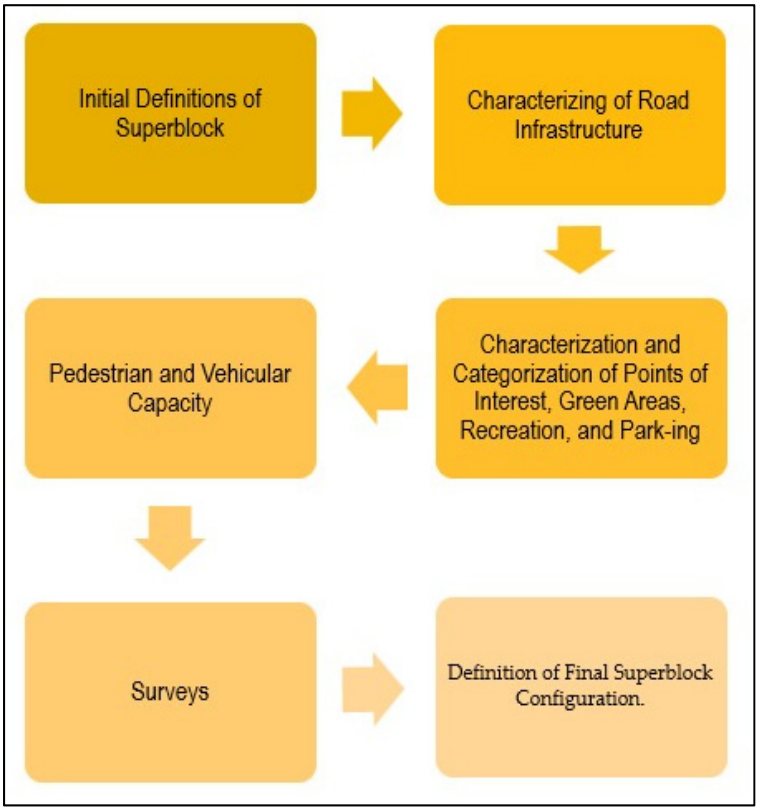

Figure 2. Methodology.

4.1. Initial Definitions of Superblock

Based on technical criteria derived from the theoretical framework for implementing a superblock, initial configurations of pedestrian zones were defined.

The first step was based on previously studied criteria to determine the size and shape of the proposed superblocks for the size, it is considered approximately 400 m on a side, an appropriate size for walking tours. While for the form it adapts to the existing road infrastructure considering the reticularity of the roads. Two possible superblocks were defined, and the roads that were part of the different proposals were hierarchized. The ordering of highways is based on main roads where vehicular traffic circulates and secondary roads for residential and pedestrian use.

The next step consisted of preliminary tours to generally observe in the field the streets through which vehicles mostly traveled, the current transport network, and the directions of circulation on the primary and secondary roads. Then, with these data, different pedestrianization scenarios were proposed with different sizes, which could be extended outside the superblocks to cover most points of interest or connect areas that were already pedestrianized.

Once these proposals were analyzed, the most viable model was chosen, considering the circulation, size, and width of the roads, and avoiding significant interventions.

For the dimensions, they are adequate for short trips, security within the proposed area; in addition to concentrating various sites of interest and commercial premises.

One criterion used to rule out a proposal is the performance of significant interventions due to the fact that the area is a World Heritage Site.

4.2. Characterizing Road Infrastructure

The road infrastructure was characterized through tours and field visits that included a visual inspection of each of the streets included in the selected pedestrian zone configuration, to determine their road infrastructure, including sidewalks, roads, pedestrian crossings, drains, obstacles, signs, and urban furniture.

At this point, the streets selected to serve as main roads were measured to determine their widths and heights and the degree of illegal parking of vehicles on-street obstructing traffic. In the same way, tours were made of all the sidewalks of the superblock to determine if pedestrians' circulation occurred fluidly or there were some obstacles in the way.

During the tours, an inventory was made of the different obstacles on the sidewalks, and these were classified as permanent or temporary (support structures by constructions), along with the signs present in the streets and the urban furniture found in the study area.

4.3. Characterization and Categorization of Points of Interest, Green Areas, Recreation, and Parking

The area has several diverse tourist attractions, and so walking routes were designed between classified sites of interest such as cultural sites (theaters and museums), recreation areas (parks), historical heritage (squares and monuments), and churches. In addition, we charted the locations of current private and public parking lots and areas of possible future parking within the area of influence.

4.4. Pedestrian and Vehicular Capacity

Next, we estimated the vehicular and pedestrian capacities at the main intersections of the historic center. Three capacity points were assessed—including the most important entrances/exits—at off-peak and peak hours to determine their levels of pedestrian and vehicular use throughout the day, the prevailing direction of movement at different times, and the maximum safe capacities. Regular security measures were in place, including the tourist police who guarantee safety gauges, without these interrupting or interfering with the results obtained. Some points of interest were also filmed.

4.5. Surveys

We surveyed the public's thoughts on the possible implementation of a pedestrian zone meeting superblock criteria in the study area. To do so, we used consecutive sampling also known as snowball sampling. Snowball sampling is a type of non-probability sampling used when potential participants are hard to find or if the sample is limited to a very small subgroup of the population [37].

Table 1 below presents the questions and possible answers that were used for the online survey. The sampling technique used during this survey is the snowball which is a non-probabilistic technique since it allows the size of the sample to grow as the selected individuals invite their acquaintances to participate.

Table 1. Online survey form.

Study of Pedestrian Zone according to Superblock Criteria in the Casco Antiguo of Panama					
How old are you?	Insert your age				
Sex	F	M			
Nationality	Panamanian	Foreigner			
Have you visited the Casco Antiguo of Panama?				Yes	No
Reason why you have not visited the Casco Antiguo:					
You do not know it	You do not know how to get there	Remoteness	Difficult to get there	Because no parking is found	Not in my interest

Table 1. *Cont.*

Study of Pedestrian Zone according to Superblock Criteria in the Casco Antiguo of Panama				
When you go to the Casco Antiguo you prefer:				
Go by car and park it in a safe place.	Go by car and park anywhere.	Go by taxi and be dropped off directly at your destination.	Go by public transport and walk to your destination.	
Reason for your last visit:				
Family outing	Diligence	Food	Religious tour	Cultural recreation
I am a resident	Other	Work	Night recreation	Walk with friends
What is the transportation that you used to visit to Casco Viejo?				
Private vehicle (own car)	Private vehicle (companion)	Public transport (bus)	Public transport (Taxi)	
Motorbike	Bicycle	Walking	Other	
How safe do you think the Casco Antiguo is?				
Very safe	Sure	Neutral	Unsafe	Unsure
Have you ever done walking tours in Casco Viejo?			Yes	No
Are your agreement with the creation of a permanent pedestrian zone within Casco Viejo?				
Totally agree	Disagreeing	It is indifferent to me		
I agree	Strongly disagree			

How long would you be willing to walk to get from a parking lot or bus stop to the site where you are going in the Casco Antiguo?

	Strongly agree	I agree	Indifferent	Disagree	Strongly disagree
5 min or less					
Between 6 and 10 min					
Between 11 and 15 min					
Between 16 and 20 min					
Between 21 and 25 min					
25 min or more					

What aspects do you take into account when taking walking tours?

	Very important	Important	Neutral	Slightly Important	Not Important
Time					
Money					
Distance					
Safety					
Climate					

How do you consider street furniture to be? (Chairs, garbage cans, luminaires, water fountains, etc.)				
Very good	Well	Regular	Bad	Very bad
What do you think of locals (bars, restaurants, handicrafts) using public spaces and/or streets to place equipment and merchandise?				
Very good	Good	It is indifferent to me	Bad	Very bad

Table 1. *Cont.*

Study of Pedestrian Zone according to Superblock Criteria in the Casco Antiguo of Panama				
Would you use public transport if there was an active route to the Casco Antiguo?				
Very often	Often	Little	Very little	I wouldn't use it
Did you know that the Casco Antiguo has more than six (6) parking areas?				
Yes	No			
What do you think of the placement of parking meters in the Casco Antiguo?				
Very good	Good	It is indifferent to me	Bad	Very bad
How much would you be willing to pay per hour for secure parking in the Old Town?				
$2.40 an hour	$1.80 an hour	$1.20 an our	$0.60 an hour	I am NOT willing to pay for parking

In this type of sampling, research participants recruit other participants for a test or study. Here, the researchers use their own judgment to choose the participants, unlike simple random sampling where the odds of any member being chosen are the same. In these surveys, we also sought to determine the current perceptions of people who visit the Casco Viejo, their issues with pedestrian safety, problems with parking lots, and other issues with services so that our proposal would cover the points of view of users.

4.6. Definition of Final Superblock Configuration

Based on the initial configuration of the selected pedestrian zone and our characterization of the study area, a final superblock was established with various pedestrianization mechanisms to free the streets from passing vehicles and, thus, create new public spaces for residents and pedestrian tourists who visit the Casco Viejo of Panama.

The results of the vehicular and pedestrian capacities, surveys, and the routes allow the approach of a pedestrian zone according to superblock criteria.

5. Results

5.1. Characterizing Road Infrastructure

Currently, the Casco Viejo of Panama differs in its road structure from the rest of the city, mainly due to the dimensions of the roads, which hail back to colonial times. These make it difficult for large cars, delivery trucks, and dump trucks to turn around on most of the streets.

In addition, the widths of the roads do not allow for traffic in both directions; for this reason, the entire area is designed with one-way roads. Another characteristic that distinguishes it is its entirely cobbled streets, which in general, are in good condition.

Along some of the roads, bollards have been placed to support pedestrian use and prevent cars from parking on-street. Curiously, there are no pedestrian crossings or zebra lines within the Casco Viejo.

Each block has sidewalks, though these have widths below the minimum in many cases, there is no continuity between blocks, and they are not accessible for the disabled or people with reduced mobility since they do not have access ramps.

The obstacles encountered on the sidewalks range from traffic cones and safety tapes, due to temporary construction works, to pillars that support old structures or structures under remodeling, which do not allow the passage of pedestrians at all. Such blockades lead to pedestrians walking along the avenues, and in Figure 3, a summary of the obstacles encountered on the sidewalks is shown.

Figure 3. Obstacles on the sidewalks of the Casco Antiguo of Panama.

5.2. Characterization and Categorization of Points of Interest, Green Areas, Recreation, and Parking

Varied land use characterizes the historic center of Panama; it is a place where one can find commercial establishments, shops and restaurants, cultural and religious sites, and places of fun and recreation such as parks and discos.

On the issue of parking, there is undoubtedly a deficit as the number of vehicles within the Casco Viejo exceeds the available parking spaces, forcing drivers to park along the streets despite there being a parking ban, as marked with yellow lines.

5.3. Capacity

Analysis of the vehicular and pedestrian capacity was carried out at three strategic points, which sought to cover the most important entrances and exits of the Casco Viejo of Panama. We divided our work into two shifts covering a total of 13 continuous hours.

Figure 4 shows the vehicles that entered and left the Casco Viejo of Panama during the period assessed. We can see that the highest rate of vehicles entering occurred during the morning, while the highest rate of vehicles leaving occurred in the late afternoon.

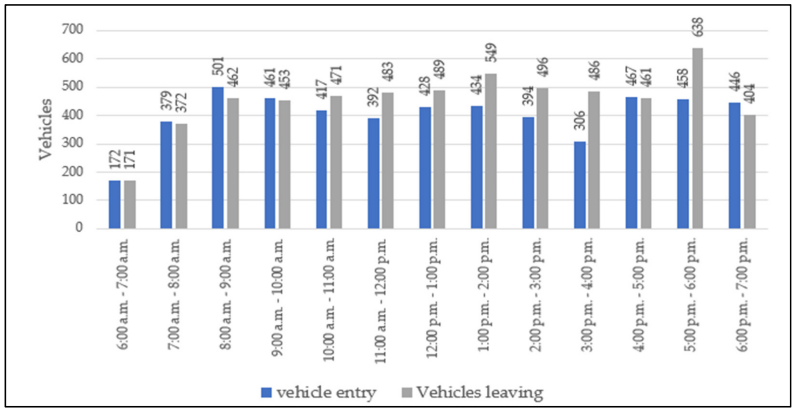

Figure 4. Comparison of vehicles entering and leaving the Casco Antiguo.

Of the vehicles that entered Panama's Old Town, most were private vehicles (72%) with a total of 3792, followed by taxis (17%) with a total of 865, while only 11 buses (0.2%) were observed to have entered. In turn, the vehicles that left the Casco Viejo of Panama were mainly private vehicles (70%) with a total of 4171, followed by taxis (19%) with a total of 1134, while only 9 buses (0.2%) were observed to have left. We consider these distributions to be highly skewed and propose that an efficient public transport system would help to reverse these proportions.

5.4. Surveys

The survey was conducted virtually using a Google Form due to COVID-19 biosecurity issues. There was a total of 172 respondents.

Figure 5 shows how long visitors to the Casco Viejo are willing to walk from a parking lot or bus stop. This graph reflects that users are not willing to take long walks, with an estimated maximum time of 15 min happily spent walking. These data are vital for the placement of possible future parking lots on the periphery of the study area.

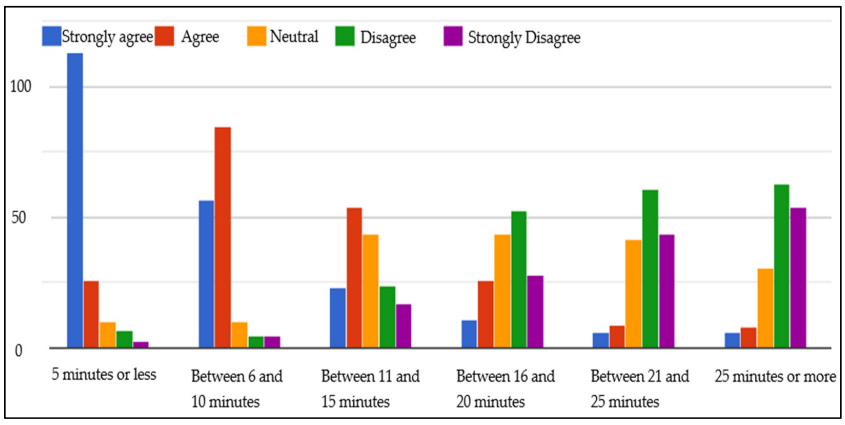

Figure 5. How long visitors to the Casco Viejo are willing to walk from a parking lot or bus stop to their destinations.

Meanwhile, in Figure 6, the main aspects to consider for walking routes are indicated. The central aspect is their safety, followed by the weather and the walking time.

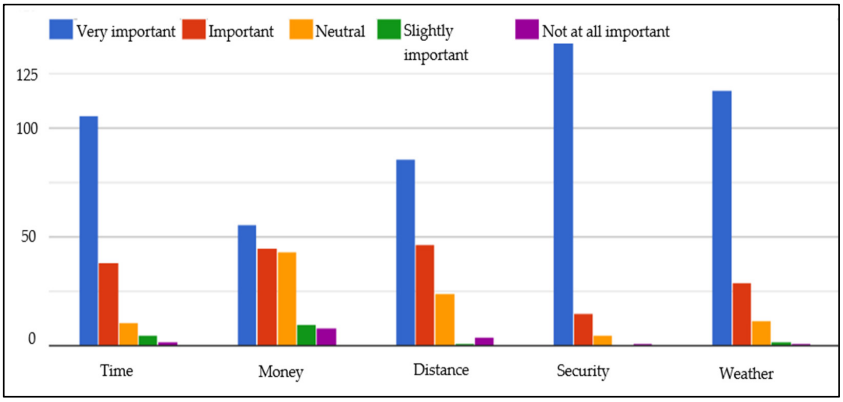

Figure 6. The main aspects to consider for walking routes in the Casco Antiguo.

The primary means of transport used to enter the Casco Viejo of Panama is the private vehicle; 112 people visited the area using their car or as a passenger in a car, while only 23 people used public transport, due to the lack of services available and poor promotion of those that are available (Figure 7a).

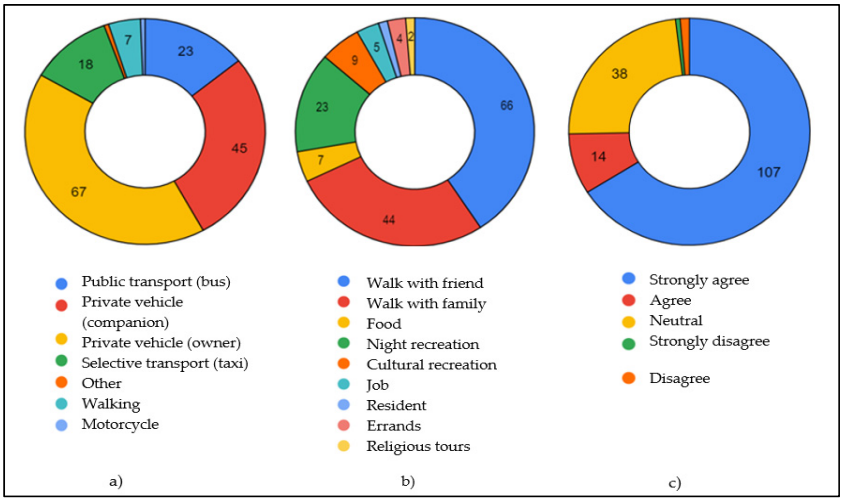

Figure 7. (**a**) Means of transport used to get to the Casco Viejo. (**b**) Reason for the last visit. (**c**) Level of agreement with the creation of a permanent pedestrian zone within Casco Viejo.

We found in our survey that the area has diverse land uses, promoting different activities, as shown in Figure 7b.

The people surveyed favor the creation of a permanent pedestrian zone within the study area (Figure 7c), with approval from 121 people, representing 89% of the total surveyed population, which indicates that the proposal has a high level of acceptance within the general population of visitors to the Casco Viejo.

5.5. Definition of a Superblock

The pedestrian zone aims to ensure a safe, quiet, and comfortable environment for each user who moves on foot, without neglecting the integration of other modes of mobility.

The results of our capacity assessment, survey, and route planning allowed us to formulate a corresponding approach to creating a pedestrian zone according to the superblock criteria, marked in gray in Figure 8, depicting the final proposal for the pedestrian zone.

This pedestrian zone proposal comprises the main roads: East and West 9th Street, Avenue A, the beginning of Central Avenue, East 2nd Street, and B Street, while the

secondary zones go from East and West 8th Street to West 2nd Street. On the main streets marked in green in Figure 8, vehicles circulate at a speed of 30 km/h; while the secondary streets marked in red in Figure 8, are closed to passing traffic, with exclusive access for residents, emergency vehicles, state security, loading and unloading transport, and waste disposal.

The area for pedestrian mobility covers the interior of the superblock and includes attractions such as Paseo Esteban Huertas, Plaza de Francia, Las Bóvedas, and Parque Las Norias. This configuration can improve the conditions of public spaces and raise pedestrian accessibility, thus humanizing the public space and recovering it as a place of pedestrian transit of the residents and tourists who visit the Casco Viejo of Panama.

Public spaces are recovered via the closure of internal streets, which promotes various cultural, commercial, and religious activities. It is important to note that some spaces are currently not being used within the Casco Viejo, including areas with the potential to become public spaces such as vacant lots and old houses. Future courses of action are further proposed to allow the expansion of the pedestrian area and integrate it with other pedestrian areas marked in light blue in the Figure 8.

We can even create pedestrian walkways like the marine section of the Cinta Costera III that connects Las Norias Park with the Paseo de Los Poetas.

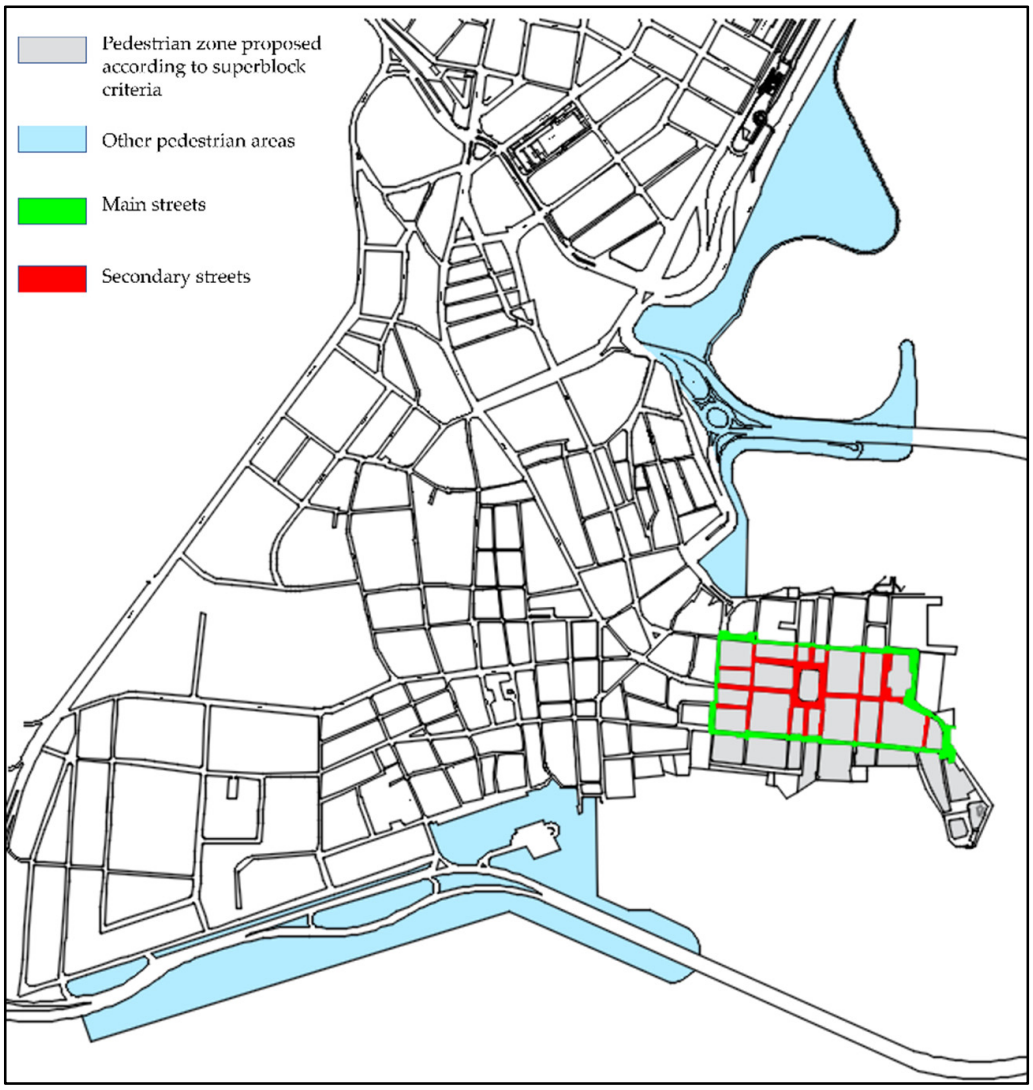

Figure 8. Proposed pedestrian zone according to superblocks criteria.

6. Conclusions

The urban model of a superblock is the main solution for the application of a new urban approach to restoring the network of urban streets. "The public space and the meeting of complementary legal entities in the territory are the two main elements that constitute the essence of a city. Without them, the city does not exist as such" [26].

A pedestrian zone is formed by roads dedicated to the circulation of pedestrians and users of non-motorized transport systems. The vehicles that can circulate are those of residents, loading and unloading vehicles at established times, service vehicles, or emergency vehicles if necessary.

The proposed mobility criteria for the Casco Viejo of Panama City are based on a pedestrian priority area that replaces the current indiscriminate use by foreign vehicles, with the introduction of physical barriers required to prevent illegal parking.

The pedestrianization mechanisms that have thus far been applied in the area are ineffective due to the lack of long-term planning.

The problem with the Casco Viejo lies in the lack of space for pedestrians due to the excessive occupation of vehicles in public spaces, which prevents users from enjoying those spaces. Further to this, there is a lack of public transport routes, which leads to a prioritization of the use of private vehicles in an area with poor management of the parking system; for that reason, pedestrians' space is occupied even more, thus starting the cycle again.

Our field analysis demonstrated the great potential for the area to become a pedestrian zone based on the criteria of superblocks. Characterizing the road infrastructure highlighted the difficulty that pedestrians face when walking on obstructed sidewalks and streets invaded by vehicles.

The capacity results indicated that in the morning, the number of vehicles entering tends to be greater than the vehicles that leave, generating an intensive occupation of public space due to the inefficient management of parking lots. In addition, the maximum time that the user is willing to spend walking to reach their destination from a parking lot or bus stop is between 11 min and 15 min, if their safety is guaranteed during the journey and if the weather allows it.

The implementation of a pedestrian zone that meets superblock criteria in the Casco Viejo of Panama will connect the area via its public spaces, thus creating a beneficial pedestrian mobility network.

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