Remittances Review
June, 2023
Volume: 8, No: 4, pp. 1123-1138
ISSN: 2059-6588 (Print) | ISSN 2059-6596 (Online)
remittancesreview.com

Received: 11 November 2022 Accepted: 15 March, 2023
DOI: https://doi.org/10.33182/rr.v8i4.78

Dynamics of public space in the Amazon city, the case of Av. 15 de noviembre

Karina Chérrez-Rodas[1], Angel Chicaiza-Ortiz[2], Andrea Carrillo-Pineda[3], Javier Sandoval-Félix[4], Myrian Larco Benitez[5], María Maldonado Marchan[6]

Abstract

The city as a complex system abstracts itself in the physical, social and cultural dimension. The object of study is Tena, an Amazon Ecuadorian city, specifically the commercial axis: Avenida 15 de Noviembre, keeping in mind that informal commerce is an important aspect in the city. The research seeks to understand what factors affect high quality public spaces from social actors. The methodology is developed in two stages: data mapping of the physical part; and the perspective of different actors in the urban space, through a focus group analyzed by impact matrices. The results show three important aspects: dynamics of informal commerce, space quality factors and accessibility. It is necessary to plan the territory emphasizing the current situation of the Ecuadorian Amazon cities that link the quality of public space with various actors in the city, as an opportunity to apply local sustainability criteria towards the planning of resilient cities.

Keywords: *Informal commerce, public space, social actors, Amazonian city, urban planning*

Introduction

A city is a complex system that cannot be divided in real terms. We know that its composition overlaps layers, functions and elements that shape it. In this context, for practical terms, a city can be understood from two large dimensions: "Urbs" that refers to physical and territorial components, and "Polis-Civitas" that groups social, political and cultural components. From this abstraction, it is considered that a city, physically talking, shapes the scene where a series of social dynamics take place, which will therefore, be particular to each physical environment and those who inhabit it (Corti, 2015).

[1] Universidad Regional Amazónica Ikiam, Tena 150101, Ecuador; https://orcid.org/0000-0001-6330-3955
[2] Universidad Regional Amazónica Ikiam, Tena 150101, Ecuador; https://orcid.org/0000-0002-2405-2783 Email: angel.chicaiza@ikiam.edu.ec
[3] Universidad Regional Amazónica Ikiam, Tena 150101, Ecuador; https://orcid.org/0000-0002-7116-7655 Email: andrea.carrillo@ikiam.edu.ec
[4] UrbanLab, Ensenada22750, Mexico. https://orcid.org/0000-0003-0776-3070 Email: javier.sandoval@urbanlab.city
[5] Universidad Regional Amazónica Ikiam, Tena 150101, Ecuador. https://orcid.org/0000-0002-1846-8440 Email: myrian.larco@ikiam.edu.ec
[6] Universidad Regional Amazónica Ikiam, Tena 150101, Ecuador. Email: maria.maldonado@ikiam.edu.ec
Corresponding author: Karina Chérrez-Rodas (karina.cherrez@ikiam.edu.ec)

Then, social relationships acquire value in different urban spaces of the city and pedestrians are taken into account into them; this is the factor that gives life to a system generating social identity (Gehl, 2014),(Arroyo, 2015). In agreement with Gehl, 2004, it is considered that the quality of public spaces increases as social activities take place, therefore, optional activities that trigger these events are important (Gehl, 2004).

Particular social events give life to a city, characterize and give vocation to public spaces at the same time. Thus, for people's conception regarding cities, local culture, climate, context, social construction and integrated local priorities influence (Campisi et al., 2020). In this sense, some examples can be explained in Latin American contexts: after the fall of dictatorships established in their territories from the eighties (Petropoulou, 2018), Argentine cities conceive public spaces as demonstrations places and defense of population rights that are evidenced in popular marches on streets understood as a social construction that lasts over time. On the other hand, economic dimensions condition the use of some spaces of great importance in Latin American cities that become the main activity of spaces such as Andean markets considered spaces for commercial, ethnic and cultural exchange and identification with local traditions (Vergara et al., 2015); a situation that is evident in the markets of cities in Ecuador, Peru and Bolivia.

When speaking of urban structures, the physical aspect is understood as the natural support on which a city sits and extends: radiocentric, semi-radiocentric, linear and polycentric cities can be observed (Corti, 2015). However, Janoschka makes a characterization of a Latin American city referring to a new city model, where the urban nucleus enjoys the privileges of cities and the outskirts are notably impoverished, and at environmental risk (Janoschka, 2002). In the social aspect, as a consequence of the crisis of modernizing processes since the eighties in Latin American cities, informality has become an important area of economy which is considered one of the main aspects for public policies implementation (Pérez, 1991). In Dantas' research, the location of cities represents a series of variations in social behavior. Through the analysis of appropriation of public spaces by street vendors in urban centers, he explains how there is an articulation of the use of public spaces and state policies affirming the complexity of cities' dynamics from an integral aspect (Silva, 2001). Schaffer's studies show in Uruguaiana areas, a city on the border between Brazil and Argentina, that informal street commerce plays a role in shaping city centers emphasizing that this social and economic factor is also linked to accessibility and fluidity of space, and affect the location of informal commerce in cities (Silva, 2004). Another example is the Central District, Francisco Morazan in Honduras, in which the main point of commerce is Zonal Belen. In this market, about 33% of people are engaged in informal commerce becoming the main and the first place where this type of trade in the district is developed (Roberto et al., 2017).

At the International Conference of International Labor Organization (ILO) held in 2002 in Geneva, they researchers emphasized that informal trade should stop being considered a sector, but rather categorized it as a global phenomenon and therefore an informal economy. Thus, the term informality and the questions about how to measure it, generate studies that focus on knowing

and deepening the causes of informal trade in some European and Latin American countries (Rivadeneira et al., 2021). In this way, Latin American urban centers are characterized by a high percentage of informal commerce which is a source of income for a large part of households reaching an average informality rate of 54% (Quispe Fernández et al., 2020). On many occasions, it is around trade areas of these territories that emphatic social interactions emerge. In Latin America, the growing percentage of informal work is associated with migration. This reality responds directly to political - economic conditions in countries such as Venezuela, Honduras, Cuba and Colombia, where an average of 5 out of 10 people find a temporary means of subsistence in informal trade. They are also linked to phenomena such as population growth and poverty conditions (Quispe Fernández et al., 2020).

In Ecuador, according to a report from the Institute of Statistics and Censuses (INEC), 46.7% of people work in the informal sector of economy. This means that 31.2% of population is part of poverty indexes for unsatisfied basic needs directly affecting quality of life (Lombeida & Serrano, 2019). Informal sectors show an increase of 6.3% from 2016 to 2019, which shows a serious problem regarding informality understood as workers who are not affiliated to the country's tax system, whether in a dependent or independent way (Quispe Fernández et al., 2020). In addition, the income from these economic activities is below the minimum wage, and trading conditions are variable, intermittent and / or precarious (Lombeida & Serrano, 2019).

Ecuadorian cities have been developed in three continental regions where they acquire physical features in their urban structure marked by topography, geographical and orographic conditions, among others, as well as social dynamics accentuated by local peculiarities. Cities on the Pacific coast show urban activities related to artisanal fishing or the port; cities in the mountains are related to agricultural and artisan activities with dynamics present in their Andean markets; and finally, Amazon cities are developing cities characterized by strong urban-rural links. Since 2007, these cities have been influenced by the policy of "territorial equity". This implied the construction of infrastructures and equipment that have been part of the current development of the Amazon region in contrast to a previous historical process of expansion, extraction, exportation of raw materials, and dispossession and civilization of indigenous population (Japhy et al., 2019).

The Amazon region of Ecuador is made up of 6 provinces where 13 natural protected areas are located. Tena belongs to the Amazon province of Napo; it is the third most populated city in this region. The canton approximately has 60,880 inhabitants, 38% live in urban areas (GAD Municipal de Tena, 2021). This data shows the presence of strong urban-rural links, which, to a certain extent is reflected in social dynamics related to informality in the study area that presents a commercial vocation as evidenced in on-site mappings.

INEC data related to 2010 Population and Housing Census, show that economic indicators of Napo province are related to activities such as agriculture / livestock with 39.7% followed by 10.7% dedicated to commerce (Instituto Nacional de Estadística y Censos, 2021). Furthermore, according

to data from Land Use Plan - Land Use and Management Plan 2020-2023 (PDOT-PUGS), the province has its income source linked to tourism and commerce which has a strong relationship with informal commerce (GAD Municipal de Tena, 2021). It is pertinent to point out that PDOT-PUGS diagnosis highlights that 51.52% of informal trade present in the province is developed due to the lack of work. For 2019, the unemployment rate stands at 4.9%, that is, 0.30 percentage points over national index (Gad Municipal de Misahualli, 2018).

Among relevant factors for the increase in levels of informality, the following stand out: low levels of associativity, scarcity in markets for the commercialization of local products and low level of technology and traders training (GAD Municipal de Tena, 2021). All these generate limitations to access the financial sector.

In Tena, at the beginning of 2020 before the pandemic, specific points with growing and active informal commerce are observed in sectors such as Del Chofer Avenue, 15 de Noviembre Avenue and Terminal Terrestre where 56% of located merchants are informal (GAD Municipal de Tena, 2021). These are classified as: permanent informal merchants 25%, stationary 15% and itinerant 65%. In addition, it is indicated that the presence of informal workers increases on holidays and local festivities. On the other hand, 15 de Noviembre Avenue is considered one of the articulating road axes of the city; in its development, public spaces for collective use are connected as well as various uses on the ground floor with shops at different scales and financial activities (GAD Municipal de Tena, 2021). These characteristics encourage the flow of passersby by significantly increasing the number of possible contacts, which is attractive for proliferating informal trade in the provincial capital. Due to the aforementioned reasons, commercial axis of 15 de Noviembre avenue has been selected as a Specific Study Area (SSA).

On the other hand, data provided by Municipal Police Station of Municipal GAD affirm that there is an increase in informal commerce directly related to an unemployment increase rate of 4.7% corresponding to March 2019 in urban areas (GAD Municipal de Tena, 2021). Post-pandemic data show that informality has been one of the most vulnerable sectors after this crisis that has triggered an increase in the informal sector.

When comprehending that a city can be abstracted from a physical and social sphere, understanding the impact that informal commerce has on urban dynamics of Latin American contexts, it is appropriate to analyze the quality of its physical space in relation to the dynamics of informal trade that characterizes the SSA. The SSA is a sector has been affected by different measures related to biosafety regimes since 2020, with the pandemic, which have been generating an evolution of urban and social events of this city. Therefore, it is important to diagnose commercial areas of Tena in terms of physical conditions and perceptions of these public spaces by social actors considering users as protagonists of this process; since, street commerce is unknown, and there are important investigations that allow enriching diagnosis and debate of public policies (Rocha et al., 2009).

After analyzing data in SSA of Tena city, we can see that informal trade sector evolves as a result

of the pandemic; however, these changes are not framed in guidelines towards the construction of sustainable cities that are consistent with urban structure of Tena associating physical and social aspects. Thus, this study aims to know what factors influence the high-quality of public space on 15 de Noviembre Avenue in Tena from the perspective of social actors.

The present study is focused on contributing to the planning of the city. By the understanding of the functional relationships of the different factors that compose the city and its specificities, it is possible to contribute to the optimization of the use of public resources. With the use of technological tools such as NodeXL (Himelboim & Smith, 2017), the use of Complexity Science in an urban context (Portugali, 2011) and through collecting the perception of the citizens of Tena, the researchers proposed the identification of solutions that are more sustainable for urban life (Sandoval et al., 2017) (Furtado et al., 2015) (Murgante et al., 2009).

Complexity focused on the urban, addresses the relationship that exists between the different factors, elements, mechanisms and heterogeneous variables that are part of the city (Walloth et al., 2014), (Landini & Occelli, 2012). A complex system is made up of networks, which are made up of nodes that interact with each other (Sayama, 2015) and considering that the systems that are part of the city are made up of factors that interact with each other, one option to study them in an integral way is the network theory (Furtado et al., 2015). One of the uses of Complexity is to find certain patterns that are often not visible to the naked eye. To study the territory is important to understand the specificities of the locality (Xu et al., 2021) and this can be achieved through the help of the Science of Complexity (Sandoval et al., 2017).

The understanding of the city as a complex system starts from the abstraction of two key dimensions: Urbs and Polis-Civitas. Tena, with particularities of location in Amazonian environments, where the reality of public space is largely associated with the presence of informal commerce that takes place in the specific study area is selected for the study. It is based on the premise that these actors of urban spaced together with other passers-by, must be considered as essential elements for the elaboration of effective policies in terms of urban design towards resilient post-pandemic cities. From this perspective, the study identifies three key clusters that precisely link physical aspects related to social actors and urban comfort, quality of public space, and accessibility. These clusters are obtained after the application of the methodology of taking physical data in the field and matrices applied to a focus group of actors in the space. These priorities groupings in the development of activities in the public space of the commercial axis of Tena, allow to generate a series of reflections around the lessons learned from this pandemic for the planning of more humane cities.

Methods

To understand the dynamics and conditions of public space in SSZ starting from the premise of having a commercial nature and the presence of informal workers, the study methodology has two stages: the first one seeks to know the physical conditions of SSZ and the presence of merchants

by time zone through "Field Mapping"; and the second methodological stage starts from base data processed by researchers to generate an impact matrix that will be filled out by a focus group.

Methodological stage of Field Mapping

Location and place delimitation: In this section maps are used at two scales. To understand the object of study, first Ecuador, the Amazon region, the province of Napo and the study canton are located delimiting the influence area (IA) within the urban limit of Tena. This IA covers 9 blocks on 15 de Noviembre Avenue (15 Av) where the largest number of informal traders are located. (Figure 1).

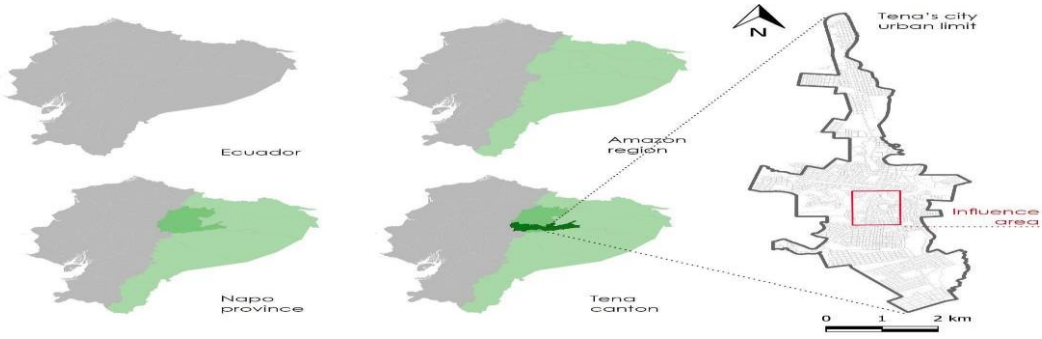

Figure 1 Influence Area Location, from Ecuador to Tena

Source: J. Cusquillo (2021)

Delimitation of zones: In (Figure 2), IA is divided into three zones for data mapping: zone 1, 2 and 3. These are delimited taking 15 de Noviembre Avenue as the center and generating walkable radii of 400m along 9 blocks from IA.

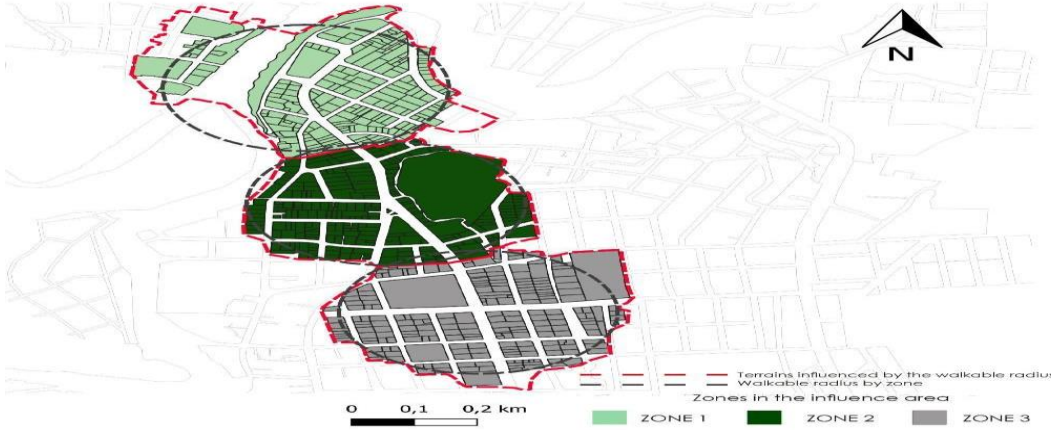

Figure 2 Delimitation of areas in walkable radius

Source: J. Cusquillo (2021)

Mapping of IA equipment: In these areas, equipment mapping is carried out, that is, the buildings or properties that have a city level functionality. In addition, the Specific Study Zone (SSZ) is delimited (Figure 3).

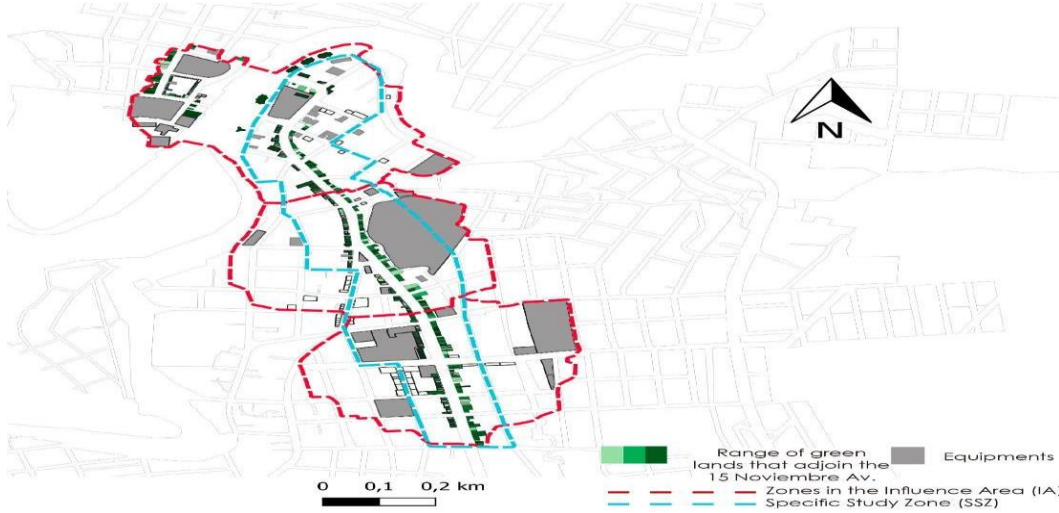

Figure 3 AI equipment mapping.

Source: J. Cusquillo (2021)

A map of uses on the ground floor SSZ: In (Figure 4), different uses on the ground floor in SSZ associated with any type of business and / or service, including housing are mapped.

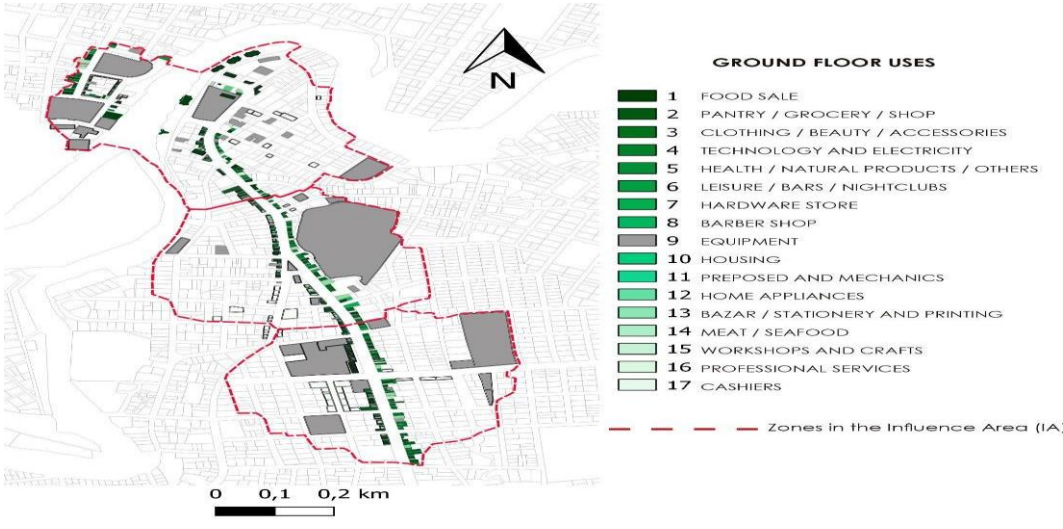

Figure 4 Mapping of uses on the ground floor SSZ

Source: J. Cusquillo (2021)

A map of informal traders by time zone: In the following map, (Figure 5) identifies the presence of informal traders by time zone: morning (7am - 8am), noon (12pm to 1pm) and afternoon (5pm to 6pm). The results show the total of informal traders in mappings carried out during two weeks for three days a week. Data taken during February 2021.

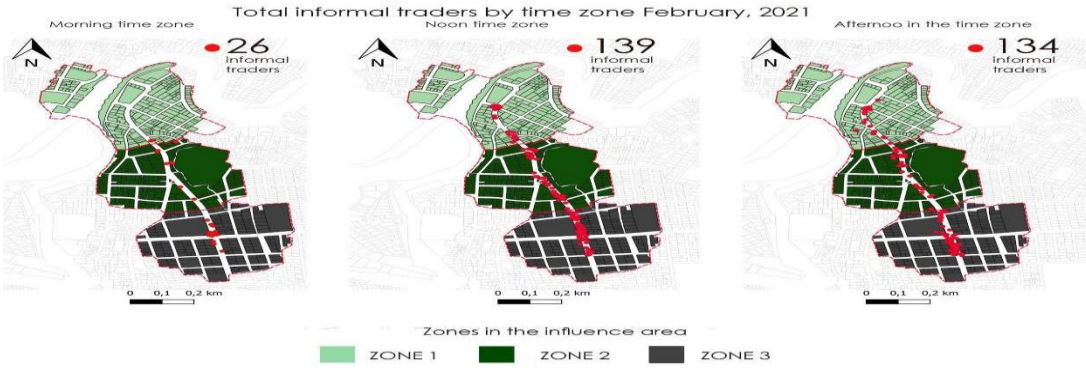

Figure 5 Map of informal traders by time zone

Source: J. Cusquillo (2021)

Map of informal traders by characteristics: The following diagram in (Figure 6) explains the characteristics of informal traders: number of traders according to weather conditions, number of merchants by location within the SSZ and number of merchant by type of informal commerce.

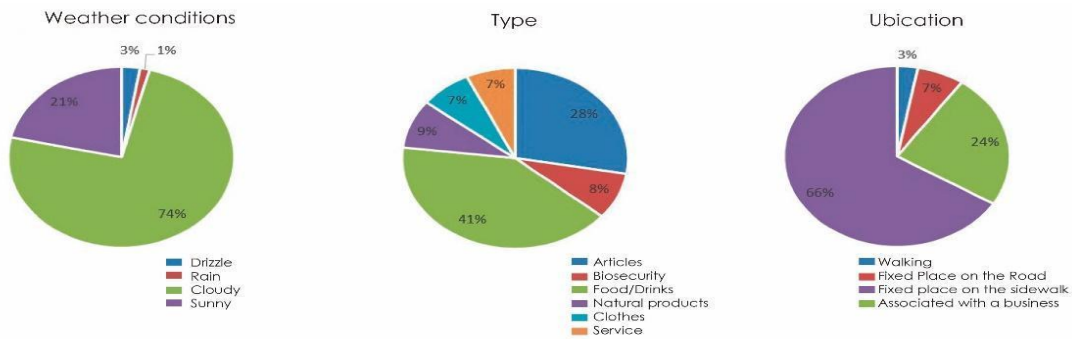

Figure 6 Characteristics of informal traders.

Source: J. Shiguango (2021)

These maps and graphics allow synthesizing elements of the physical part of the city in the IA and the presence of informal merchants in the SSZ. It is important to point out that the researchers, who were authors of the investigation, were the ones who took data in the field, these parameters allow defining the 16 factors that are the basis for the next stage: methodology.

Methodological stage of Impact Matrices

After having delimited IA and SSZ based on field mapping of physical aspects and characteristics of informal traders, a focus group was organized where citizens of Tena were invited to participate voluntarily as city actors in different roles such as merchants, teacher-researchers, doctors, sector residents and public and private officials. In addition, a survey with questions about the level of relationship of the different elements that are part of 15 Av was conducted. These questions were closed, quantitative, qualitative, and consolidated in an impact matrix. Respondents had to select the impact of one variable on another, where: 0 represented that one factor did not influence another, 1 represented an indirect impact and 2 represented a direct impact of one factor (F) on another. It is important to consider that the data was taken during January 2021, when some restrictions were still in place due to the covid pandemic. For this purpose, an assembly is called with municipal officials, merchants in the area and actors in the area as pedestrians. It is important to note that approximately 40% of the focus group participants belong to the merchants and direct actors in the area, the rest of the participants are divided into the aforementioned actors, the participation of the researchers is considered.

Table 1 details the factors that were considered for this study based on field mapping.

ID Factor	Description of the factors
F1	Sidewalk width
F2	Urban signage for vehicles and people
F3	Presence of elements of universal accessibility
F4	Luminaires
F5	Sunshine
F6	Urban furniture: Benches, garbage cans
F7	Vehicle parking lots
F8	Bus / taxi stop
F9	Fixed / itinerant informal traders
F10	Presence of garbage
F11	Noise pollution
F12	Location of merchants on the sidewalk, urban furniture / equipment, building walls
F13	Street merchants' location
F14	Shadow generated by existing buildings according to number of floors
F15	Climatic conditions
F16	Ground Floor Uses

Table 1: Table of SSZ factors for impact matrix.

Source: A. Chicaiza (2021) J. Cusquillo (2021)

The (Table 2) shows the impact matrix with the average values of the degree of influence or weight of the different factors (variables) generated from the participatory process of social actors and

their perception about 15 Av.

Table 2 Impact matrix table with average values among factors

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16
F1		1,20	1,40	1,30	1,00	1,70	1,00	1,40	1,50	1,00	1,00	1,60	1,30	1,00	0,90	1,20
F2	1,20		1,20	0,90	0,60	0,90	1,20	1,30	0,90	0,90	0,50	0,90	1,00	0,40	0,60	0,60
F3	1,80	1,50		1,10	0,60	1,30	0,60	0,90	1,00	0,50	0,60	1,00	1,00	0,40	0,80	0,70
F4	1,30	1,00	1,10		0,50	0,90	0,90	1,00	1,30	0,20	0,10	1,30	1,20	0,10	0,30	0,80
F5	1,80	1,10	1,30	1,20		0,90	0,80	1,00	1,40	1,00	0,50	1,50	1,60	0,80	0,60	1,00
F6	1,80	1,10	1,30	1,20	0,90		0,80	1,00	1,40	1,00	0,50	1,50	1,60	0,80	0,60	1,00
F7	1,20	1,20	1,20	0,80	0,50	0,80		1,50	1,10	0,50	0,90	1,10	1,40	0,60	0,60	1,20
F8	1,40	1,60	1,40	1,20	0,60	1,20	1,30		1,50	1,10	1,10	1,10	1,30	0,60	0,60	1,20
F9	1,40	0,60	0,70	0,80	1,40	1,10	0,80	1,30		1,00	1,20	1,80	1,70	0,80	1,50	1,10
F10	0,60	0,30	0,20	0,40	0,30	1,40	0,70	0,70	1,30		0,10	1,20	1,10	0,10	0,50	1,10
F11	0,40	0,30	0,60	0,10	0,10	0,30	1,20	1,30	1,40	0,10		0,90	0,90	0,10	0,50	1,30
F12	2,00	0,80	1,10	0,70	1,30	1,20	0,80	0,80	1,60	1,10	1,10		1,60	1,10	1,30	1,40
F13	1,60	1,00	0,90	0,70	0,70	0,90	1,30	1,20	1,60	1,10	1,20	1,40		0,70	1,30	1,00
F14	0,70	0,10	0,20	0,20	1,10	0,50	0,70	0,50	1,60	0,50	0,40	1,70	1,60		1,20	0,80
F15	0,50	0,20	0,50	0,30	1,20	0,50	0,30	0,60	1,80	0,70	0,80	1,80	1,80	1,60		1,10
F16	1,60	1,20	1,10	1,00	0,80	1,20	1,20	1,40	1,60	1,40	1,30	1,50	1,60	0,80	0,60	

Source: K. Chérrez (2021)

In this section, a study of data distribution is carried out as shown in (Figure 7) from which it can be seen that a large part of factors has an indirect or null impact, and few factors can be considered as high impact.

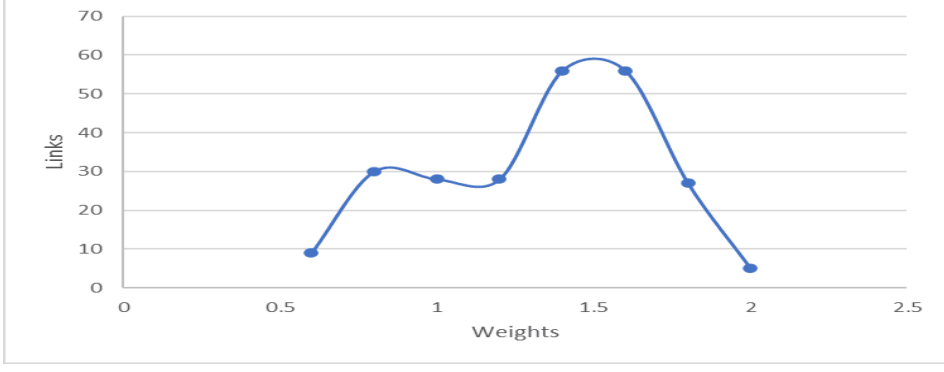

Figure 7 Data distribution study

Source: A. Chicaiza (2021)

Based on the results of the impact matrix, we proceeded to identify the most influential elements, those that are most influential and those that are less relevant.

Four quadrants were identified in (Figure 8): the critical one that covers the most influential and influenceable points, the Active that covers the influential and little influenceable points, the Passive that covers the influenceable points and the Neutral zone that has little impact.

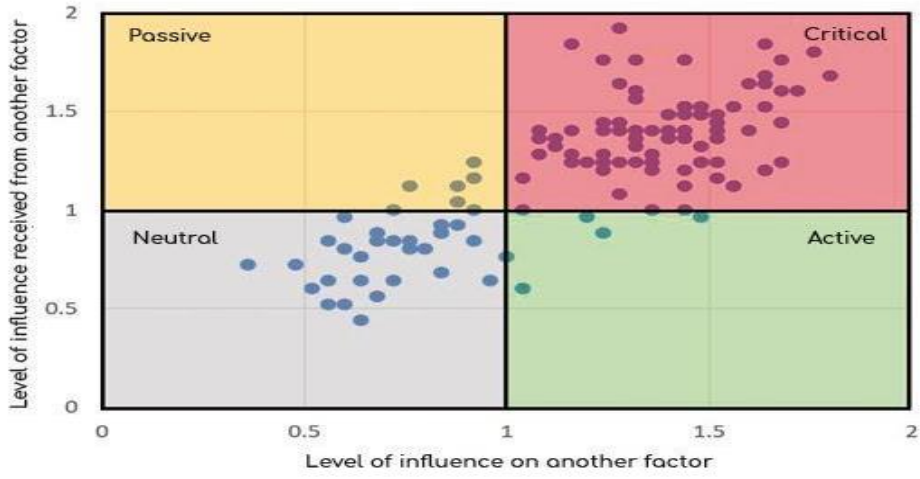

Figure 8 Influence level quadrants.

Source: A. Chicaiza (2021)

Through the use of network theory, the influence of different elements that are part of the city was determined (Sandoval et al., 2017).

The information was then processed in NodeXL and Gephi; programs to define the clusters of the different components of the city according to the affinity degree of factors.

Results

First of all, it is appropriate to explain that after field mappings, the result is 16 factors, which have been synthesized after the analysis of AI and SSZ maps. In addition to the in situ experience of the researchers, these include issues of physical aspects as well as social dynamics and the presence of informal commerce: Width of the sidewalks, urban signage for vehicles and people, presence of elements of universal accessibility, luminaires, sunning, urban furniture such as benches, and garbage cans, vehicle parking lots, bus / taxi stops, fixed / itinerant informal traders, presence of garbage, noise pollution, location of merchants on sidewalks, urban furniture / equipment, building walls, location of merchants on the street, shadow generated by existing buildings according to number of floors, weather conditions and ground floor uses. Each of the described aspects is considered a factor for the impact matrices applied in the focus group.

By using Gephi program, and taking the consolidated information from the impact matrix, the link among all factors was found, as shown in (Figure 9).

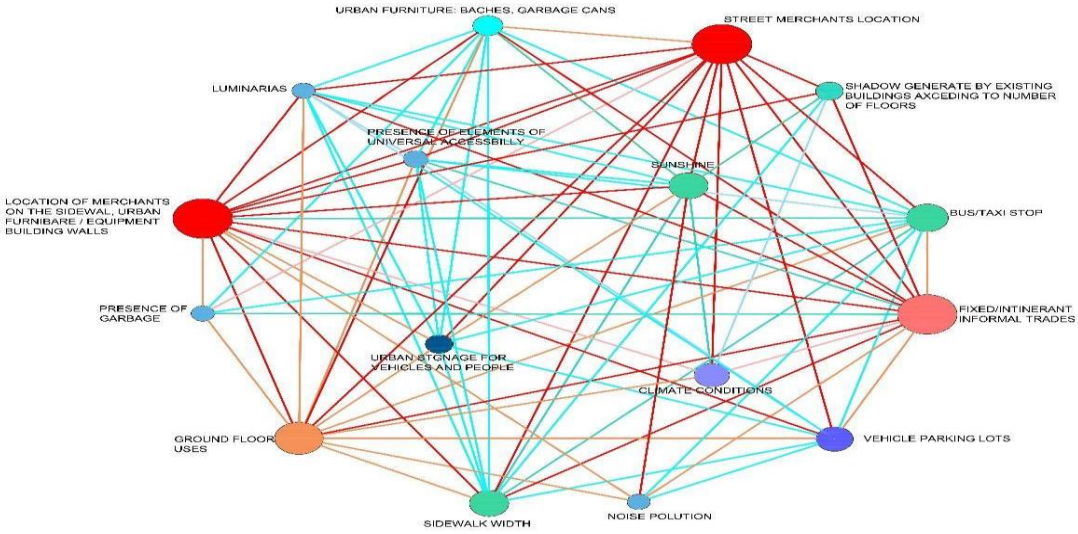

Figure 9 Link among factors.

. **Source:** J. Sandoval (2021)

Selecting the most influential links (in a range from 1.5 to 2), and with the help of the NodeXL program, (Figure 10) shows the links among the main factors located in the critical quadrant (upper right area of Figure 8) and the clusters formed from the impact matrix, where the algorithm reveals groupings of heterogeneous elements that are not evident at first glance (Sandoval et al., 2017).

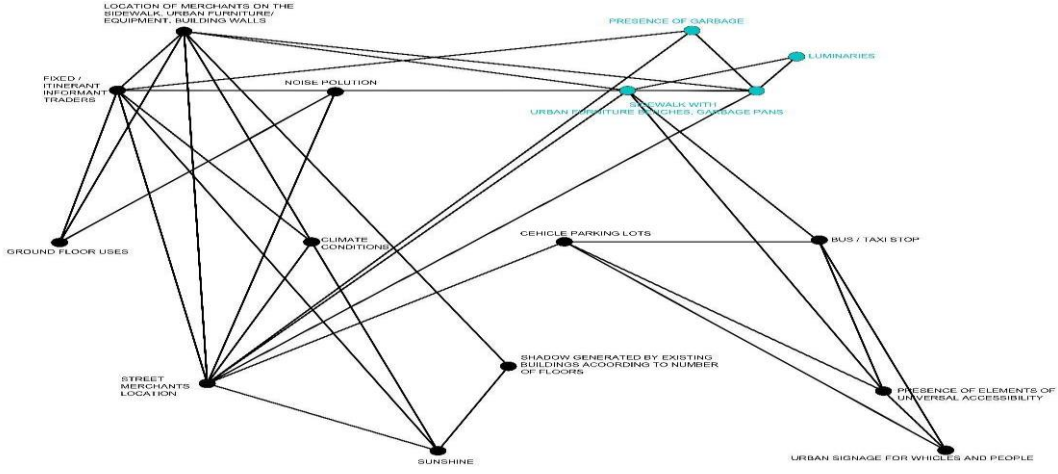

Figure 10 Link among main factors of critical quadrant.

Source: A. Chicaiza (2021)

From the network, the clusters obtained using Clauset-Newman-Moore clustering algorithm (Clauset et al., 2004) are the following:

Group 1: Dynamics of informal traders and urban comfort: location of traders on sidewalks, urban furniture / equipment, building walls, location of merchants on the street, fixed / itinerant informal traders, sunning, shadow generated by existing buildings according to number of floors, weather conditions, noise pollution and ground floor uses.

Group 2: Quality of public space: width of sidewalks, luminaires, urban furniture: benches, garbage cans and presence of garbage.

Group 3: Accessibility to public space: presence of elements of universal accessibility, urban signage for vehicles and people, vehicle parking and bus / taxi stops.

Discussion or conclusions

Developing cities have the opportunity to plan and grow in a more sustainable way. This is the case of Tena, it is feasible to implement planning processes that point towards a development that places pedestrians as the main axis of urban proposals. After studying SSZ particularities, it is possible to comprehend the dynamics of informal merchants on 15 Av. by understanding that there is an incidence of permanence with weather conditions, the relationship of quality factors of spaces with their location reaffirming Gehl's thesis that relates the quality of public spaces with the activities that people can carry out (Gehl, 2004).

Obtained results generated three groups that allow us to understand space perception from social actors, precisely the aspects that place pedestrians as a priority, then spatial quality and finally space access. These results allow supporting territorial planning processes where feelings and visions of different social actors of Tena are taken into account. Academy contribution and the participation of the decentralized Autonomous Government towards cities that are more sustainable from a social aspect and resilient to face the crisis that the pandemic has caused in the Amazonian cities is significant too.

Cities are constantly evolving, and citizens and social dynamics are constantly changing. It has been noticeable that with the pandemic, a new logic of informal trade related to articles for biosafety has been incorporated. However, in the particular case of Tena, it can be understood that this phenomenon can affect other aspects of its rural economy since it has replaced the sale of natural products from nearby towns. Knowing these phenomena will allow the incorporation of sustainable strategies into public policies that allow citizens to supply new needs and promote informal businesses that are sustainable with local environment at the same time; in this case, products from Amazonian farms.

The present study lets us understand locality specificities and contextualize them in a global panorama provided by the literature. In this sense, taking formed clusters as a reference, the first group of factors is associated with a social and cultural component while groups 2 and 3 are related

to a physical aspect of the city validating theories such as Corti's. Corti's theory abstracts the city into these two large components and inhabitants of the city finally recognize them.

Finally, it is important to mention that this work's methodology can be replicated to the study of other cities even where new related factors are included: urban landscape (Alberti, 2008), traffic (De Roo & Silva, 2010) and epidemics (Heppenstall et al., 2011); emphasizing that the results visualize the perception of various actors.

The Amazonian cities are the least developed in Ecuador; despite this, in recent years they have undergone some investment processes that have promoted their development. The Amazonian city of Tena, although it has experienced some urban interventions, in the case of SSZ carried out no more than 15 years ago, it has not implemented sustainability criteria. In this context, it is necessary to plan territory and public spaces starting with diagnosing the city's current situation with tools that embrace people's perception such as NodeXL.

This work is presented as a tool to develop and conceive a new urban planning paradigm on 15 de Noviembre Avenue from the perspective of social actors, the use of network theory and new technological resources. These will allow concentrating public policy efforts on elements that generate a positive impact on the city and on the design of its public spaces, which are the spaces where people live in.

Learning about social dynamics of the commercial axis of Tena in SSZ, allows us to understand a population struggling to resist the adversities of the pandemic. In this setting of actors and commercial activities, local municipalities can contribute through their policies to the construction of more sustainable urban environments for people and from people. As a result, this study has generated three aspects to be considered as priorities in the approach to urban dynamics of this specific context.

Acknowledgment

This research was funded by the UE-Agencia Española de Cooperación Internacional AECID, within the project "Sustainable guidelines for the integration of informal commerce in public spaces. Urban simulation in Av. 15 de Noviembre-Tena" developed at Universidad Regional Amazónica Ikiam in the Faculty of Socio-environmental Sciences. A special thanks to UrbanLab Mexico for the contributions.

References

Alberti, M. (2008). *Advances in urban ecology: integrating humans and ecological processes in urban ecosystems*. Springer.

Arroyo, J. (2015). *Espacio público. Entre afirmaciones y desplazamientos*. Ediciones UNL.

Campisi, T., Basbas, S., Tesoriere, G., Trouva, M., Papas, T., & Mrak, I. (2020). How to Create Walking Friendly Cities. A Multi-Criteria Analysis of the Central Open Market Area of Rijeka. *Sustainability*.

Clauset, A., Newman, M., & Moore, C. (2004). Finding community structure in very large networks. *Physical Review E*.

Corti, M. (2015). *La ciudad posible. Guía para para la actuación urbana.* Café de las ciudades.

De Roo, G., & Silva, E. A. (2010). *A planner's encounter with complexity*. Ashgate Publishing, Ltd.

Furtado, B., Sakowski, P., & Tóvolli, M. (2015). *Modeling complex systems for public policies*. Instituto de Pesquisa Econômica Aplicada (Ipea).

Gad Municipal de Misahualli. (2018). *Plan del buen vivir y Ordenamiento Territorial de la Parroquia Puerto Misahualli Tena-Napo*. https://docplayer.es/53522315-Plan-del-buen-vivir-y-ordenamiento-territorial-de-la-parro-quia-puerto-misahualli-tena-napo.html

GAD Municipal de Tena. (2021). *Actualización PDOT Tena 2021-2023*. https://drive.google.com/file/d/18umSDDvHxXNPKyYirjNgUV2nhXPC7HzT/view

Gehl, J. (2004). *La Humanización del espacio urbano: La vida social entre los edificios.* Editorial Reverte, S.A.

Gehl, J. (2014). *Ciudades para la gente*. Ediciones Infinito.

Heppenstall, A. J., Crooks, A. T., See, L. M., & Batty, M. (2011). *Agent-based models of geographical systems*. Springer Science \& Business Media.

Himelboim, I., & Smith, M. A. (2017). NodeXL. *The International Encyclopedia of Communication Research Methods*, 1–3.

Instituto Nacional de Estadística y Censos. (2021). *Base de Datos – Censo de Población y Vivienda*. Censo Población y Vivienda 2010. https://www.ecuadorencifras.gob.ec/base-de-datos-censo-de-poblacion-y-vivienda/

Janoschka, M. (2002). El nuevo modelo de la ciudad latinoamericana: fragmentación y privatización. *EURE*.

Japhy, W., Bayón, M., & Díez, H. (2019). Posneoliberalismo y urbanización plantearia en la Amazonía ecuatoriana. *Revista Economía*.

Landini, S., & Occelli, S. (2012). Innovative Public Policy-The Role of Complexity Science. *Emergence: Complexity and Organization*.

Lombeida, E., & Serrano, M. (2019). *Reporte de pobreza y desigualdad*. Encuesta Nacional de Empleo, Desempleo y Subempleo. https://www.ecuadorencifras.gob.ec/documentos/web-inec/EMPLEO/2021/Trimestre-enero-marzo-2021/Trimestral enero-marzo 2021_Mercado_Laboral.pdf

Murgante, B., Borruso, G., & Lapucci, A. (2009). Geocomputation and urban planning. In *Geocomputation and urban planning*. Springer.

Pérez, J. P. (1991). *Informalidad urbana en América Latina. Enfoques, problemáticas e interrogantes*. Editorial Nueva Sociedad.

Petropoulou, C. (2018). Social Resistances and the Creation of Another Way of Thinking in the Peripheral "Self-Constructed Popular Neighborhoods": Examples from Mexico, Argentina, and Bolivia. *Urban Science*.

Portugali, J. (2011). Complexity theories of cities. In *Complexity, Cognition and the City*. Springer.

Quispe Fernández, G. M., Ayaviri Nina, D., Villa Villa, M. V., & Velarde Flores, R. (2020). Comercio informal en ciudades intermedias del Ecuador: Efectos socioeconómicos y tributarios. *Revista Ciencias de Sociales* .

Rivadeneira, D., Sandoval, D., Zambonino, D., Albán, A., & Garcés, C. (2021). *Encuesta Nacional de Empleo, Desempleo y Subempleo (ENEMDU) Documento Metodológico*. Instituto Nacional de Estadísticas y Censos. https://www.ecuadorencifras.gob.ec/documentos/web-

inec/EMPLEO/2018/Septiembre-2018/ENEMDU_Metodologia Encuesta Nacional de Empleo Desempleo y Subempleo.pdf

Roberto, N., García, R., & Alvarenga, R. (2017). Impacto del comercio informal en la estructura económica de Honduras. *Economía y Administración (E&A)*.

Rocha, R., Sanchez, F., & Garcia, L. (2009). Ventas callejeras y espacio público: efectos sobre el comercio de Bogotá. *Desarrollo y Sociedad*.

Sandoval, J., Castañón-Puga, M., Gaxiola-Pacheco, C., & Suarez, E. (2017). Identifying Clusters of Complex Urban–Rural Issues as Part of Policy Making Process Using a Network Analysis Approach: A Case Study in Bahía de Los Ángeles, Mexico. *Sustainability*.

Sayama, H. (2015). *Introduction to the modeling and analysis of complex systems*. Open SUNY Textbooks.

Silva, S. (2001). Trabajo informal en América Latina: El comercio callejero. *Revista Bibliográfica de Geografía y Ciencias Sociales*.

Silva, S. (2004). Trabajo informal, género y cultura: el comercio callejero e informal en el sur de Brasil. In *Universitat Autònoma de Barcelona Facultat de Filosofia i Lletres Departament de Geografia*. Universitat Autònoma de Barcelona.

Vergara, A., Gierhake, K., Jardón, C., Hernández, J., Vidal, A., & Carranza, E. (2015). Espacio público en Latinoamérica: de la fragmentación espacial y la segregación social hacia la cohesión territorial. Nuevos retos a viejos problemas. *Discussion Paper*.

Walloth, C., Gurr, J. M., & Schmidt, A. J. (2014). *Understanding complex urban systems*. Springer.

Xu, J., Yang, M., Lu, Z., Liu, D., & Wu, Y. (2021). Quality Analysis on Spatial Planning Pattern of Rural Area in Southern Shaanxi, China. *Sustainability*.