

## **ANALYZING THE UNEQUAL REGIONAL URBAN ECONOMY; CLASSIFICATION OF THE HETEROGENEITY OF THE XALAPA METROPOLITAN AREA UNDER THE TERRITORY AND ECONOMIC DISPERSION IN PERIOD PREPANDEMIC 2010-2020**

**ANALIZANDO LA ECONOMÍA URBANA REGIONAL DESIGUAL;  
CLASIFICACIÓN DE LA HETEROGENEIDAD DE LA ZONA METROPOLITANA DE  
XALAPA BAJO EL TERRITORIO Y DISPERSIÓN ECONÓMICA EN EL PERIODO  
PREPANDEMIA 2010-2020**

**Juan Andrés Sánchez García,<sup>1</sup> Darío Fabián Hernández González<sup>2</sup> y Ángel  
Fernando Argüello Ortiz<sup>3</sup>**

**SUMARIO:** 1. Introduction, 2. Economy and its importance in the dynamics of the region, 3. Xalapa Metropolitan Area: case study, 4. Xalapa Metropolitan Zone Cluster through the Economic Units and territorial conformation, 5. Conclusions, Bibliography

### **ABSTRACT**

The city and its territory present broad and complex intellectual challenges that belong to the study of urban planning. However, it is not intended to discredit the work, techniques, and methodologies, but to show that the help of a disciplinary dialogue provides the urban planning researcher as well as the student to visualize urban phenomena from another perspective and maintain a different vocabulary that allows validating the studies in the territory. This work aims to present a statistical model that shows the relationship between economic units and size of the territory in the

### **RESUMEN**

La ciudad y el territorio presentan retos intelectuales bastante amplios y complejos que pertenecen al estudio en la disciplina del urbanismo. Se pretende mostrar que la ayuda de un diálogo disciplinar dota al investigador en urbanismo y al estudiante a visualizar a los fenómenos desde otra perspectiva y mantener un vocabulario distinto que permita validar los estudios en el territorio. Este trabajo tiene como objetivo presentar un modelo estadístico que muestre la relación aplicada entre unidades económicas y tamaño del territorio en la zona metropolitana de

<sup>1</sup> Arquitecto y especialista en Métodos Estadísticos por la Universidad Veracruzana (UV). Maestro en Procesos y Expresión Gráfica en la Proyección Arquitectónica Urbana por la Universidad de Guadalajara. Doctor en Arquitectura y Urbanismo por la Universidad Veracruzana y Doctor en Arquitectura, Diseño y Urbanismo por la Universidad Autónoma del Estado de Morelos. Profesor de tiempo completo titular C de la UV. Miembro del Sistema Nacional de Investigadores de México.

<sup>2</sup> Doctor en Educación de la Economía. Investigador Académico del Instituto de Investigaciones y Estudios Superiores Económicos y Sociales (IISES) del Universidad Veracruzana, México. Línea de investigación es la Tecnología y Economías Sociales en lo Glocal; Planeación Urbana y Economía Social y Solidaria.

<sup>3</sup> Doctor en Finanzas Públicas. Profesor de la Facultad de Economía Xalapa, Universidad Veracruzana, México. Líneas de investigación: desarrollo social con modelación estadística, generación de indicadores sociodemográficos y políticas públicas, y análisis y prospectiva política con enfoque espacial.

Metropolitan area of Xalapa whose purpose is to demonstrate that urban phenomena can be measured using validated statistical techniques in conjunction with urban planning research. The hypothesis is assumed that economic activity is not distributed homogeneously in the territory of the Xalapa Metropolitan Zone, through a multivariate statistical analysis, it is demonstrated that there are 3 groups of municipalities with similar characteristics, establishing the relationship between concentration of activities in territorial extensions, which concludes that there is no regional economy but that the region is unequal and that they can be classified based on the mix of economic and territorial variables for studies with an urban-spatial approach.

Xalapa cuya finalidad es demostrar que los fenómenos urbanos pueden medirse bajo técnicas estadísticas validadas en conjunto con la investigación en urbanismo. Se asume la hipótesis de que la actividad económica no se distribuye de forma homogénea en la zona metropolitana de Xalapa y, mediante un análisis estadístico multivariado, se demuestra que existen 3 grupos de municipios con características similares, estableciendo la relación entre concentración de actividades en extensiones territoriales, con lo que se concluye que no existe una economía regional sino que la región es desigual y que se puede clasificar en función de la mezcla de variables económicas y territoriales para estudios con enfoque urbano espacial.

**KEYWORDS:** regional economy, urbanometrics, metropolitan area

**PALABRAS CLAVE:** economía regional, urbanometría, zona metropolitana

## 1. INTRODUCTION

Every territory is immersed in the dynamics of urban phenomena which reflect its constant transformation and many of which are linked to the types of spatial concentrations that define its morphology, especially in its peripheral area; Some of these phenomena are Peri-urbanization, Redevelopment, Reconversion of industrial spaces, Appearance of new centralities or financial, commercial or administrative centres, the latter being one of those in the 21st century that has become notorious based on new concentrations

that modify the city dynamics. One of the main dynamics that proceed to these urban transformations is the economic one that manifests the drive for the development each of them and the region have.

Talking about the study of the city is talking about the territory, the geographical space where cities are located. The concept of territory, most often used in the discipline of geography, presents various aspects of analysis such as those related to physical, ecological, social, political, landscape tradition, etc., but the one that has drawn the most attention to the area of urban

planning is the spatial tradition that implies returning into quantitative Geography related to the science of the location and distribution of phenomena on the surface or the science of spatial relationships.

The economy, being linked to the territory, reflects a series of spatial phenomena commonly confused with the term problem, which represents an inaccurate approach when studying cities. Therefore, it is not cautious to make the economic activity problematic knowing that it is heterogeneous and that it is located in different parts of the city, but it is rather necessary to respect these differences and accept that they coexist under certain conditions, that is to say, the real question would be to study the inequality of economic behaviour, avoiding a homogeneity that does not exist, as well as validating the methods and developing processes that allow synthesizing and explaining the urban economic phenomena.

## 2. ECONOMY AND ITS IMPORTANCE IN THE DYNAMICS OF THE REGION

The different cities that shape a region are exposed to changes in the systems that prevail in spatial dynamics. One of the most important refers to economic phenomena since they pose a very close link to the development and growth of cities.

One of the most precise assumptions that helps to understand the way in which the economy affects cities development is the Economic Theory of Development,

TDE hereinafter, whose objective “es desentrañar las causas, los mecanismos y las consecuencias del crecimiento económico de los países” [is to unravel the causes, mechanisms, and the consequences of economic growth of the countries] (Bustelo, 1998, p.19) and, without an exhaustive analysis, it is necessary to consider the way in which the economic system can impact the development of the city.

Summarizing the way the economic system has impacted the transformation of cities, it should be mentioned that capitalism, as a current economic and social system, evolved from a feudal system in medieval Europe where peasants worked for the nobility. Later, around the 16th century, mercantilism emerged as a trade between nations and was precisely the predecessor to the discovery of America. During this period, the owners of the routes had wealth growth, such system was criticized by the Scottish Adam Smith (1776) in his work *The Wealth of Nations*.

Adam Smith (1723-1790) considered that “el crecimiento demográfico, la expansión geográfica internacional y la demanda de la agricultura desembocaban en una ampliación del Mercado” [population growth, international geographical expansion and the demand for agriculture led to an expansion of the market] (Bustelo, 1998, page 46); The increase in labour productivity was then marked by the specialization of workers and the division of labour, which in turn increased the accumulation of capital to generate competition in the market that, in a certain

way, was limited by the geographic issues of cities.

Given the before mentioned, the Englishman Thomas R. Malthus (1766-1834) shared Smith's vision only, glimpsing the population nature of the issue, demonstrated a cause and effect chain as a consequence of progress: "economic growth increases workforce, which increases salaries.(...) The standard of living of workers makes the population grow, by an increase in the birth rate and a decrease in the infant mortality rate" (Bustelo, 1998, p. 48); phenomena that occur today and that apparently have a certain relationship in most cities, but Malthus also managed to visualize a trend in the opposite direction since if the population increased it generated an increase in the labour supply, which made salaries tendency to decline, that is, a relationship between the population and the way of survive.

Malthus's works at the beginning of the 19th century, especially the correlation between overpopulation, social inequality, and economy, ultimately expressed criticism from Marx in his work Capital, considering that Malthus referred to overpopulation in a negative way, Marx maintained that the increase in resources would occur through technological advances.

From a very particular point of view, the communism proposed by Karl Marx (1818-1883) is relevant to this work. Tangentially, he touches on the topic of system, referring to this term because he believed in a fair and utopian system where society owned the factories and raw materials rather than private individuals or private companies.

According to this plan, the State would disappear over time once society eliminated social classes. However, this utopia feared globalization, giant international corporations, the monopolization of production systems that would give power to a few people to exploit the proletariat and in its most serious scenery it would cause revolutions.

These purely economic visions affect the growth of cities directly since the European nations and the United States that adopted capitalism had more advanced economic development than the communist nations under the socialist regime and it is necessary to acknowledge that the equality in the system could not overcome private investment.

Having said the above, and agreeing with what was established by Condway (2014), it is noticeable that the evolution of this capitalist system has prevailed and worked successfully in several countries to generate wealth and, in a matter of confrontation between society and capital, it is appreciated that this system directly impacts the activity of the proletariat, macro and microenterprises, the zoning in the urban structure as well as the distribution of social classes within urban settlements.

The economic system in which cities develop and grow has been of interest to researchers, especially at the end of the 19th century and beginning of the 20th century, which makes us evaluate, support and question the contributions that each of them have made in order to evaluate the relationship between economy and

territory, which is why some are opening methodological bridges to explain what happens with the economic dynamics in cities.

Some more recent studies have shown the importance of urban economics within urban studies; in Italy Camagni (1993, 2004) questions: How are productive and residential activities organized within? and on which elements is the sustainability of urban development based? With which it has developed an innovative perspective on urban sustainability and with a rigorous justification of the need for territorial, regional and urban policies. Authors such as Polése & Rubiera (2004) also suggest that economic development directly impacts current cities and the way in which current dynamics shape the construction of inequalities in regions. Finally, from Brazil, De Moura, Rubiera, Da Silva & Polése (2018), who address agglomeration economies and the way in which the urban economy shapes current cities supported by policies that help mitigate inequality between the territory.

The studies conducted open the panorama to develop the introduction to spatial analysis from the aspect of the impact of economic development to understand the city. Although the territory is possibly indefinable, in order to conduct the analysis, it is delimited to the study of the distribution in Xalapa Metropolitan Area to visualize the inequalities that the economy has in an urban region that is hypothetically equal.

### 3. THE XALAPA METROPOLITAN AREA: CASE STUDY

In 2004, the Secretaría de Desarrollo Social (SEDESOL), the Consejo Nacional de Población (CONAPO) and the Instituto Nacional de Estadística y Geografía (INEGI) published the book *Delimitación de las Zonas Metropolitanas de México*, as a result of joint effort around the definition of the Metropolitan Zones of the country and their territorial delimitation, through the establishment and application of operational criteria to identify the units that comprise them, based on Geostatistical cartography and data from the XII General Census of Population and Housing 2000 (CONAPO SEDESOL INEGI, 2012). In this case only the following municipalities are considered: Xalapa, Tlalnahuayocan, Jilotepec, Emiliano Zapata, Coatepec, Rafael Lucio y Banderilla; this situation is due to the fact the study was carried out since 2010, the year in which Xico and Naolinco did not yet belong to the Metropolitan Zone of Xalapa, and later in 2024, Acajete municipality was added to the Metropolitan Zone. For these reasons, this study is considered a work on the pre-pandemic spatial composition that was structured with the 7 municipalities in 2010 to assess their growth.

The document makes an update in 2015 where the Department of Agrarian, Territorial and Urban Development are joined along with INEGI and CONAPO, present a reference to the importance of the metropolitan phenomenon in Mexico and the challenges it faces, among those that draw attention “ayudar a poner fin a la pobreza y el hambre en todas sus formas y dimensiones; a reducir las desigualdades; promover un crecimiento económico, sostenible, inclusivo y

sostenido” [help put an end to poverty and hunger in all their forms and dimensions; to reduce inequalities; promote economic, sustainable, inclusive and sustained growth] (SEDATU, CONAPO, & INEGI, 2015, p. 13) referred to in the United Nations Conference on Housing and Sustainable Urban Development, better known as Habitat III in which The New Urban Agenda was presented through the Quito Declaration on Sustainable Cities and Human Settlements for All in October 2016.

This inform also mentions the State of the Cities in Latin America and the Caribbean report. Heading towards a new urban transition (UN-Habitat, 2012), the Organization for Economic Cooperation and Development (OECD) conducted the study Redefining “Urban” A New Way to Measure Metropolitan Areas (OECD, 2012), among others.

The important thing is to mention that:

El proceso de urbanización en México, en el que gran parte de la expansión urbana ha sido resultado del crecimiento acelerado de una ciudad central, lo común es que al interior de las metrópolis se establezcan flujos centro-periferia, como resultado del incremento o agudización de la divergencia entre lugares de trabajo y residencia. [The urbanization process in Mexico, in which a large part of the urban expansion has been the result of the accelerated growth of a central city, it is common that centre-periphery flows are established within the metropolises, as a result of the increase or exacerbation of the divergence between places of work and residence] (SEDATU, CONAPO, & INEGI, 2015, p. 21).

The complexity of metropolitan areas comes from the combination of their population size, their territorial scale, the concentration of economic activities, and the fact that political-administrative limits are exceeded, which gives rise to fragmented management. Thus, the substantial issue of the advantages and challenges of the metropolitan area requires an overall vision that goes beyond the decisions of the local governments involved, allowing to define visions, strategies and joint actions that benefit or underpin the advantages and opportunities in each metropolitan area.

Xalapa Metropolitan Area consists of 7 municipalities: Xalapa, Emiliano Zapata, Coatepec, Banderilla, Rafael Lucio, Tlalnelhuayocan and Jilotepec. These municipalities show certain properties depending on their population and their territorial position, since they play different connecting points and functions within the Metropolitan Area.

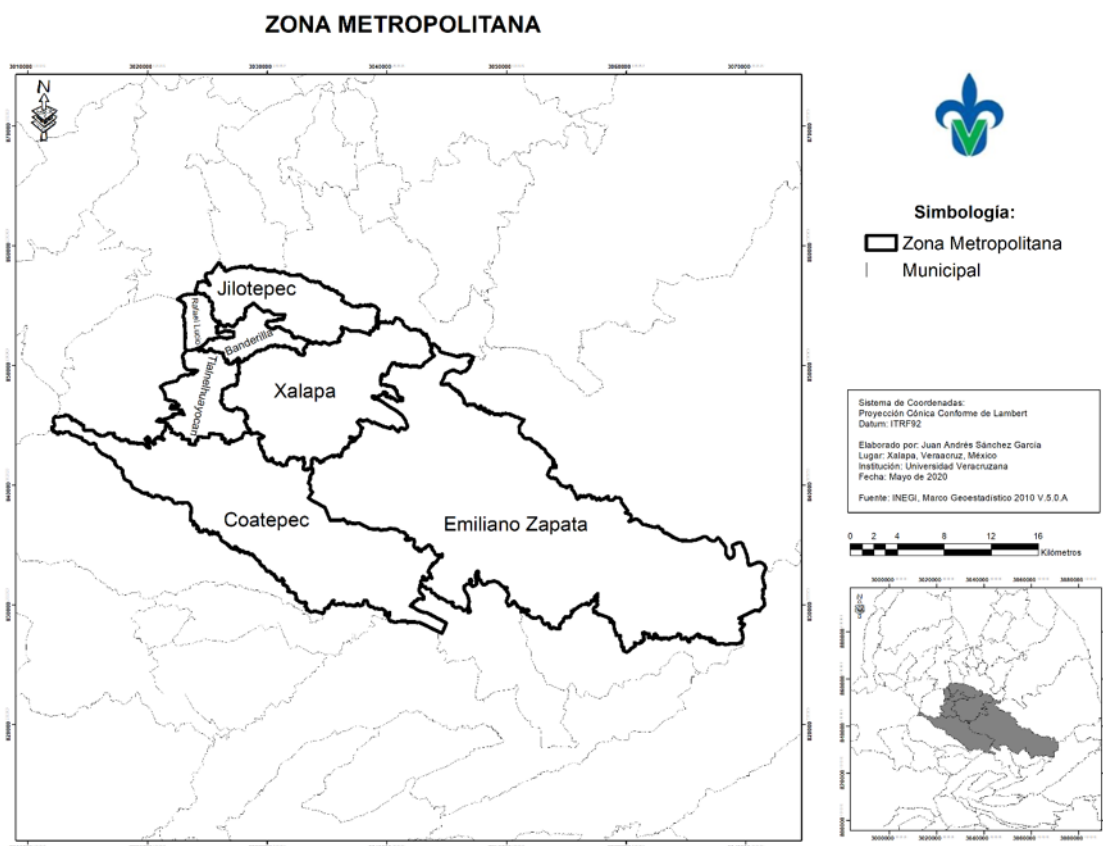
Based on the differences that the municipalities present, it is possible to distinguish at least two discrepancies that make this geographical area heterogeneous, suitable for analyzing its variability. In the first instance there is the territorial aspect, whose conformation and placement within the Metropolitan Zone manifests distinctive characteristics.

What has been said above reflects that the different approaches that the Metropolitan Area includes are a glance at determining that the territory is not homogeneous, but due to position, size, economic function,



among others, it is possible to establish some grouping arguments so that the analysis is based on spatial units that share similar characteristics. In conclusion, 7 municipalities are taken to conduct the study population that, spatially, have a criterion of proximity and that contribute to a better structure and model of the ZMX. Economically Active Population (EAP) by branch of activity in the economic censuses since 2009 provided by the National Institute of Statistics and Geography (INEGI) has been adjusted and, using its own classification of economic activities, has proposed to compare and appreciate the changes that the territory has experienced

Map 1 Territorial population of study: Metropolitan Zone of Xalapa divided into seven municipalities  
Authors 2021, based on geostatistical framework 2020



It is worth mentioning that economic activities are resumed under the taxonomic exercise based on the classification proposed by Nelson (1995), A Service Classification of American Cities, to determine the economic function of a locality. To this end, the classification of the in its predominant economic functions, or to visualize the stability in the same category over a period of time (Aguilar, Gratzbord, & Sánchez Crispín, 1996). The territory presents specific economic characteristics that are directly related

to its spatial setting. For this work, the economic activity variable that determines the function of the city has been taken as a basis along with the economic unit as the observation that is analyzed in the following models. The disaggregation for economic activities aims to “establish a hierarchical set of activities by production processes that can be used to classify statistical units based on their main economic activity” (INEGI, 2010).

Emphasizing the hierarchy of activities, the INEGI states that economic activity “es el conjunto de acciones realizadas por una unidad económica con el propósito de producir o proporcionar bienes y servicios que se intercambian por dinero u otros bienes o servicios” [is the set of actions carried out by an economic unit with the purpose of producing or providing goods and services that are exchanged for money or other goods or services,] while the unit Economic is “el lugar o entidad donde se realizan las Actividades Económicas” [the place or entity where Economic Activities are carried out] (INEGI, 2010).

The heterogeneity of the territory makes it evident that localities do not have affinity with certain economic activities, so it is necessary to reduce the number of observations of this variable to have a concrete and significant model and to discriminate those that may bias the analysis procedures. Economic units determine, to a certain extent, the way in which economic activities impact, to a greater or lesser extent, the development of the territory and its territorial configuration, whereas in some areas a greater quantity of a certain type is concentrated, in other

areas a greater quantity of a certain type is concentrated. Produces dispersion and changes to the predominant activity.

For this study, a data matrix scheme of  $n$  spatial statistical individuals on which  $p$  characteristics or variables are measured is considered. Each of the individuals represents a spatial unit that subsequently expresses  $x_{ij}$  as the measure of characteristic  $j$  on individual  $i$  to generate the rectangular arrangement as follows:

$$\begin{bmatrix} X_{11} & X_{12} & \dots & X_{1p} \\ X_{21} & X_{22} & \dots & X_{2p} \\ \vdots & \vdots & & \vdots \\ X_{i1} & X_{i2} & \dots & X_{ip} \\ \vdots & \vdots & & \vdots \\ X_{n1} & X_{n2} & \dots & X_{np} \end{bmatrix}$$

Gráfico 1 Data Matrix Scheme  
Authors 2021

The economic units are located in the territorial unit of the Basic Geostatistical Area (AGEB), which is “the territorial extension that corresponds to the subdivision of the municipal Geostatistical areas and constitutes the basic unit of the National Geostatistical Framework” (INEGI, 2010), and they are generally divided into urban and rural AGEBS, which creates a particular stratification in the type D territorial units. The Urban AGEBS are:

Un área geográfica ocupada por un conjunto de manzanas perfectamente delimitadas por calles, avenidas, andadores o cualquier otro rasgo de fácil identificación en el terreno y cuyo uso del suelo es principalmente habitacional,



Tabla 1 Data Array Example.  
Authors 2021

Geostatistical Key	Municipality	Retail Trade		Manufacturing industry
3008700010018	Xalapa	9	...	10
3008700010022	Xalapa	25	...	0
3008700010094	Xalapa	9	...	28
⋮	⋮	⋮		⋮
300870135232A	Xalapa	0	...	0

industrial, de servicios, comercial, etcétera, y sólo son asignadas al interior de las localidades urbanas [a geographical area occupied by a set of blocks perfectly delimited by streets, avenues, walkways or any other easily identifiable feature on the land and whose land use is mainly residential, industrial, services, commercial, etc., and are only assigned within the urban localities] (INEGI, 2010 [b], p.8).

areas that are located in the rural part, whose territorial extension is variable and is characterized by agricultural or forestry land use. It contains rural localities and natural extensions such as swamps, lakes, deserts, and others, generally delimited by natural features (rivers, streams, ravines, etc.) and cultural features (railroad tracks, power lines, roads, gaps, trails, pipelines), property limits, etc.) (INEGI, 2010 [b], p. 9).

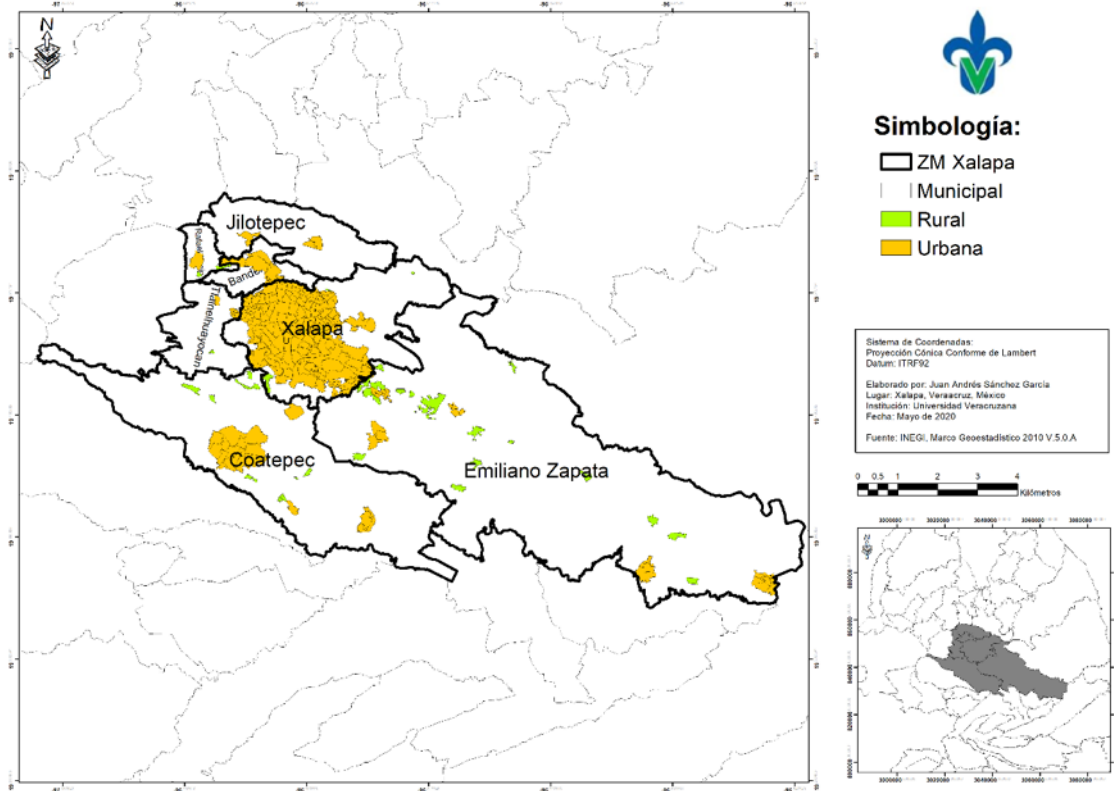
On the other hand, rural AGEB are understood as:

Subdivisión de las áreas geoestadísticas municipales que se ubican en la parte rural, cuya extensión territorial es variable y se caracteriza por el uso del suelo de tipo agropecuario o forestal. Contiene localidades rurales y extensiones naturales como pantanos, lagos, desiertos y otros, delimitada por lo general por rasgos naturales (ríos, arroyos, barrancas, etcétera) y culturales (vías de ferrocarril, líneas de conducción eléctrica, carreteras, brechas, veredas, ductos, límites prediales, etcétera) [subdivision of municipal geostatistical

It is also worth mentioning that for the management of the initial database, a readjustment of the National Geostatistical Framework is made based on the type C territorial units, differentiating between Urban Localities and Rural Localities; The first “son aquellas que tienen una población mayor o igual a 2500 habitantes o que sean cabeceras municipales independientemente del número de habitantes de acuerdo con el II Censo de Población y Vivienda 2005” [are those that have a population greater than or equal to 2,500 inhabitants or that are municipal seats regardless of the number

Map 2 Basic Geostatistical Areas by urban-rural area.  
Authors 2021 based on geostatistical framework 2020

**ÁREAS GEOESTADÍSTICAS BÁSICAS (AGEB)  
POR ÁMBITO URBANO-RURAL**



of inhabitants according to the II Population and Housing Count 2005] (INEGI, 2010 [b], page 10), while the latter “son las que tienen una población menor a 2500 habitantes y no son cabeceras municipales, aceptado por el II Censo 2005” [are those that have a population of less than 2,500 inhabitants and are not municipal seats, accepted by the Second Count 2005] (INEGI, 2010 [b], pag. 11).

The division of AGEBS then allows us to study the geographical space of the different municipalities that belong to the Metropolitan Area of Xalapa as if they were the statistical subjects, but they change

based on the analysis that are generated throughout the work. The statistical subjects are each of the individuals  $i$ , whose characteristics  $j$  are divided into economic variables, so each AGEBS is the  $i$ -th multivariate observation  $X_i = (X_{i1}, X_{i2}, \dots, X_{ip})$  that corresponds to the measurements in the  $p$  variables  $X_1, X_2, \dots, X_p$ , for the  $i$ -th subject.

This statistical approach generates a database arrangement that can provide a spatial inference and give the work a panorama of phenomena, relationships, patterns, or structure of the behavior of the territory at the intra-urban level, which

goes from the statistical (numerical) level to the spatial level (geographic) represented on maps. variabilities are accepted, and the regional imbalance is assumed as an empirical event.

Board 2 Total Territorial Units in the Metropolitan Zone of Xalapa  
Authors 2021 based on DENU 2020

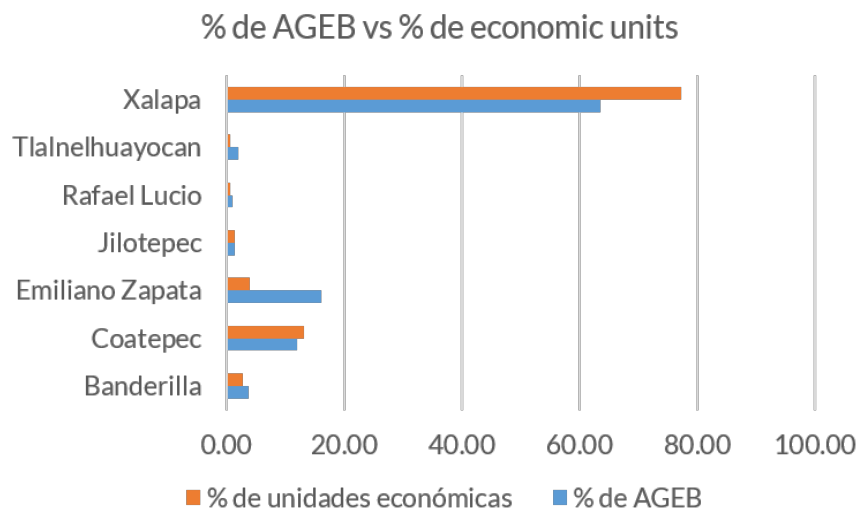
Municipality	Urban AGEB	Rural AGEB	Total by municipality
Banderilla	11	0	11
Coatepec	25	10	35
Emiliano Zapata	18	29	47
Jilotepec	4	0	4
Rafael Lucio	1	2	3
Tlalnahuayocan	5	1	6
Xalapa	182	3	185
<b>TOTAL</b>	<b>246</b>	<b>45</b>	<b>291</b>

#### 4. XALAPA METROPOLITAN AREA CLUSTER THROUGH THE ECONOMIC UNITS AND TERRITORIAL CONFORMATION

The disparity in concentration of territorial units shows, at first instance, a bias in favor of the municipality of Xalapa, so through the construction of the system these

As a second instance, a standardization procedure for data converted to percentages is used to control the bias developed in compliance with the assumptions and that the questions or modeling considered heterogeneity to structure homogeneous or classifying forms of analysis that produce assertions or axioms in a forceful way under the established context.

Grafic 2 Percentage of AGEB vs Percentage of economic units  
Authors 2021 based on INEGI 2020



The following graph shows that Xalapa is the one that concentrates more than  $\frac{3}{4}$  of the total economic activities, so the following graph shows a reference to this percentage regarding the percentage of AGEB by municipality.

Although there is more homogeneity in the percentages of concentration of economic units regarding the percentage of AGEB per municipality, unlike the first comparison between territorial units, the first similarity of concentrations appears in the municipalities, but they are very heterogeneous among themselves.

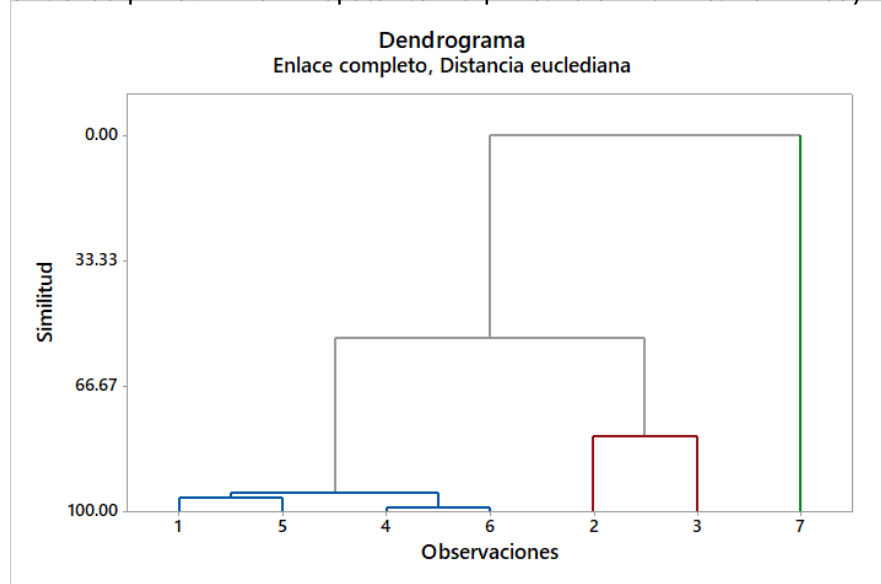
To visualize the similarities or differences between the municipalities, a grouping of municipalities is generated, according to the three variables measured in the exploratory analysis once standardized in percentage, called Cluster or Conglomerate Analysis, which is a "técnica estadística multivariante

que busca agrupar elementos (o variables) tratando de lograr la máxima homogeneidad en cada grupo y la mayor diferencia entre los grupos" [multivariate statistical technique that seeks to group elements (or variables) trying to achieve maximum homogeneity in each group and the greatest difference among the groups] (De la Fuente, 2011, pag. 1), and that tries to "place the cases (individuals) in homogeneous groups, conglomerates or cluster, unknown in advance but suggested by the very essence of the data, so that individuals that might be considered similar are assigned to the same cluster, while different individuals (dissimilar) are located in different clusters" (De la Fuente, 2011, p. 1).

In the dendrogram, based on Euclidean distances, it is shown that at least 90% of similarity is explained in 3 defined groups: one that covers Banderilla, Rafael Lucio, Jilotepec and Tlalnahuayocan; group

Grafic 3 Cluster Analysis Dendrogram by municipality  
Authors 2021 based on INEGI 2020

1. Banderilla 2. Coatepec 3. Emiliano Zapata 4. Jilotepec 5. Rafael Lucio 6. Tlalnahuayocan 7. Xalapa



two defined by Coatepec and Emiliano Zapata and in a third group expressed by the municipality of Xalapa that is totally heterogeneous to all the previous ones.

Group 2 draws attention, whose similarity between Coatepec and Emiliano Zapata lies in the fact that they have a high percentage of territorial extension and a low percentage of AGEB compared to Xalapa.

Jilotepec, Tlalnahuayocan and Rafael Lucio; while group two involves Coatepec and Emiliano Zapata, whereas in group three the municipality of Xalapa stands as different from the others.

It is important to visualize that there is a dependency between the territorial variable and the economic variable measured in the number of spatial concentrations. Therefore, to verify

Tabla 3 Analysis of cluster observations; % AGEB, %EU, %EU, %Territorial Extension. Authors 2021 based on INEGI 2020

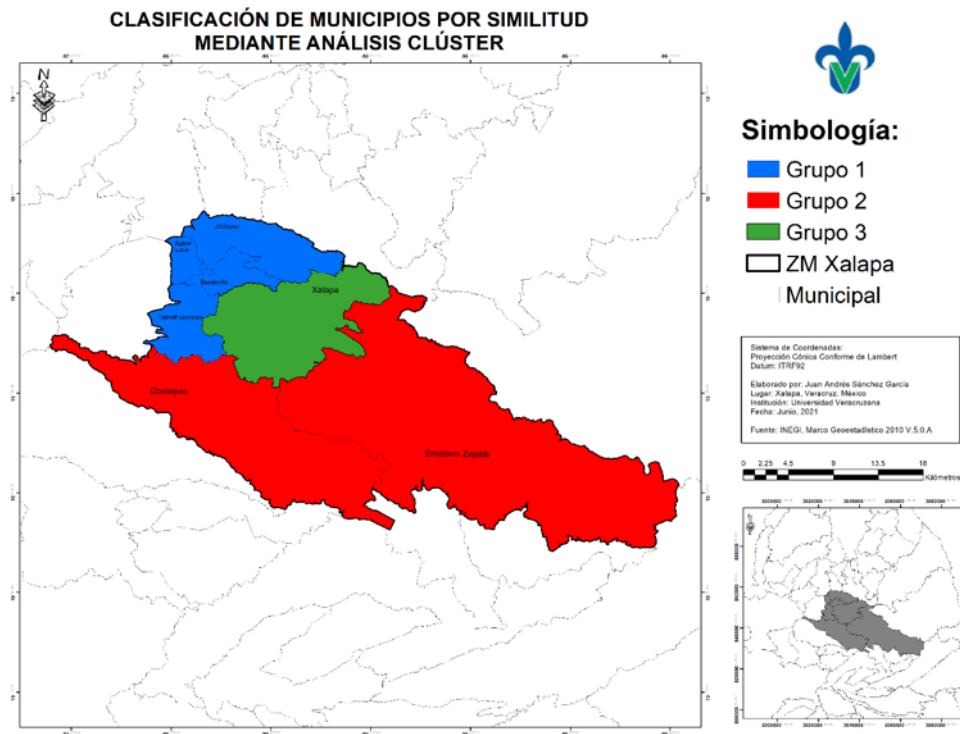
	number of observations	Within the cluster sum of squares	Average distance from centroid	Maximum Centroid Distance
Conglomerate 1	4	27.211	2.509103	2.91540
Conglomerate 2	2	197.208	9.92996	9.92996
Conglomerate 3	1	0.00	0.00	0.00
<b>Centroides por grupo</b>				
<b>Variable</b>	Conglomerate 1	Conglomerate 2	Conglomerate 3	Main Centroide
% AGEB	2.06186	14.0893	63.5739	14.2857
% UE	1.40733	8.4957	77.1813	14.2857
% territorial expansion	3.85409	35.6910	13.2016	14.2857

The results show a clear classification into three groups which are homogeneous within them, but not among the 7 municipalities. Therefore, it is necessary to mention that before looking for a model to explain the behavior, time might not be appropriate to generate one model for each conglomerate and even less so if they are not spatially contiguous or are separated by a different municipality.

With the classification process, the heterogeneity of the ZMX is validated since group one consists of Banderilla,

dependency in these two variables, we proceed to model each of the economic-territorial relationships through of partial hypotheses and make decisions on the type of analysis needed.

Map 3 Classification of municipalities by similarity using cluster analysis  
Authors 2021 based on INEGI 2020



## 5. CONCLUSIONS

Urban planning, as a discipline aimed at configuring spaces and regions in a habitable way, presents a crisis to a certain methodological extent in one of the guidelines for the formation of urban planning, which is quantitative. The various techniques and methodologies that express the urban are diverse; The narratives, the archetypal, the geometries, the compositions, the regenerations, the valuations, among others, start from perspectives of understanding the city from different standpoints but that have lacked of touch on disciplines that contribute too much to urban studies in their techniques or procedures; but not because they are

unnecessary but because of the lack of use of a vocabulary that allows interpreting what is being researched.

In this work it was determined that the ZMX as a whole is not homogeneous in concentration of economic activity, so the principle of region is not met, so 3 subregions of the ZMX are determined, the northern subregion, the center subregion with greater concentration and the southern subregion with greater dispersion and in the process of consolidation.

The term region even applies to each economic activity, a retail trade region, a health region, an educational region, a construction region, an accommodation



region, etcetera, and these distinctions of combinations reflect the diversity of possible scenarios in that a region can be represented and that the complexity becomes greater depending on the variables that are present.

Suggesting the term region of economic concentration is an appropriate way to present the features of the territory through economic activity since it does not make a distinction to its classification but to the density to form areas into strata of higher, medium, and low density.

Using numerology and data through statistical modeling techniques allows the urban planner and the economist to enter an important standpoint, being able to measure everything that involves the territory. The measurement parameter brings the researcher closer to comparison, to the universe of verification, to postulating appropriate magnitudes and above everything to dimensioning everything that happens in the territory. Expressing a phenomenon in the city and in the territory in terms of numbers represents a language barely used by urban researchers but that uses procedures, forms and techniques to determine or evaluate a dimension of urban phenomena.

This opens the way to moving towards hybrid perspectives that help researchers consolidate graphic and numerical processes in the same phenomenon. The presentation of urban metrics issues an entry that helps to question and reflect on the way in which interdisciplinary presents consolidated studies with multidisciplinary arguments and vocabularies in articulation

with contemporary science. This achieves the objective of demonstrating the influence of other disciplines so that big data functions as processes and procedures to express urban phenomena.

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