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**THE COVERAGE OF
URBAN EQUIPMENT IN
PERIPHERAL AREAS OF
THE CITY OF MEXICALI**

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Abstract: The gradual growth of the urban area of the Metropolitan Zone of Mexicali has resulted in the absence of coverage of essential urban facilities in marginal neighborhoods such as the Santa Isabel neighborhood and surrounding areas. This way, an analysis of the existing equipment elements is carried out as well as the identification of the main attributes of provision by radius of influence based on the SEDESOL Regulatory System, where in addition to knowing the deficits in the study area, properties are also selected based on the delimitation of urban reserves with the potential to expand the missing equipment elements based on the guidelines established in the property selection phase of the aforementioned standards. The research required consultation of sources of bibliographic, statistical, cartographic information, regulatory instruments of the main components to be studied: territorial reserves, existence of facilities, infrastructure, population, housing in the area in question. The results are presented through cartographic material resulting from the processing of geospatial assets supported by a Geographic Information System (GIS). Finally, the information obtained will serve the municipal government institutions to strengthen and increase the coverage of equipment of the elements that have a deficit in the area, which makes it possible to remedy the current situation of marginalization and disarticulation with the rest of the urban structure. which is currently evident in the western part of Mexicali.

Keywords: Urban equipment, Regulatory system, GIS, Mexicali.

INTRODUCTION

The City of Mexicali, like many others in Mexico, has experienced a process of urban dispersion as a result of certain specific factors. Its growth is closely linked

to large private real estate projects, and self-construction processes that have gradually taken shape on the immediate periphery of the city, areas characterized by the existence of primary activities and uses that have been disappearing (Barrera et al., 2020). This expansion is accompanied by a series of problems experienced by the country's large metropolises: marginalization, lack of services, infrastructure and urban facilities, dispersion of neighborhoods with respect to the centralities of the city, absence of green areas, violence, insecurity, developments housing translated into small-sized homes with inadequate materials, overcrowding, waste generation, etc.

Thus, within a sustainability framework widely manifested in global agendas: The Future We Want (2012), Agenda 2030 (2015), Habitat III (2016); This research work is oriented towards an evaluation of the basic urban attributes linked to the coverage of services, infrastructure and equipment in marginal neighborhoods of Mexicali. The above is complemented by research such as: Urban Planning for Local Authorities (UN-Habitat, 2014), Basic Index of Prosperous Cities of Mexico (INFONAVIT, 2018), documents that exalt, among several of their objectives: efficient use of land, reorient growth towards more compact city models and combat intra-urban inequalities, among many others.

This work is part of an exercise that seeks, in addition to presenting a diagnosis on the coverage of urban facilities, also to take the step towards the detection of ideal properties that allow expanding the deficits detected for certain elements. Likewise, it provides current data from the most recent Population and Housing Census and the 2020 Geostatistical Framework.

METHODOLOGY

This proposal focuses its analysis on the western part of Mexicali, where a polygon (Study Area) was delimited that covers a total of 55 neighborhoods, classified by the National Population Council (CONAPO, 2020) as one of the most marginal in the city. The study required the consultation of bibliographic, statistical, and cartographic information sources to know the causes, effects, mechanisms, and legal instruments of the main elements to be studied: territorial reserves, existence of facilities, population, housing in the area in question. Through a spatial analysis supported by a Geographic Information System, thematic maps were made using the QGIS tool.3.22.

To understand the coverage of equipment and infrastructure in the area in question and the benefited population, technical manuals published by the defunct Secretariat of Social Development (SEDESOL) and the Secretariat of Agrarian, Territorial and Urban Development (SEDATU) were used with the purpose of identifying the criteria associated with 1) regional and urban location and provision, 2) urban location, 3) site selection and 4) architectural program that specifies the Urban Equipment Regulatory System (SNEU) and the Building Code of Housing (CEV). The above allowed us to know the radius of influence specified in the SNEU of the equipment identified within the analyzed polygon, based on the criteria that define the 4 dimensions mentioned above.

In relation to the existing infrastructure, the information was obtained from the vector data set of the National Institute of Statistics and Geography (INEGI) of the municipal geostatistical framework, complemented with information from the IMIP Mexicali, Building Regulations for Mexicali, Housing Building Code (criteria: conditions, equipment, characteristics, minimum service, etc.) and

field trips. Finally, the population within the proposed study area is 33,631 inhabitants. Likewise, we find 38 Basic Geostatistical Areas (AGEBS) where there are 55 colonies with a total of 948 blocks within the contour, which in total give a population of 33,631. The estimated total number of homes is: 11,265 (See table 1). These data were obtained by consulting the National Housing Inventory that packages the data from the last 2020 Population Census of the INEGI.

ANALYSIS OF THE COVERAGE OF URBAN EQUIPMENT

According to the Urban Equipment Regulatory System (SNEU or Standards) of 1999 and in force to date in Mexico in its 4 dimensions (regional and urban location and provision; urban location; site selection; and architectural program) there are 6 systems of urban equipment: Education and culture, Health and social assistance, Commerce and supply, Communications and transportation, Recreation and sports, and Public administration and urban services.

In relation to the Education and Culture system, the Standards highlight the following as elements of equipment applicable in the urban area: Kindergarten, Preschool Education Preventive Care Center, Child Development Center, Primary School, Work Training Center, General Secondary, Technical Secondary, General High School, Cooperation High School, High School, National College of Technical Professional Education, High School Studies Center, High School Center, Industrial and Services Technology, Technological Institute, Agricultural Technological Institute, State University and National Pedagogical University.

Among the elements that have total, medium or low presence within the study area (ZE) are: Kindergarten, Primary School, General Secondary School, Technical

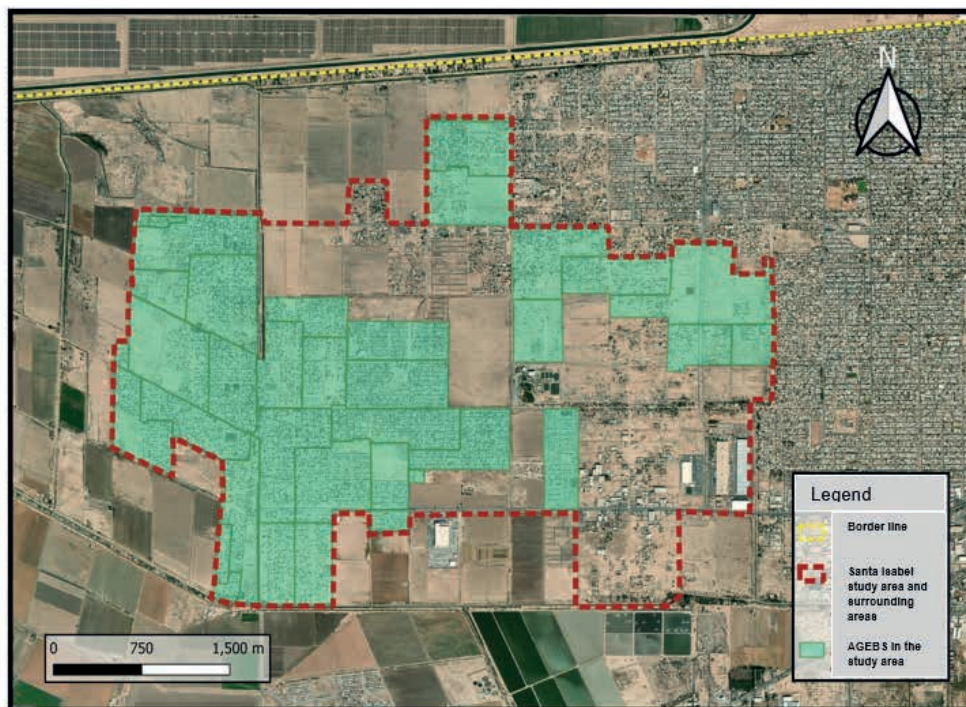


Figure 1: Study area (ZE) located west of Mexicali

Source: Own elaboration based on vector information from INEGI

Colonies						
Centinela	El sauce	El Coloso	El Paraíso	Porvenir	El Colonial	Villas del Sol
Santa Lucía	Santa Lorena	Valle de las Misiones	El Refugio	Nacionalistas	Las Margaritas	Granjas Virreyes
San José	San Carlos	San Clemente	Valle de los Ángeles	Gasca	Villas Galacia	Sol del Amanecer
San Antonio	La Estrella	Municipio Libre	San Jacinto	Sindicalista	Sanchez Taboada	Ejidatarios CCI
Las Reynas	Gabriela Mistral	Los Milagros	Los Viñedos	Los Faisanes	Villas Coahuila	Villas del Campo
Santo Niño	Misión Viejo	Santa Isabel	Haciendas de Zempoala	La Luna	Haciendas Orizaba	Haciendas de Mexicali
Los Olivos	Huertas de la Progreso	Las Magdalenas	Martinez de la Democracia	Las Palmeras	Palmar de Orizaba	Bordo Canal Reforma

Table 1. Colonies within the Study Area (ZE)

Source: Own elaboration based on the vector layer of CONAPO colonies, 2020.

Secondary School, Cecyte, Cetus and State University. In the case of Kindergarten, it was found that the interior coverage is average, since according to the service coverage radii indicated by the SNEU it is 750 meters.

Regarding the Primary School, medium coverage was found, since it has an urban service radius of 500 meters, likewise covering only the same area and leaving another area marginalized without the element. The

General Secondary School has low coverage, since its urban service radius is 1 km. The Technical Secondary School located inside the ZE, has medium coverage, having an urban service radius of 1.5 km that does not cover the neighborhoods that make up the area in question (figure 2). On the other hand, the 2 Cecyte within the ZE have total coverage, since the urban service radius is 10 km and as shown on the map, the entire area is covered.

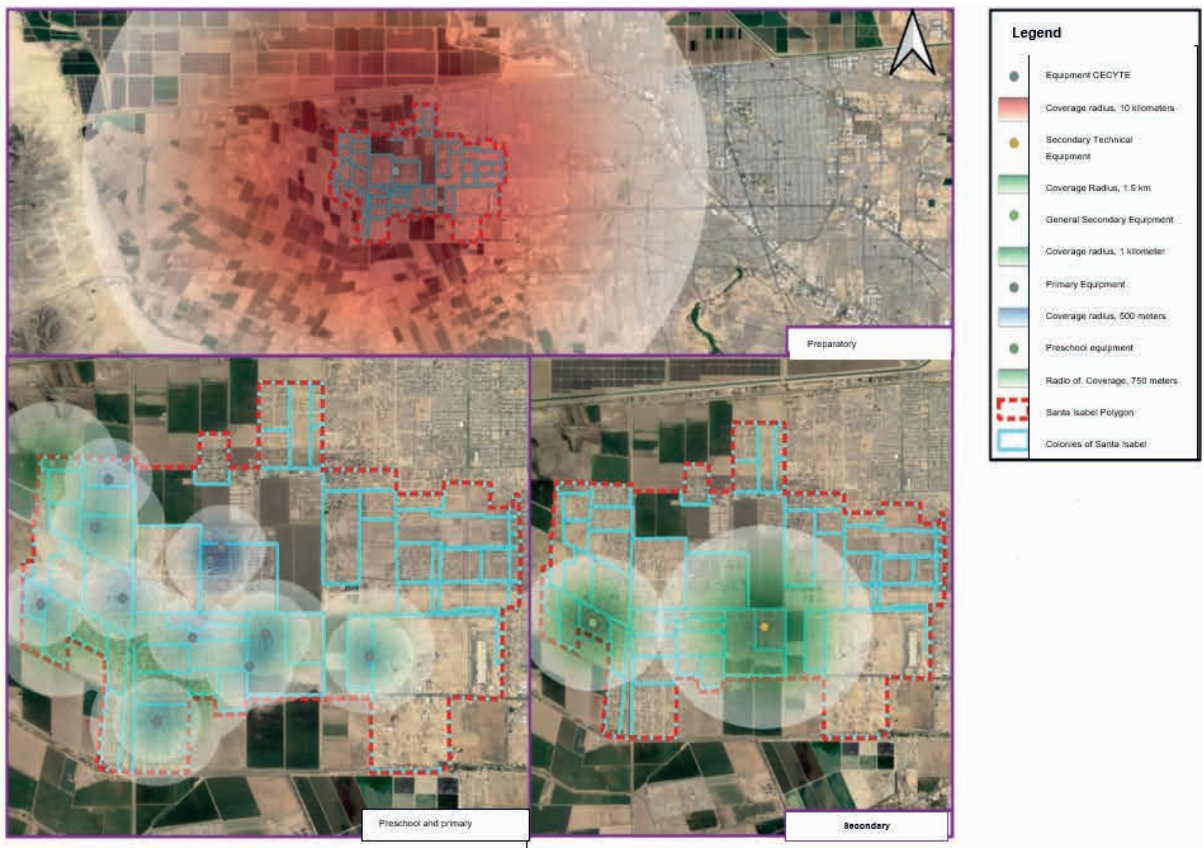


Figure2: Coverage of education subsystem equipment in the ZE
 Source: Own elaboration based on information taken from INEGI 2020.

In the case of the Culture subsystem, the Standards define the following elements as urban: Municipal Public Library, Regional Public Library, State Central Public Library, Local Museum, Regional Museum, Site Museum, House of Culture, Art Museum, Theater, Comprehensive School of Arts, Popular Social Center and Municipal Auditorium. It is important to specify that none of these elements are present within the ZE, but its radius of influence covers the entire population center, that is, the entire city of Mexicali, therefore covering its western part where Santa is located. Isabel and surrounding colonies.

The Health and Social Assistance system defines the following elements within its urban area of administration: Urban Health Center, Health Center with Hospitalization,

General Hospital, Specialty Hospital, Family Medicine Unit, General Hospital, Specialty Hospital, Health Care Unit. Family Medicine, Resolution Module, Family Medicine Clinic, Hospital Clinic, General Hospital and Emergency Center, which have a presence throughout Mexicali, but outside the ZE. In this sense, the elements that are located inside are: Urban Health Center, General Hospital, Emergency Center and Family Medicine Unit.

For the Urban Health Center we found that the interior coverage is average, this according to the radii established by the Standards (1 km urban service radius). On the other hand, those that have full coverage throughout the city and that are outside the study area are the General Hospital, IMSS Hospital, ISSSTE Hospital and Emergency Center; while the Family Medicine Unit has average coverage.

For the Social Assistance subsystem there are the following elements: Crib House, Home for Minors, Home for the Elderly, Child Development Assistance Center, Community Development Center, Rehabilitation Center, Youth Integration Center, Daycare, Wake, Stay of Child Welfare and Development and Wake.

Two elements were detected: a Home for Minors that, within the ZE, has average coverage since the SNEU marks an urban service radius of 2 km (approximately 30 minutes) and a Community Development Center that, in However, it has a low coverage of 700 meters. Those that do have coverage within, but their facilities are not within the ZE, are 1 Child Development Assistance Center, Wake by the IMSS Rehabilitation Center and a Youth Integration Center.

Volume III of the SNEU corresponds to the subsystems: Commerce and Supply. The first is made up of establishments that are responsible for distributing products, among which we find: Multipurpose plaza (whether flea markets or markets on wheels), public market, Conasupo store (which is now Liconsa and Diconsa), commercial store and pharmacies.

Regarding the multiple-use plazas (which in this case are on wheels), three were detected inside the ZE and two nearby, with a service radius of between 700 meters to 1 km, thus providing average coverage. In the case of the public markets, 2 were identified within the polygon, however, there is very low coverage here since it has a service radius of 700 meters that can even extend to 1 km (figure 4).

In relation to the Supply elements we find the following with impact within the ZE: 2 Wholesale Supply Units and 1 warehouse (Liconsa-Diconsa). In both cases for the two elements, the Standards define a service radius that covers the entire City, providing wholesale basic product supply services to the population.

For the Communication and Transportation equipment system, the SNEU frames the following elements: Postal Agency, Comprehensive Service Center, Automated Postal Center, Telegraph Administration, Remote Line Unit, Work Center, Postal Branch, Postal Administration, Telephone or Radio Office, Integrated Services Center, Digital Central and Commercial Office. Based on the analysis and processing of IMIP information, we can identify the following elements with a presence outside the area in question: Digital central (Telnor) where a radius of influence of 12 km is established, which gives almost total coverage to the area. interior of the ZE. In the case of the Work Center element, full coverage was obtained even though its facilities were in the city center since the radius of influence is 20 km (figure 6).

The coverage presented by the 5 km Commercial Office is more predominant in the eastern part of the city municipality, having greater coverage in the western part, decreasing its services, which is where the ZE is located. This way, it only has partial coverage, which means its inhabitants will have problems accessing these institutions and services.

Concerning telegraphic administration, the ZE has total coverage by covering the entire population center or city in accordance with the Standards, this means that it has an excellent telegraphic network, highlighting: Telecomm Telégrafos located in the north and southeast of Mexicali. The Post Office and Post Office branch, according to the SNEU and the analysis obtained through the IMIP, has a coverage of 1 km, so they do not meet the coverage requirements in Santa Isabel and surrounding areas, showing that their inhabitants will have greater difficulty accessing these facilities.

Within this same system we find the Transportation subsystem, which is

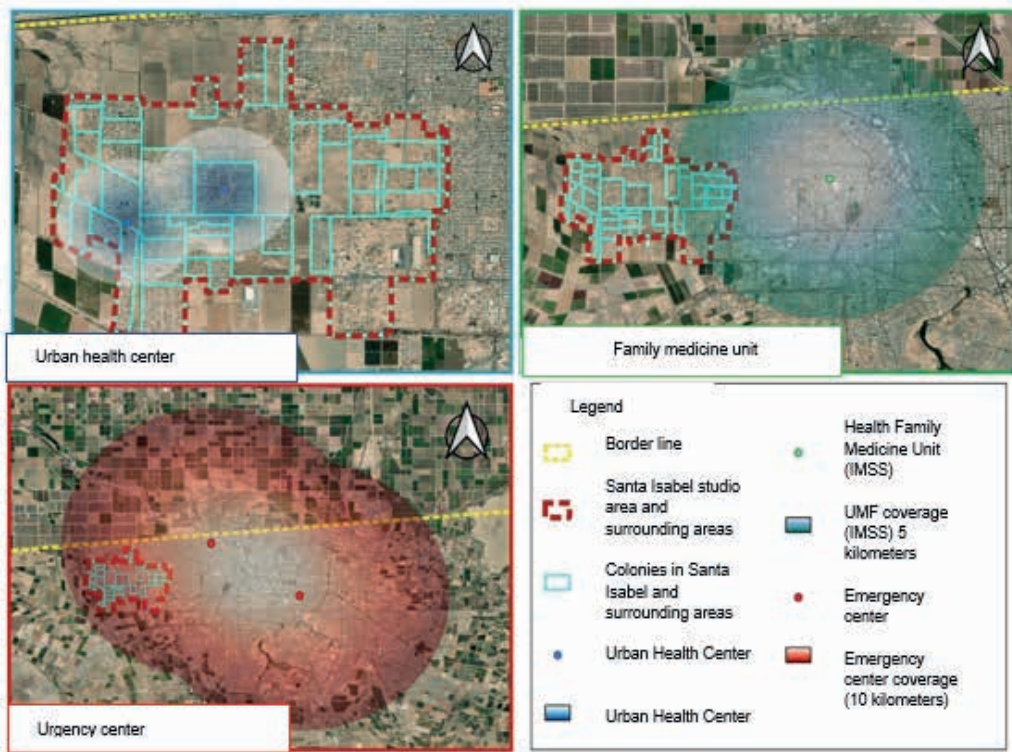


Figure 3: Health subsystem equipment coverage in the ZE

Source: own information based on information from INEGI, SEDESOL and IMIP, 2020

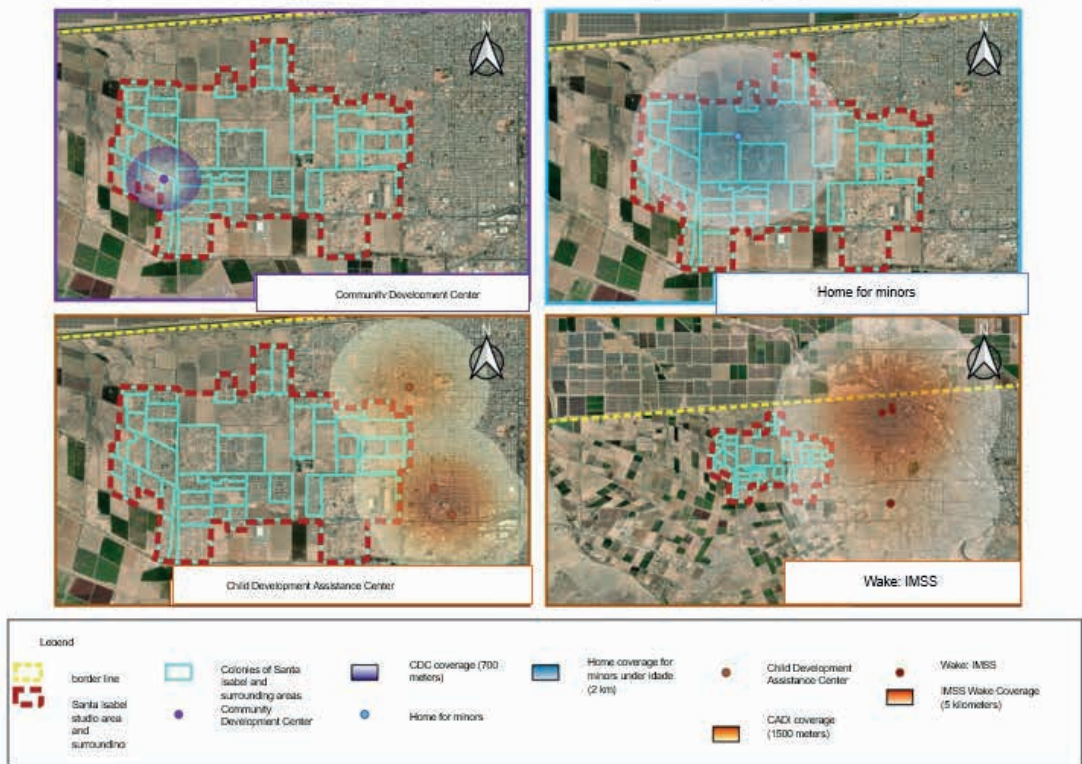


Figure 4: Coverage of social assistance subsystem equipment in the ZE

Source: own information based on information from INEGI, SEDESOL and IMIP, 2020

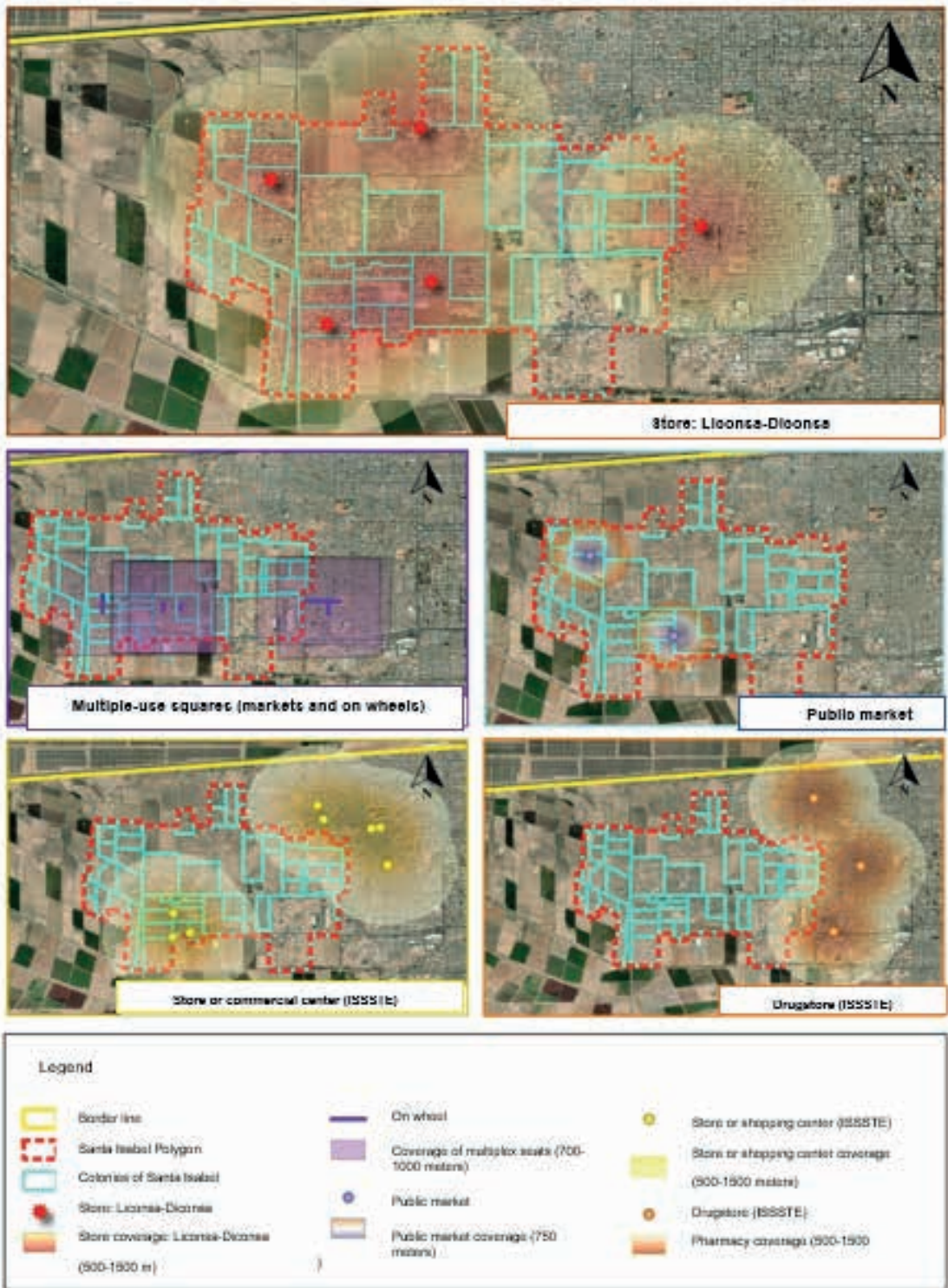


Figure 5: Trade equipment coverage in the ZE

Source: own information based on information from INEGI, SEDESOL and IMIP, 2020

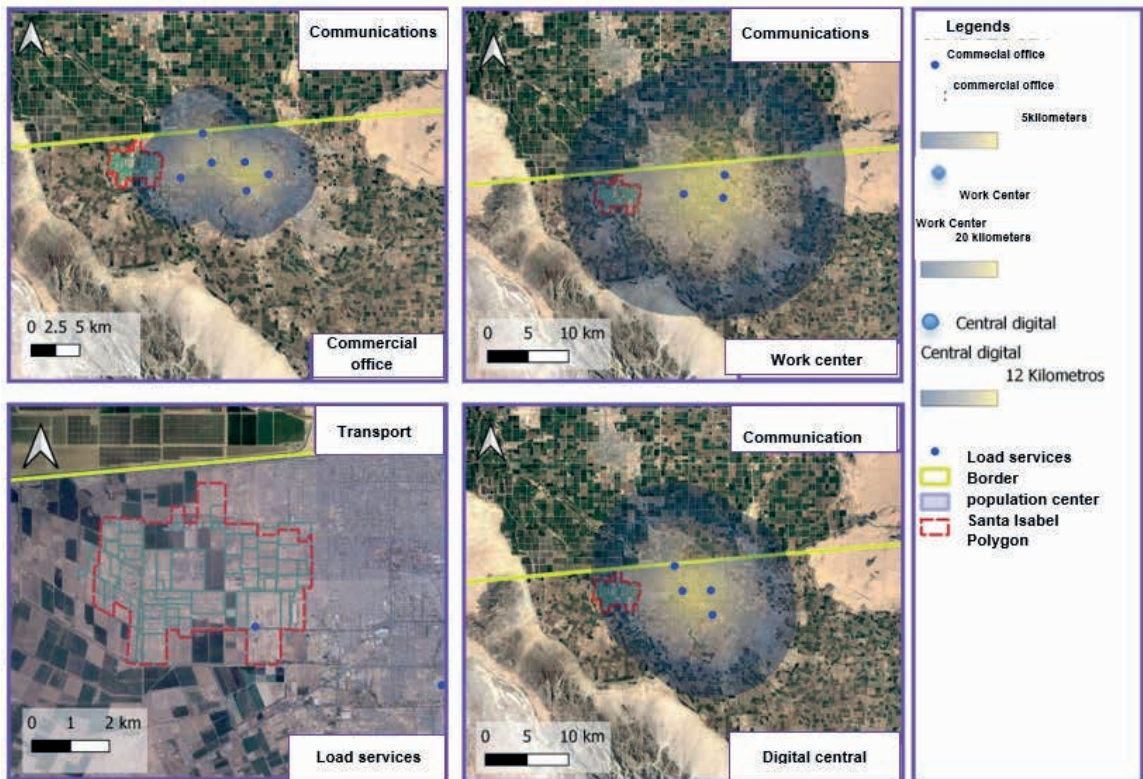


Figure 6: Communication and transportation equipment coverage in the ZE

Source: Own elaboration based on information from INEGI

comprised of: Passenger Bus Central, Airport, Airport, Cargo Services Central. In the City of Mexicali, there are only two elements: Cargo Services Center and Passenger Bus Center and both have a total radius of influence for the population center, so they cover the area in question; There is a cargo services center within the ZE. Outside the City, we also find the Airport, whose service radius has full coverage for the ZE.

Volume V corresponds to the Recreation and Sports System, where we find the following components: Urban Parks, Neighborhood Gardens, Children's Play Areas and Spaces for Sports Shows and for the Sports Subsystem: Sports Centers, Sports Modules and Sports City. When examining children's play spaces, limited coverage in the sector is evident. This is because, according to the radii established by the Standards, the influence of these spaces ranges from 350 to 700 meters, resulting in

little impact on the area. The Neighborhood Gardens also show limited coverage, since their radius of influence is 300 meters. This leads to zero influence of these spaces on the ZE.

Regarding the Sports Modules, a significantly wide coverage stands out, considering a range radius of 750 meters, which could even be extended to 1 km. This area of influence practically covers the entire ZE. In summary, the recreation and sports infrastructure in Santa Isabel and surrounding areas is in line with the Standards in relation to Sports Modules, but there are areas for potential improvement in the expansion of neighborhood gardens and children's play areas to ensure complete coverage and equitable.

In relation to the Public Administration system, the elements that make it up are the following: Government Palace, Local

Legend

- Border limit
- CP-Mexicoall limit
- Marginalization
- Colonies of Santa Isabel
- Equipment
- Neighborhood Garden
- Children games
- Urban park

Heat map neighborhood garden

- Banda 1 (Gray)
- 1.482099
- 0

Heat map (Children games)

- Banda 1 (Gray)
- 1.360801
- 0



Legend

- Border line
- Margination polygon
- Colonies Santa Isabel
- sports equipment
- sports module
- sport Center

Map of heat - Sports module

- Banda 1 (Gray)
- 3.070015
- 0

Map of heat - Sports center

- Banda 1 (Gray)
- 1.01858
- 0

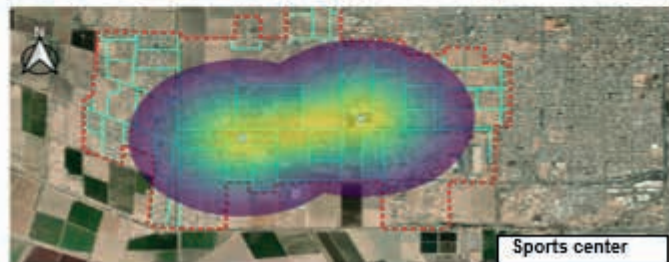
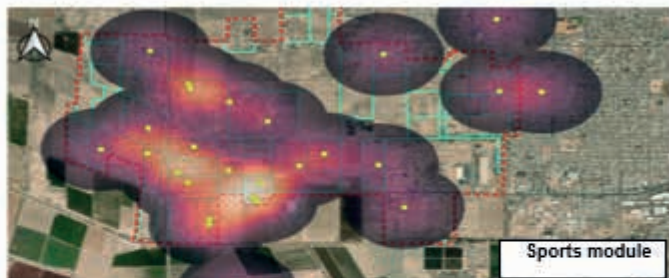


Figure 7: Cobertura de equipamiento subsistemas Recreación y Deporte en la ZE

Source: Own elaboration based on information from INEGI and SEDESOL

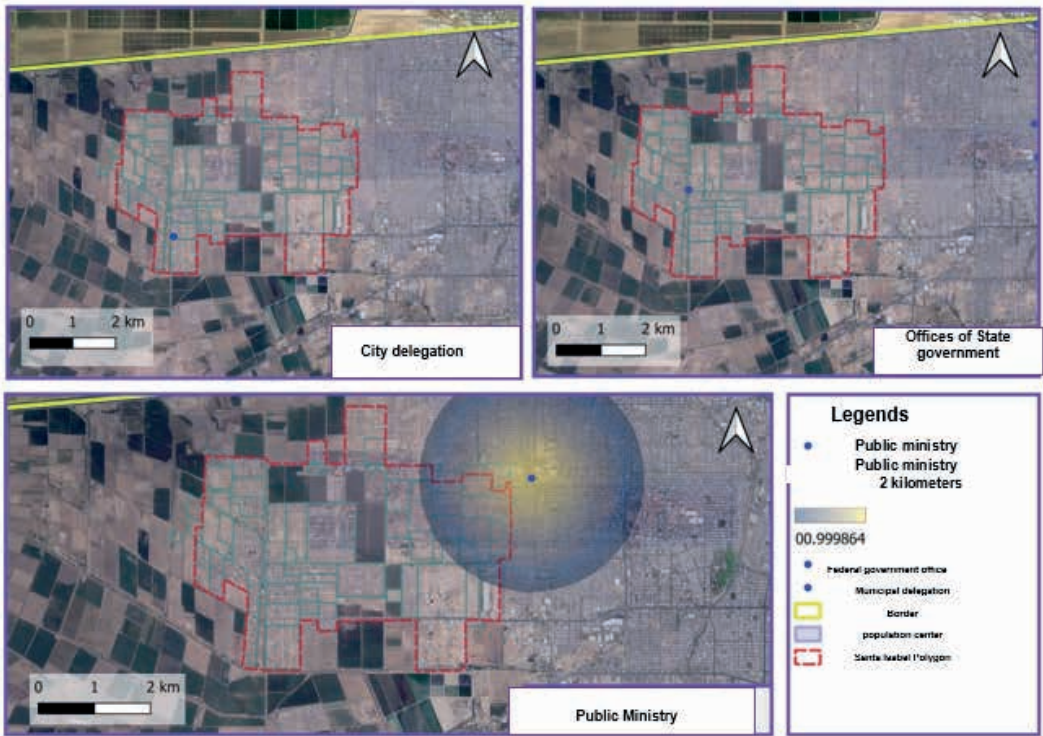


Figure 8: Coverage of Public Administration equipment in the ZE
 Source: Own elaboration based on information from INEGI and SEDESOL

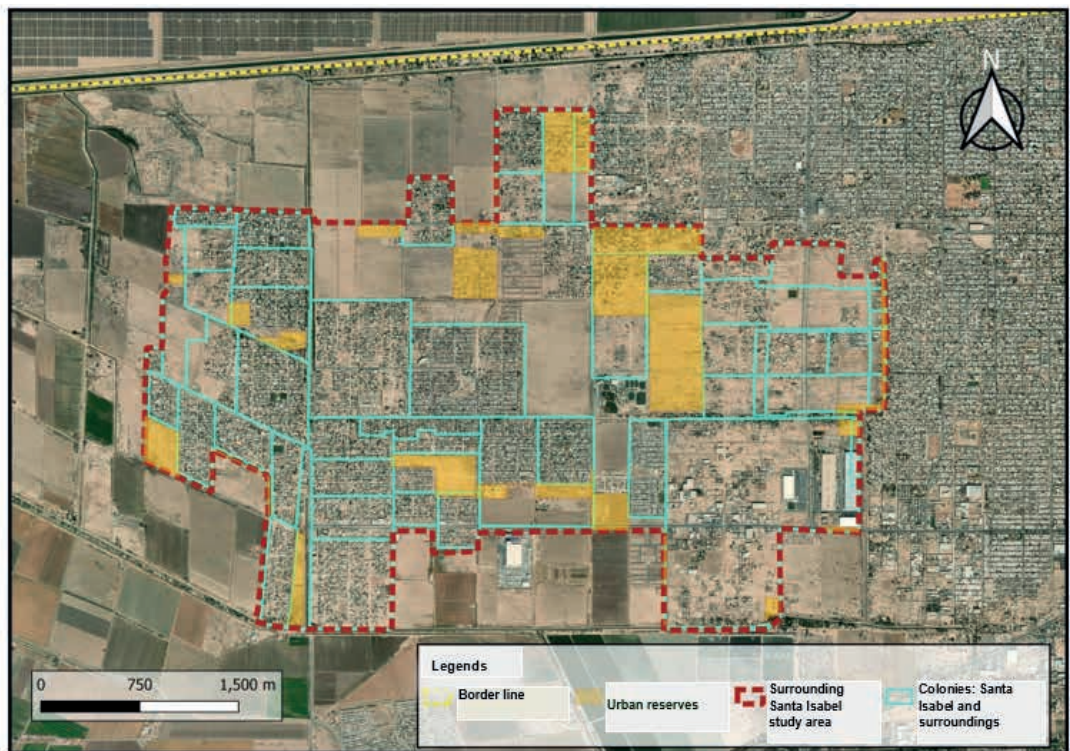


Figure 9: Urban reserves within the ZE
 Source: own elaboration with information taken from the IMIP Mexicali Geovisor (2020)

Tax Collection Administration, Social Rehabilitation Center, State Delegation, Municipal Palace, State Government Palace, State Public Ministry, Guardianship Center for Minors Offenders, Federal Government Offices, Municipal Delegation, State Government Offices, State Courts of Justice, State Legislative Palace.

There is a State Public Ministry, which has a radius of influence of 2 km, having partial coverage of the ZE. The other elements, and specifically, the Municipal Delegation and State Government Offices, even when their radius of influence is the entire City of Mexicali, have an office within the neighborhoods in question, fully covering it. In the other elements, its radius of influence is for the entire city.

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URBAN RESERVES FOR PUBLIC WORKS PROJECTS

Based on the analysis of the coverage of equipment elements in Colonia Santa Isabel and surrounding areas, it was possible to identify the deficits for the different subsystems, which largely shows the high and very high degrees of marginalization according to data from the CONAPO (2020).

To the above, within the proposal for the development of facilities, within the urban reserves that already belong to the municipality, those lands that have drinking water, electrical network, drainage, transportation routes and paving were sought in order to make way for

the lack of equipment and achieve optimal coverage in an efficient manner by having all the services.

With the information from the equipment maps, it is possible to identify that the northeast zone and the northwest zone of the ZE are those that present the greatest deficit in equipment, therefore there are reserves owned by the Trust for the Urban Development of Mexicali that could be taken to carry out equipment projects that complement the existing ones and thus reduce the current shortages of certain elements such as: Daycare, Daycare, Home for the elderly, Command Offices, Agencies and Post Office Branches.

CONCLUSION

Mexicali is a thriving city in industrial, commercial and service terms, which, together with its proximity to the United States, makes it a very dynamic territory with vigorous urban growth. This has given rise to new settlements and colonies that are in the process of consolidation and integration into the urban structure of the City, but the levels of marginalization in the periphery are still visible, as is the case of the analyzed colonies.

In these demarcations there are notable margins of equipment coverage that do have a presence in other areas of the city with medium, high and very high levels. It is very important to address the issue of coverage as part of the same guidelines and goals established in the Development Program of the Population Center of Mexicali 2020-2025, with a view to homogenizing a more balanced development, seeking to favor the spaces of the city with greater delays in terms of infrastructure, services and urban equipment.

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