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ARTICLE

The Communal Roots of Mexico's Maquila Industry: Urbanization, Land, and Inequality in Ciudad Juárez, 1960–2000

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Abstract

This article analyzes the urbanization and privatization of communal lands (ejidos) in Ciudad Juárez, Mexico, via a computer vision model that utilizes Google Street View (GSV) and Geographic Information System (GIS) imagery. Our innovative methodology reveals how processes of ejidal urbanization in Mexico's northern borderlands contributed to the rise of multinational factories (maquiladoras) and geographies of inequality and violence. Past scholarship on the (d)evolution of ejidal land tenure details how periurban ejidal lands throughout Mexico were often sites of impoverishment and a lack of investment, featuring informal settlement and rapid or chaotic urbanization following the country's 1960 urban turn. Through its use of novel sources and methods, this article demonstrates that the urbanization process in Juárez's principal periurban ejidos diverged from this classic model in specific ways. By combining conventional historical sources with visual data like GSV and GIS imagery, Juárez's former and current ejidal landscapes reveal high levels of investment, formal planning, and infrastructure. We argue that Juárez's distinctive physical, political, and economic geographies shaped the overwhelmingly industrial, private, and invested character of the city's (former and current) periurban ejidal lands. This process occurred via a globalized modernization regime that forged disparate landscapes of investment and inequality beginning in the 1950s.

Keywords: ejido; urbanization; maquiladora; Juárez; border area

Resumen

Este artículo analiza la urbanización y privatización de los ejidos de Ciudad Juárez, México, a través de un modelo de visión computarizada que utiliza imágenes derivadas de Google Street View (GSV) y Geographic Information System (GIS). La metodología innovadora de nuestro artículo revela como los procesos únicos de urbanización ejidal en la frontera norte de México contribuyeron al aumento de la industria de maquilas y además a geografías de desigualdad y violencia. Estudios anteriores que se enfocaron en el tema de la descentralización del régimen ejidal han detallado como las tierras ejidales periurbanas fueron frecuentemente sitios de empobrecimiento y falta de inversión, caracterizados por viviendas informales y una urbanización caótica en los años que siguieron al giro urbano del país en 1960. Mediante su uso de fuentes y métodos novedosos, este artículo demuestra que el proceso de urbanización en los ejidos principales periurbanos de Juárez divergió de este modelo clásico académico en maneras específicas. Tras combinar fuentes históricas convencionales

con datos visuales como las imágenes de GSV y GIS, los paisajes ejidales pasados y presentes revelan altos niveles de inversión, planeación formal e infraestructura. Argumentamos aquí que las distintas geografías físicas, políticas y económicas de Juárez influyeron en formar el carácter altamente industrial, privado e invertido de las tierras ejidales periurbanas (pasados y presentes) de la ciudad juarense. Este proceso ocurrió a través de un régimen de modernización globalizado el cual forjó paisajes disparos de inversión y desigualdad principiando en los años cincuenta.

Palabras clave: ejido; urbanización; maquiladora; Juárez; zona fronteriza

The evolution of communal land use provides vital insight into diverse processes of urbanization and industrialization in Mexico. The ejido, paragon of communal land tenure in Mexico during the twentieth century, represents a particularly insightful subject of analysis for researchers. Recent decades' scholarship on ejidal development reveals that the ejido's economic, legal, and cultural position in Mexican society resulted in urbanization patterns that often deviated from non-ejidal lands. The northern Mexican borderlands are illustrative of this phenomenon. In the state of Chihuahua during and after the Mexican Revolution (1910–1917), nationalized lands and natural resources were redistributed by the federal government in the form of inalienable agrarian grants. The ejido system soon came to dominate Chihuahuan and other state landscapes (Figure 1). As the century progressed, the intrinsically rural ejido increasingly abutted or was incorporated into burgeoning urban spaces, becoming "the most important source of land for development in Mexican cities" (Lombard 2016, 2703). In Ciudad Juárez, Chihuahua's most populated city, located on the US-Mexico border, ejidal development was influenced by political, economic, and spatial factors particular to its borderlands geography. The distribution of industry and investment in the city's formerly peripheral ejidal lands reveals both the complexity of ejidal urbanization processes in Mexico and how changes to communal land use shaped incipient borderlands industrialization.

Recent technologies provide scholars with novel tools to analyze established research subjects anew, and ejidal urbanization is no exception. In particular, the use of visual data and artificial intelligence allows us to construct innovative arguments that complicate our existing understanding of periurban and urban built environments, arguments formerly obscured by conventional sources. Ciudad Juárez, inhabiting vital borderlands space, represents an ideal case study. This article utilizes Google Street View (GSV) imagery beginning in 2007 and Geographic Information System (GIS) satellite imagery originating in the 1970s to provide visual evidence of industrialization and investment trends in Juárez, trends whose origins can be traced via conventional sources to postwar decades. Some of the conventional sources we use to historicize and analyze the GSV and GIS imagery are Mexico's official state journal, borderlands newspapers, and Juárez census data. Our methodology reveals how ejidal urbanization in borderlands Juárez diverged from ejidal urbanization patterns in interior Mexican cities.

The key to our multidisciplinary methodology is its use of machine learning to read tens of thousands of GSV images. A diverse team of researchers and research assistants examined thousands of images to identify visual markers of capital investment. Markers included such factors as the conditions of buildings and public infrastructure (e.g., paved or dirt roads). The team then selected more than eight hundred GSV images that they agreed conformed to the following three categories: "invested," "neutral," and "impoverished." This subset of images was fed into a state-of-the-art computer vision model for training, a process in which the model learns to recognize visual patterns that exist in a set of images. The model then built "invested," "neutral," and "impoverished" classes that could be compared to new sets of GSV images. The trained model, when fed a new GSV image, returned a measure of confidence (expressed in percentages) that

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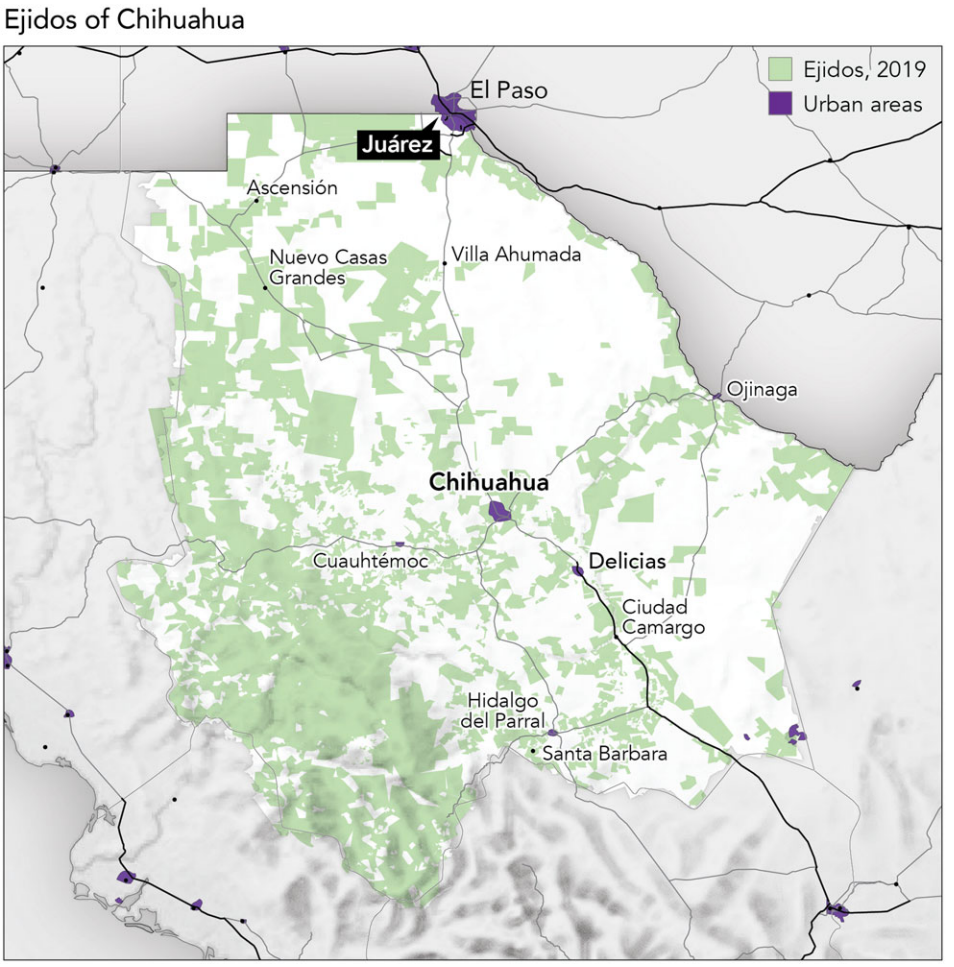

Figure 1. Ejidos of Chihuahua. Sources: Open Street Map; Natural Earth Data; Registro Agrario Nacional. Credit: Erik Steiner.

"tagged" the image to a certain category. In other words, the model uses visual patterns it recognizes from the images selected by our team via close reading to classify new images, approximating how close they are to our examples (for a broader discussion of the process and evaluation of results using this computer vision model, see Barleta et al. 2020).

Conscious of the method's limitations (as well as the complexity of the subject), our research team adopted several conservative measures to ensure the integrity of our analysis. First, we kept classes simple and did not use the model to identify "nuances." Second, we visually inspected samples of the tags predicted by the artificial intelligence model (which is standard practice in the field.) Third, we discarded all images with tags lacking very high confidence scores (greater than 85 percent). Fourth, we analyzed the resulting data by identifying large patterns that were difficult to detect in single observations. The fact that the resulting patterns emerged when we plotted the points on a map, and are consistent with the literature on the subject, is a strong indication of the reliability of the results. Finally, the data set was analyzed in conjunction with archival and historical sources that allowed us to corroborate patterns and, most importantly, propose an interpretation. We derived no causal explanation from the quantitative methods alone.

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Our innovative methodology is vital to exposing previously unseen patterns of development in Juárez as well as to complicating the study of ejidal urbanization. In general, current scholarship presents the urbanization of Mexico's ejidal lands in the following typical pattern: ejidos on the periphery of urban areas (periurban) were often sites of informal settlement, rapid and chaotic urbanization, and a lack of infrastructure and investment in the decades following Mexico's 1960 urban turn (Salazar, Reis, and Varley 2022; Barleta et al. 2020; Schumacher et al. 2019; Lombard 2016; Parramond 2008; Jones and Ward 1998). Following this classic model, inalienable yet invaded ejidal lands were increasingly expropriated by the state beginning in the 1970s to regularize existing migrant settlements and facilitate new public works projects (for more on the history of the ejido and land tenure regularization in Mexico in the latter half of the twentieth century, see Appendini 2001; Azuela and Duhau 1998; Durand 1983). Often, this resulted in the creation of periurban landscapes characterized by impoverishment and sprawl. This informal urbanization process, sanctioned by a corporatist state determined to maintain economic growth and social order, circumvented the ejido's protected legal status ((Lombard 2016, 2704–2705). Changes to ejidal lands in Juárez, however, deviated from this formula in specific ways. After 1960, local, regional, and transnational elites primarily drove the urbanization of the city's ejidal lands, not rural-to-urban migrants in informal settlements. These actors forged a modernization regime that privatized periurban ejidal lands and waters for the principal benefit of private industrial parks and foreign-owned factories (maquiladoras).[1] The result: current and former ejidal lands within Juárez's urban boundaries often demonstrate high levels of investment, infrastructure, and planning, outcomes that diverge from the classic ejidal urbanization model in Mexico.

This article, as a result, explores the origins of private industrial parks in communal agrarian lands and the distribution of investment in Juárez by combining spatial and historical methodologies. For this particular study, the city's residential street network was sampled to obtain twenty thousand random points with a minimum distance of twenty-five meters between points. A GSV image was downloaded for each point, but given GSV limitations, only 11,620 points were matched with a street-level image. Images were then processed via our computer vision model that tagged images into "invested," "impoverished," or "neutral" categories. Only GSV images tagged with greater than or equal to 85 percent confidence were considered for the current analysis.

The Ejido and the City

The ejido was one of the "most extraordinary social compromises" to emerge from the Mexican Revolution (Ginzberg 2019, 552). This modern iteration of communal land tenure, modeled on indigenous customs, redistributed nationalized natural resources to rural peasants beginning in the 1910s. Born of radical land reform ideology and enshrined in Mexico's 1917 Constitution, the ejido conferred usage rights, not ownership, to its members (*ejidatarios*). Despite its social objectives and radical pedigree, the ejido system often reinforced *ejidatarios*' cultural and economic differences (Rosemblatt 2018). The redistribution of nationalized lands and waters via ejidal grants intensified during President Lázaro Cárdenas's term (1934–1940). New federal bureaucracies administered these grants as well as agrarian credit, transforming *ejidatarios* into clients of the state. Cárdenas, under pressure from rising population rates and rightist movements, abandoned

[1] Scholars have demonstrated that periurban ejidal lands were urbanized and privatized throughout Mexico after World War II, often by US interests, for the benefit of tourism and housing subdivisions. For examples, see González Luna and Vázquez Toriz (2016) and Varley (1985). However, the processes of urbanization and privatization in Juárez's periurban ejidal lands differed largely because of the singular concentration of private investment, industry, and foreign manufacturing after 1960.

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his more radical, domestic-focused agenda by the end of his administration. In doing so, he inaugurated Mexico's conservative turn and ensuing embrace of Mexican-US cooperation, economic expansion, and rural modernization.

A major consequence of Mexico's 1940 conservative turn was the escalation of ejidal land invasion by private interests, migrants, landless peasants, and fellow *ejidatarios*. Legal restrictions proscribing the sale of national lands and waters and the private consolidation of land were eased following World War II (Aboites 2019, 1169). After Mexico's 1960 urban turn, the vulnerability of periurban communal lands made them favored targets for migrant settlers and new public works projects, leading to a rise in ejidal expropriations in the 1970s. A series of constitutional reforms enacted by President Carlos Salinas beginning in 1991 legalized the sale and rental of ejidal lands, formalizing processes that had occurred unlawfully throughout Mexico for decades (Jones and Ward 1998, 77–78).

Ejidal urbanization played a pivotal role in the development of Ciudad Juárez, a northern borderland metropolis with a rich agricultural past. After the Mexican-American War ended in 1848, the Mexican settlement of El Paso del Norte was divided by a new international border limited by the Rio Grande (or Río Bravo in Mexico) in the north and east and the mountainous desert to the city's west and south. The city, inhabiting vital geographical, political, and economic space, served as a main hub for US-Mexican trade, transportation, and migration beginning in the late nineteenth century (García 1981). In 1888 the city was renamed in honor of the former Mexican president and historical benefactor of local agrarian communities Benito Juárez. In fact, President Juárez's 1860s grant of irrigable land to the agricultural community of Senecú, to the east of El Paso del Norte, was key to the city's expansion. It effectively created an interstitial space between town and country that oriented future urban development eastward and along the river (Santiago Quijada 2011, 71–72, 121). As Figure 2 demonstrates, the pueblo of Senecú abutted the river and international border to the east of Juárez's urban core, occupying riparian lands used largely for growing cotton.

The rapid growth of industrialization, population, and migration in Mexico after 1940 inaugurated a dynamic era of urbanization in Juárez. In the 1960s the federal government initiated two pivotal programs: the Programa Nacional Fronterizo (National Border Program, PRONAF) in 1961 and the Border Industrialization Program (BIP) in 1965. These projects sought to increase economic activity in Mexico's northern borderlands. PRONAF developed infrastructure and services near ports of entry to attract US investors and tourists. US investment, often in the tourist sector, had been a transformative economic and cultural force in Mexico since the early twentieth century (Velázquez García and Balslev Clausen 2020). BIP, limited to the northern Mexican borderlands, created a free trade zone that enticed foreign manufacturers to relocate to borderlands industrial parks (Mize 2008, 143). BIP sought to mitigate the termination of the Bracero Program (1942–1964), a series of guest labor accords that encouraged millions of rural Mexicans to migrate north to the United States. Former braceros amassed at Mexico's northern border would, in theory, acquire jobs in domestic infrastructure projects and US-owned maquilas (de la O 2007, 32). Contrary to BIP and PRONAF's original intent, however, Juárez's maquila workforce was soon dominated by women, reflecting the burgeoning national trends of domestic female migration, the feminization of domestic low-wage labor, and mass undocumented male labor migration to the United States after 1965 (Durand 1994, 237–238).

At first glance, the urbanization of Juárez's ejidal lands in the northern borderlands reflects similar trends observed in other major cities in Mexico's interior. Urbanization and land development in Juárez were politicized processes influenced more by the partisan and economic interests of dominant political groups than the technical policies of public planners (Llera Pacheco 2000, 64–65). Given the importance of cities in general—and borderlands cities in particular—to Mexico's post-1940 economic growth, both land use

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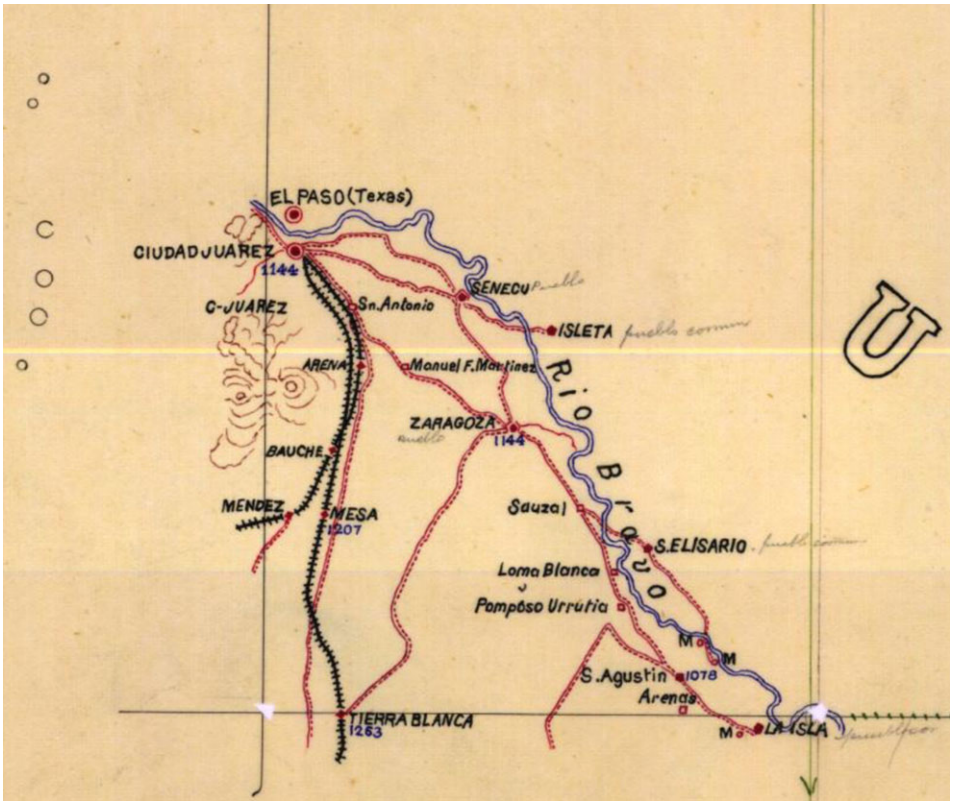

Figure 2. Undated, early-twentieth-century map. Credit: Mapoteca Manuel Orozco y Berra (accessed at https://linealist.wordpress.com/2016/09/19/paso-del-norte/).

and urban development in Juárez and other major metro areas reflected the priorities of the party that dominated politics nationally until the year 2000, the Institutional Revolutionary Party (PRI). Consequently, the development of Juárez's main periurban ejidos—Senecú, Zaragoza, and Salvárcar—reflected national trends. Located in modern Juárez's eastern sector, all in proximity to the Rio Grande, these ejidos occupied the former liminal space on the eastern outskirts of the city's historic urban core.[2]

The evolution of the Juárez ejido of Zaragoza, for example, parallels trends documented in periurban ejidos in Guadalajara, Mexico's third-largest metropolitan area and a classic model of informal ejidal urbanization (note the location of Zaragoza in Figure 2). Like the periurban ejido Santa Maria Tepetitlán and others in Guadalajara, Zaragoza's initial ejido petition occurred in the 1920s, with an augmentation of ejidal hectarage taking place around midcentury. Shortly thereafter, an initial period of regularization of informal settlement through federal expropriation began in the 1970s, followed by substantial deregulation beginning in the early 1990s resulting from Salinas's reforms (Barleta et al. 2020; Jones and Ward 1998).[3] As early as 1976 and through to the 1990s, then, the expropriation of ostensibly agrarian and inalienable ejidal lands occurred in Juárez, as in Guadalajara, to assist in the city's "regular and planned growth."[4] The state's rationale of

[2] Antonio Rebolledo, "Ejidos, una especie en extinción aquí," *El Diario*, June 2, 2013.

[3] "Decreto por el que se expropia por causa de utilidad pública una superficie de 26-99-32 hectáreas de riego de uso común, de terrenos del ejido Zaragoza, Municipio de Juárez, Chih.," *Diario Oficial de la Federación*, February 2, 1999.

[4] "Decreto."

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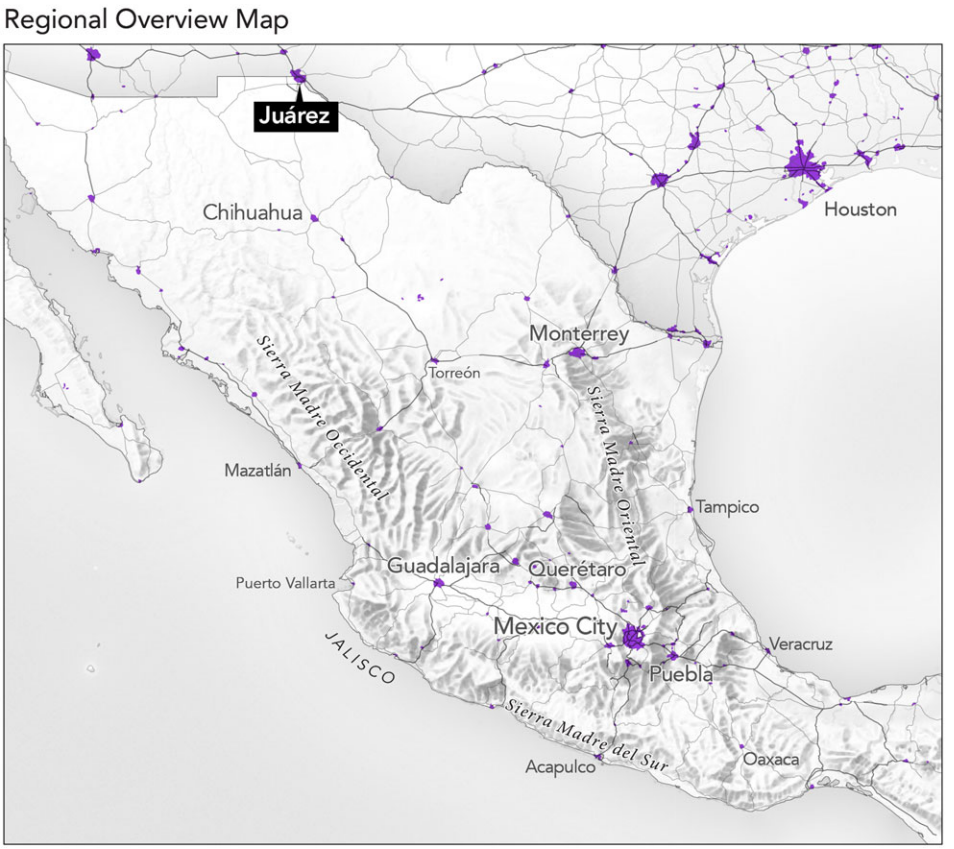

Figure 3. Regional overview map. Sources: Open Street Map; Natural Earth Data. Credit: Erik Steiner.

regularization was applied nationwide for periurban ejidal expropriations, not only in Juárez and Guadalajara (western Mexico) but also in major cities like Santiago de Querétaro (central Mexico) (Figure 3).

Similar to Juárez and Guadalajara, ejidal lands in the city of Querétaro experienced a dramatic change in the latter half of the twentieth century. In 1970 agriculture dominated both the economy and land tenure regime of the municipality of Querétaro.[5] However, informal settlements on the city's periphery, established chiefly on periurban ejidal lands, proliferated beginning in the 1970s, a trend that directly informed the city's urbanization and expansion of its city limits (Jorge Chavarría Bravo and Martha Sánchez A, qtd. in Icazuriaga Montes 1994, 447). In the ensuing decades, Querétaro's agricultural and ejidal lands were gradually subdivided for private and public housing due, in large part, to the intensification of rural-to-urban migration and industrialization. From 1960 to 1970, industrial parks were introduced into the municipality. After 1990s reforms the expropriation of lands in periurban ejidos like Santa Rosa Jáuregui was driven by urban public works projects, the regularization of existing informal settlements, and public municipal developments like sports fields and parks.[6]

[5] Section titled "Economía," subsection "Agricultura," Poder Ejecutivo del Estado de Querétaro. https://www.queretaro.gob.mx/municipios.aspx?q=RrRbGx+QAUgDLhK1VcwWPw==.

[6] "Decreto por el que se expropia por causa de utilidad pública una superficie de 18-02-31.77 hectáreas de agostadero de uso común, de terrenos del ejido Santa Rosa Jáuregui, Municipio de Querétaro, Qto.," *Diario Oficial de la Federación*, December 13, 1999.

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Figure 4. GSV image, 2010–2019. Eastern Ciudad Juárez. Source: Google Street View.

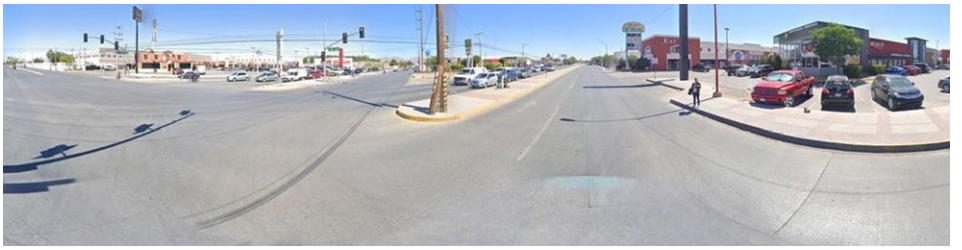

Figure 5. GSV image, 2010–2019. Eastern Ciudad Juárez. Source: Google Street View.

Figure 6. GSV image, 2010–2019. Ciudad Juárez city center. Source: Google Street View.

While aspects of the evolution of ejidal land use in Juárez paralleled patterns in interior Mexican cities like Guadalajara and Querétaro, the urbanization of communal lands in this key borderlands city diverged in crucial ways. Visual analyses of periurban ejidal landscapes in Juárez confirm this. GSV imagery illustrates that former and current ejidal lands within Juárez's urban limits often demonstrate high levels of investment, infrastructure, and planning. Figure 4 is a random sample of an image taken from a residential location in the city's formerly periurban, agrarian eastern sector near the former ejidal lands of Zaragoza.[7] Figure 5 represents another random sample from the city's eastern sector, a public intersection located on lands comprising or abutting the former ejido of Senecú. These images represent examples tagged as "invested" by our computer vision model: paved roads and sidewalks, the presence of utilities, and appearance of formal planning. Conversely, Figures 6 and 7 depict urban landscapes the model identified as "impoverished": unpaved or crumbling roads and/or sidewalks, vacant lots, graffiti, informality, and/or a lack of privacy. These random samples were taken from

[7] All GSV images have been cropped to protect privacy and preserve copyright. Single GSV images featured in the following figures are meant to highlight our computer vision model and are not intended for individual analysis.

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Figure 7. GSV image, 2010–2019. Southwestern Ciudad Juárez. Source: Google Street View.

Figure 8. GSV image, 2010–2019. Southeastern Guadalajara. Source: Google Street View.

Figure 9. GSV image, 2010–2019. Southeastern Guadalajara. Source: Google Street View.

non-ejidal lands in Juárez's western sector, namely the city's historic center (Figure 6) and current southwest (Figure 7). The GSV images depicted in Figures 4 through 7 date from 2010 to 2019.

In the case of periurban and urban ejidal lands in Guadalajara, GSV images often display the opposite scenario of Juárez's former ejidal lands: distressed landscapes, a lack of investment and infrastructure, haphazard planning, and impoverishment. Figures 8 and 9 show sample GSV images tagged as impoverished from Guadalajara. In the case of Querétaro, after 1960, periurban ejidal lands were often sites of regularized informal housing, public works projects, and public spaces. Figures 10 and 11 show sample GSV images from former ejidal lands in Querétaro. Ultimately, national and municipal data reveal that significant portions of Juárez's former and current ejidal lands, unlike those in interior Mexican metropolitan areas, are composed of or adjacent to private industrial parks containing multinational maquiladoras, as well as private subdivisions featuring high levels of investment and income, and fewer public spaces (IMIP 2014). GSV and GIS data and conventional sources demonstrate that ejidal lands in Juárez were privatized in a more systematic and quasi-official process, one that disproportionately benefited local elites, private US industry, and private residential subdivisions.

The process of ejidal urbanization in Juárez deviated from other examples observed in Mexico due largely to the city's political, economic, and spatial geographies. With

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Figure 10. GSV image, 2016. Northern Querétaro. Source: Google Street View.

Figure 11. GSV image, 2016. Northern Querétaro. Source: Google Street View.

development dictated by mayors whose power resided in city councils dominated by a single party (often the PRI), land investors formed networks with politicians and not urban planners (Llera Pacheco 2000, 65). Moreover, local political bosses, land developers, and businessmen were often the same people, with close ties to Mexican heads of state and US industrialists (Vázquez Ruiz 2004, 106). A regime of development via private initiative and binational free trade—encouraged by the state and predicated, in part, on the privatization of ejidal lands and waters—emerged in Juárez. Located on the literal and ideological front lines of globalization, Juárez was at the forefront of the privatization of public resources and functions. This process resulted in the rapid growth of private industrial parks and maquiladoras on former ejidal lands and shaped the distribution of investment and inequality in Juárez.

Ejido Senecú and the Antonio J. Bermúdez Industrial Park

The pivotal role of communal lands in Juárez's urbanization and industrialization is embodied by Senecú, an ancient settlement and postrevolutionary ejido that no longer exists. A community that occupied the Valley of Juárez for centuries, Senecú was designated an ejido in 1938 (Bowden 1971, 129).[8] It was located in Juárez's eastern sector along the Rio Grande, on whose waters it depended (Figure 12). Senecú was the ejido nearest to Juárez's urban core, and its rural produce was essential to the city's growth

[8] "Dictamen respecto de la solicitud de terminación del régimen ejidal del ejido Senecú, Municipio de Juárez, Chih.," *Diario Oficial de la Federación*, April 4, 2003.

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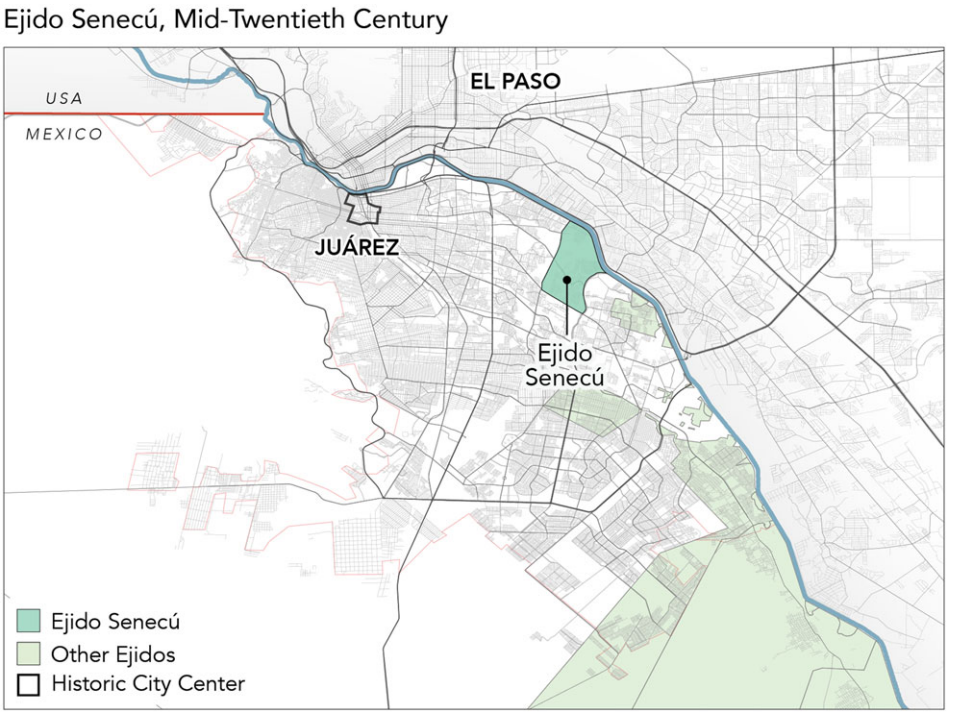

Figure 12. Ejido Senecú, mid-twentieth century. Sources: Open Street Map; rough boundaries of the ejido obtained from Antonio Rebolledo, "Ejidos, una especie en extinción aquí," *El Diario* [Juárez], June 2, 2013. Credit: Erik Steiner.

(Santiago Quijada 2011, 78). Despite this past, Senecú became the first ejido in Mexico to wholly privatize after Salinas's 1992 reforms.[9] Thus, the evolution of communal land tenure in Senecú, as well as the ejido's ultimate dissolution, is revelatory. The persons most responsible for the establishment of the regime that led to Senecú's dissolution were local PRI politicians, landowners, and businessmen Antonio J. Bermúdez and his nephew Jaime Bermúdez Cuarón.

The rise of Antonio J. Bermúdez's political and economic fortunes paralleled those of Juárez itself. Originally from the city of Chihuahua, Bermúdez moved to Juárez during the Revolution.[10] He amassed his wealth smuggling liquor across the border during US Prohibition. He cemented his position among the city's social and political elite by marrying into the pre-Revolutionary landowning class and purchasing part of the infamous Terrazas hacienda (Wasserman 1993, 113). In 1942 and 1943 Bermúdez served as Juárez's municipal president, a position he accepted only at the behest of his "dear friend" President Manuel Ávila Camacho. Bermúdez's influence in the PRI resulted in political appointments at the state and federal levels, ambassadorships to Middle Eastern countries, and the directorship of PEMEX, the state-run petroleum company. By the time Bermúdez was named PRONAF director in 1960, he was intimately familiar with the city's physical and political geographies as well as the PRI's industrialization and globalization goals. Jaime Bermúdez Cuarón would leverage his uncle's extensive financial and political capital by establishing Mexico's first private industrial park, in part, on Senecú's ejidal lands.

[9] "Dictamen."

[10] Antonio J. Bermúdez, Interview no. 161, interview by Oscar J. Martínez, June 21, 1974, Institute of Oral History, University of Texas at El Paso.

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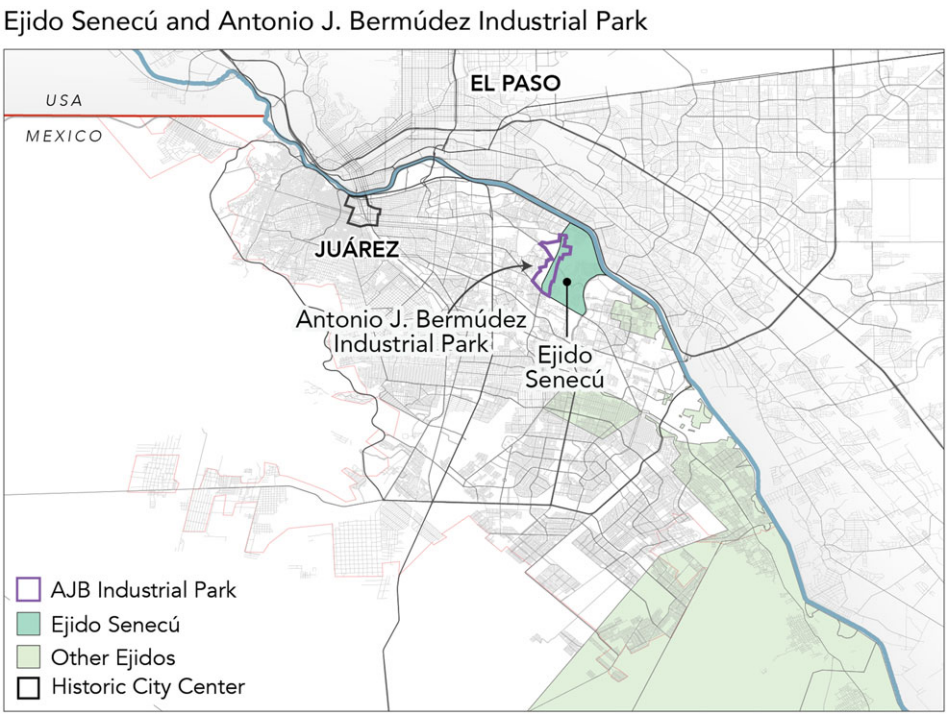

Figure 13. Ejido Senecú and Antonio J. Bermúdez Industrial Park. Sources: Open Street Map; Registro Agrario Nacional; Instituto Municipal de Investigación y Planeación Ciudad *Juárez* (IMIP); Rebolledo, "Ejidos, una especie en extinción aquí." Credit: Erik Steiner.

The creation of the Antonio J. Bermúdez Industrial Park (AJB) in 1968 was a watershed moment in the development of Juárez and evolution of its ejidos. Jaime Bermúdez, one of twelve local businessmen who founded the AJB, was born into a prominent family that owned a cotton farm in the Valley of Juárez. Jaime saw a tremendous opportunity to increase the value of his family's holdings when his uncle was named PRONAF director. In fact, he and other local business leaders lobbied the elder Bermúdez to support an industrialization study that proved instrumental to the passage of BIP.[11] The implementation of BIP and new tax structures provided crucial incentives for US companies to relocate to Juárez. And, as a US-educated engineer, Jaime had connections to US business and industry. He became a leading BIP booster, traveling across the United States to attract companies to Juárez. Jaime's first US client arrived in 1967, and the following year, Jaime broke ground on the city's (and nation's) first private industrial park.[12] Named after Antonio, this maquila industrial park was promoted as the development model not only for Juárez but other borderlands cities.[13] Yet the AJB occupied lands and used waters that legally belonged to the ejido of Senecú and, therefore, the Mexican people (Figure 13) (Santiago Quijada 2011, 415–416).

Although the AJB was created in 1968, its foundations traced to the 1940s. The adoption of import substitution industrialization (ISI) policies affected northern Mexico's ejidos

[11] "The Godfather of Mexican Manufacturing Couldn't Care Less about Donald Trump," *Bloomberg Businessweek*, October 12, 2017.

[12] "Godfather."

[13] "History Antonio J. Bermudez Industrial Park," Bermudez Industrial Park, http://web.archive.org/web/20210419215028/http://parqueindustrialbermudez.com/history.html.

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more than most. Many were vast, industrialized farms growing commercial crops. ISI increased demand for domestic raw materials, intensifying cotton production in the Valley of Juárez (Bustillos Durán 2004, 229). As the PRI pursued economic autonomy via ISI, it also sought to integrate Mexico's economy into global markets and erase international borders (Carrillo 2019, 61). Chief among the *priísta* proponents of globalization was Carlos Lazo, a prominent architect and technocrat whose modernism was heavily influenced by trips to the northern borderlands. In an influential 1950 article titled "Aching Border," Lazo decried vice and migration in the borderlands, attributing these social ills to the region's lack of infrastructure.[14] He called on the nation's planners and engineers to develop the borderlands' built environment and integrate it with that of the southern United States. Lazo's vision, as well as his role as federal secretary of Communications and Public Works from 1952 to 1955, planted the seed for PRONAF, BIP, and private industrial parks in Juárez.

By 1950 Juárez was more than a key borderlands city undergoing rapid urbanization. It was a vital proving ground for Mexican modernism due to the dynamic political, economic, and physical space it inhabited. Small farms, especially communal and subsistence ones, did not fit into this emerging globalized model of Mexican industrialism and free trade. The 138-hectare Senecú did not produce crops on the scale of the large industrial ejidos in other parts of the state or region. Plus, the physical space inhabited by ejidos like Senecú—situated between an international border and the boundaries of a growing metropolis—made them prime locations for US-focused trade in the eyes of Juárez's industrialists (Vázquez Ruiz 2004, 100). These impresarios knew that industry required infrastructure, land, and water and that arid northern Chihuahua possessed little water or infrastructure. Juárez's periurban ejidos, with their legally tenuous public lands and waters, represented ideal candidates for private industrial development.

The mid-1950s were a turning point in the urbanization of the Valley of Juárez. The process of urbanizing and privatizing Senecú's public resources originated in 1955 with the construction of the upscale neighborhood subdivision "Club Campestre de Ciudad Juárez," a private country club located on Senecú's western margins (Santiago Quijada 2011, 366–367). The Club Campestre project led Juárez planners to expand the road network that connected the city's historic core with its eastern hinterland. In late 1955 plans to pave nearly four hundred kilometers of road were finalized.[15] Months later city officials announced that Vicente Guerrero, a major Juárez avenue, would be extended to the east.[16] Figure 14, which uses Juárez's modern street grid, illustrates Vincente Guerrero's location and role in the historical expansion of the city's boundaries.

Juárez's eastward growth at midcentury, symbolized by the construction of private subdivisions and underwritten by public resources and infrastructure investment, revealed an incipient process of urbanization in periurban ejidal lands that was not haphazard. In fact, urban planners in Juárez, under the guidance and patronage of local officials and businessmen like the Bermúdez family, followed official regulatory plans proposed in 1958 and 1962 (Bermúdez 1966). These official plans' overarching objective was formal, planned growth toward the agricultural and riparian eastern regions of the city (Rodriguez and Rivero 2011). With PRONAF and BIP encouraging rapid industrialization and free trade by the mid-1960s, the city's economic and political elites rushed to acquire eastern rural land for development, speeding urbanization.[17] Once land was acquired, local, state, and national politicians, many investors themselves, provided

[14] Carlos Lazo, "Frontera Dolorida," in *Construcción Moderna*, March 1950, Archivo General de la Nación (Mexico City), Carlos Lazo Collection, box 58, *expediente*181, 52.

[15] "Pavimentación de más de 370,000 mts. de las calles de la ciudad," *El Fronterizo*, November 23, 1955.

[16] "La Avenida Vicente Guerrero será prolongada," *El Fronterizo*, May 6, 1956.

[17] "Aceptan ubicación de parque industrial," *El Continental*, August 28, 1965.

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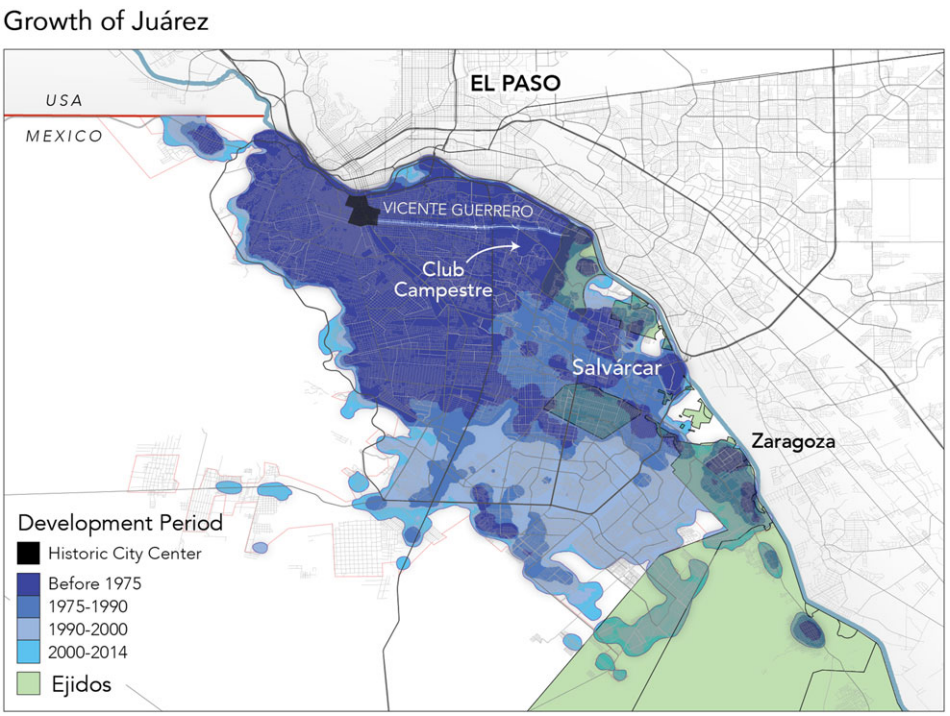

Figure 14. Growth of Juárez. Sources: Open Street Map; Registro Agrario Nacional; IMIP; the Atlas of Urban Expansion. Credit: Erik Steiner.

generous incentives and resources (especially water of "good quality") to private manufacturers and industrial park owners.[18]

The privatization of public resources in 1960s Juárez was facilitated by the privatization of public functions. In particular, municipal road building represented a lucrative windfall for private local businesses. One such firm, Constructora y Urbanizadora Nacional SA (CUNSA), was owned by PRONAF chief Antonio J. Bermúdez himself. CUNSA was awarded government contracts for road building in the 1950s and 1960s. In fact, the PRONAF head's business consortium, Grupo Bermúdez, was involved not only in construction but also in Juárez's commerce and service industries (Vázquez Ruiz 2004, 106). Bermúdez's self-dealings did not go unchallenged, however. Mexico's National Chamber of Commerce accused the Juárez Chambers of Commerce and Industry of corruption in 1963.[19] (Despite this, CUNSA received another road contract five years later).[20] At the same time, Juárez's rural sector denounced the expansion of the city's urban boundaries. Local agriculturalists argued that the elites' rezoning of rural lands to urban lands was being done inequitably and to their detriment.[21]

The establishment of the privately owned AJB in part on communal lands represented a key inflection point in Juárez's urbanization. Following the park's opening in 1968, more

[18] "Se planea industrializar la región," *El Fronterizo*, August 4, 1964; "Ayuda técnica y material a zona industrial," *El Continental*, September 8, 1965; and "Economista orientará a industriales," *El Fronterizo*, November 10, 1965.

[19] "La CANACO acusa de chantajistas a las cámaras de la industria y del comercio," *El Fronterizo*, December 3, 1963.

[20] "Inicia la tercer etapa de pavimentación," *El Continental*, November 19, 1968.

[21] "Protestan agricultores por las recalificaciones que se harán en los predios urbanos y rústicos," *El Fronterizo*, December 3, 1963.

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foreign companies relocated to the city and the maquiladora industry thrived. Five new maquilas were added to the AJB in its first two years. In 1972, 125 million pesos were invested in a park expansion that sought to accommodate thirty additional maquilas.[22] The parallel growth of the AJB and the maquila sector in Juárez continued throughout the 1970s. The peso's devaluation in the 1980s made cheap Mexican labor more attractive to US companies, further galvanizing the maquila industry. By 1985, Juárez was home to seven industrial parks. Between 1982 and 1987, the number of maquilas in the city doubled, and the number of employees tripled.[23] BIP was a resounding success for Juárez as well as Mexican modernization and globalization. Yet not all residents profited from Juárez's regime of industrialization via maquila, *ejidatarios* in particular.

While Juárez's private sector reaped the benefits of industrial and economic growth, periurban ejidos faced mounting environmental and resource challenges. Water, vital to both farm and maquila, was distributed more inequitably after 1965. Beginning in the mid-1960s, city officials, often private investors themselves, created wells to ensure maquilas' access to water.[24] Ejidos, administered by federal agencies, were not granted similar assistance. In fact, postwar urbanization and privatization trends saw agriculturalists throughout the northern borderlands compete with cities in zero-sum contests for water that encouraged the rapid proliferation of wells and pumps extracting groundwater (Walsh 2011, 55). As water in Juárez transitioned in earnest from a public to private (and rural to urban) resource by the late 1970s, expanded groundwater pumping increased the salinity of the irrigation water ejidos depended on—a problem that had steadily worsened over preceding decades.[25] This issue affected small farms predominantly, as large landholders were able to maintain or increase crop production due to their disproportionate access to state-controlled resources.[26] Moreover, new private subdivisions exacerbated ejidos' water woes. By the late 1980s, for example, some neighborhoods in Senecú's periphery had "converted ditches into dumps," obstructing the passage of fluids and contaminating the water supply of Senecú as well as other rural and agricultural communities in the area.[27]

As environmental ills and resource inequality increasingly threatened ejidatarios' lands and livelihoods, Juárez struggled to attract seasonal farm labor due to mass migration to the United States. This phenomenon only intensified after the passage of BIP. Rural male laborers, accustomed to working in large numbers in US agriculture and industry since World War II, preferred US jobs due to their relatively higher wages. In 1978, for example, the director of the Regional Union of Ejidatarios reported that dozens of men from the interior were arriving daily in Juárez with the goal of crossing into the United States despite labor shortages in the city.[28] This trend continued into the 1980s, as male migrants used Juárez primarily as a temporary stopover on their US labor journeys.[29] And although maquila jobs were an option in theory for the largely male pool of labor migrants, maquila employers preferred to hire young, single, and childless women who were perceived to be more "compliant" (Minian 2018, 27–28).

The urbanization of Juárez's ejidal lands via a regime that privatized public resources was sanctioned by Mexican officials well before the country's "neoliberal turn" in the late

[22] "Cinco nuevas maquilas," *El Fronterizo*, July 2, 1971 and "125 mdp para ampliar el parque industrial de Ciudad Juárez," *El Fronterizo*, February 29, 1972.

[23] "Lista de parques industriales," *Novedades*, October 18, 1985; Thomas Hayes, "Peso Cut Aids Plants at Border," *New York Times*, September 20, 1982; and Thomas Hayes, "Mexico's Border Plants Thrive on Weak Peso," *New York Times*, November 23, 1987.

[24] "Ayuda técnica y material a zona industrial."

[25] "Detiene el agua salitrosa la producción de algodón en los ejidos del Valle," *El Fronterizo*, March 5, 1977.

[26] "Una alambrada separa la prosperidad y la miseria que conforman el Valle de Juárez," *Uno Más Uno*, March 21, 1979.

[27] "Las colonias de la periferia contaminan el agua," *El Diario*, February 25, 1988.

[28] "Decenas de mojados a Juárez," *El Fronterizo*, September 22, 1978.

[29] "En el Valle de Juárez faltan trabajadores para levantar la cosecha," *El Fronterizo*, June 2, 1984.

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1980s and 1990s. One particular example from the early 1980s makes this clear. Agriculturalists from the Valley of Juárez accused Jaime Bermúdez of invading eleven thousand hectares of their land. They claimed Bermúdez illegally possessed these lands since the 1960s with the consent of Chihuahua's then governor, the *priísta* Óscar Flores Sánchez.[30] In 1976, Flores Sánchez became Mexico's attorney general, the official most responsible for enforcing federal laws at a critical legal juncture for the ejido system. Jaime's illicit actions, along with his uncle's self-dealings and the complicity of state and federal officials, exposed the economic boon and legal impunity of privatizing ejidal lands, especially in the northern borderlands. These lessons were not lost on the US-educated technocrats who dominated Mexican politics nationally beginning in the 1980s.

President Salinas's 1992 ejidal deregulation merely formalized processes that had occurred throughout Mexico for decades. By constructing Juárez's (and Mexico's) first private industrial park on lands belonging to and abutting the ejido of Senecú, officials and investors helped erode the legal and cultural barriers to privatizing ejidal lands (Santiago Quijada 2011, 567). Within two years of Salinas's reforms, Senecú's remaining ejidatarios were granted full individual domain of its parcels. Six years later, Senecú's members began the process to formally dissolve the ejido. And nearly a decade after early 1990s reforms, Senecú was fully privatized, marking another national first for Ciudad Juárez: the complete dissolution of a postrevolutionary ejido.[31]

Senecú's transition from a periurban to urban landscape and a public to private natural resource characterized by industrial parks and foreign-owned maquiladoras underscores the key divergences between ejidal urbanization in Mexico's northern borderlands and its interior. This process also symbolized the broader project of Mexican modernization after 1940, one that prioritized rapid industrialization and globalization over social and resource parity. Crucially, the urbanization of Juárez's eastern periphery—predicated, in part, on ejidal lands like Senecú's as well as segments of ejidos Zaragoza and Salvárcar—shaped the spatial distribution of investment in the city after 1960. And despite Carlos Lazo's midcentury modernist vision for Mexico's northern borderlands, investment and infrastructure patterns in Juárez intensified inequality, a trend that is vividly demonstrated by GSV and GIS imagery and our computer vision model.

Spatial distribution of investment in Juárez: Comparisons and consequences

GSV and GIS imagery demonstrate that the urbanization of rural and communal lands in Juárez's former eastern periphery frequently produced landscapes characterized by high levels of investment, infrastructure, and formal planning, a departure from the classic model of post-1960 ejidal urbanization in Mexico identified by past scholarship. As Figure 15 illustrates, the distribution of GSV images tagged as impoverished largely splits Juárez on a north-south axis between its more invested eastern half, home to the city's principal (former and current) periurban ejidal lands, original private industrial parks, and private housing subdivisions, and its less invested western half, home to impoverished urban landscapes and informal housing dominated by the city's historic core.

The high level of investment and planning encountered in former periurban ejidal lands in Juárez diverges from trends witnessed in Guadalajara, the nation's third-largest metropolitan region. GSV images from 2010 to 2019 and GIS data provide a revealing portrait of the distribution and concentration of tags characterized as impoverished in both cities. Figure 16 demonstrates that impoverished, informal landscapes dominate Juárez's urban core, not periphery, as is seen in Guadalajara in Figure 17. In particular, the

[30] "Acusan a Jaime Bermúdez," *El Diario de Juárez*, April 2, 1983.

[31] "Dictamen respecto de la solicitud de terminación del régimen ejidal del ejido Senecú, Municipio de Juárez, Chih.," *Diario Oficial de la Federación*, April 4, 2003.

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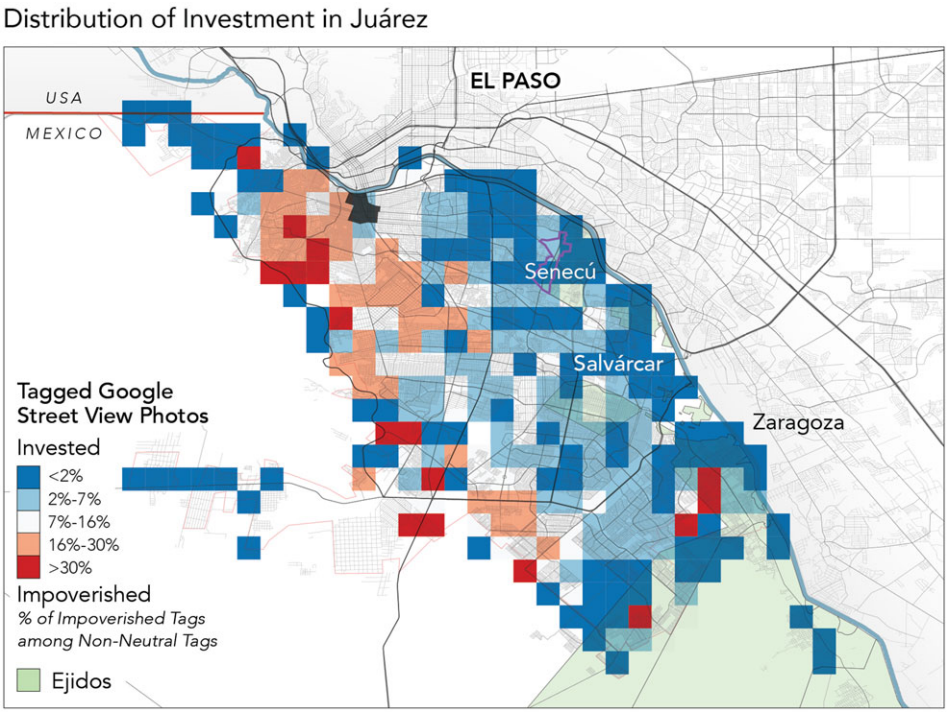

Figure 15. Distribution of Investment. Sources: Open Street Map; Registro Agrario Nacional; IMIP; Google Street View. Credit: Erik Steiner.

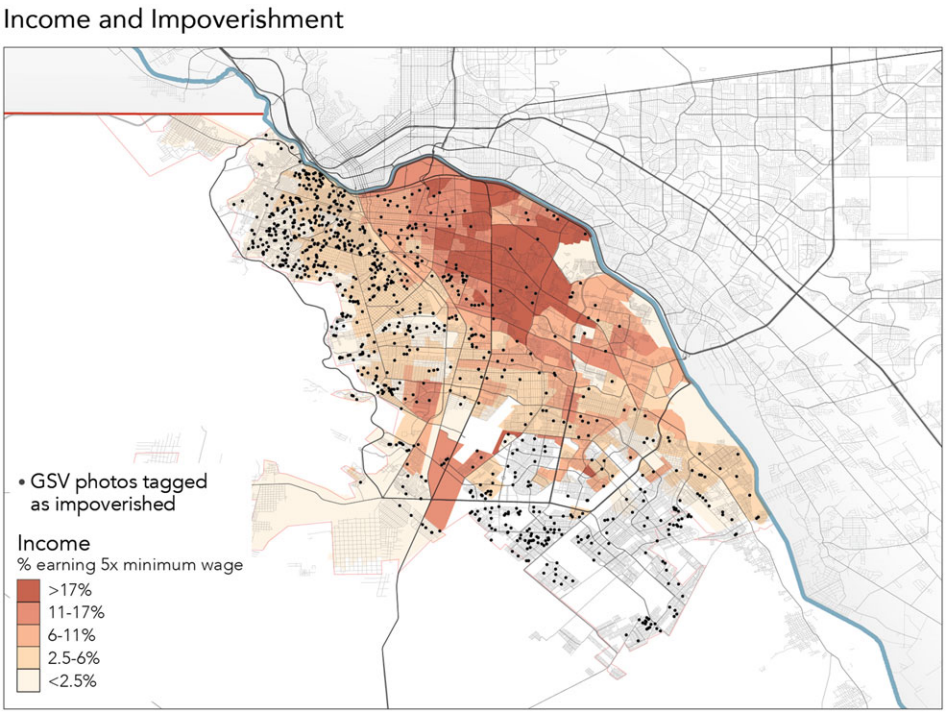

Figure 16. Income and Impoverishment. Sources: Open Street Map; Instituto Nacional de Estadística y Geografía 2010; AGEB Ciudad Juárez (https://purl.stanford.edu/bx274kk2004); Google Street View. Credit: Erik Steiner and Zephyr Frank.

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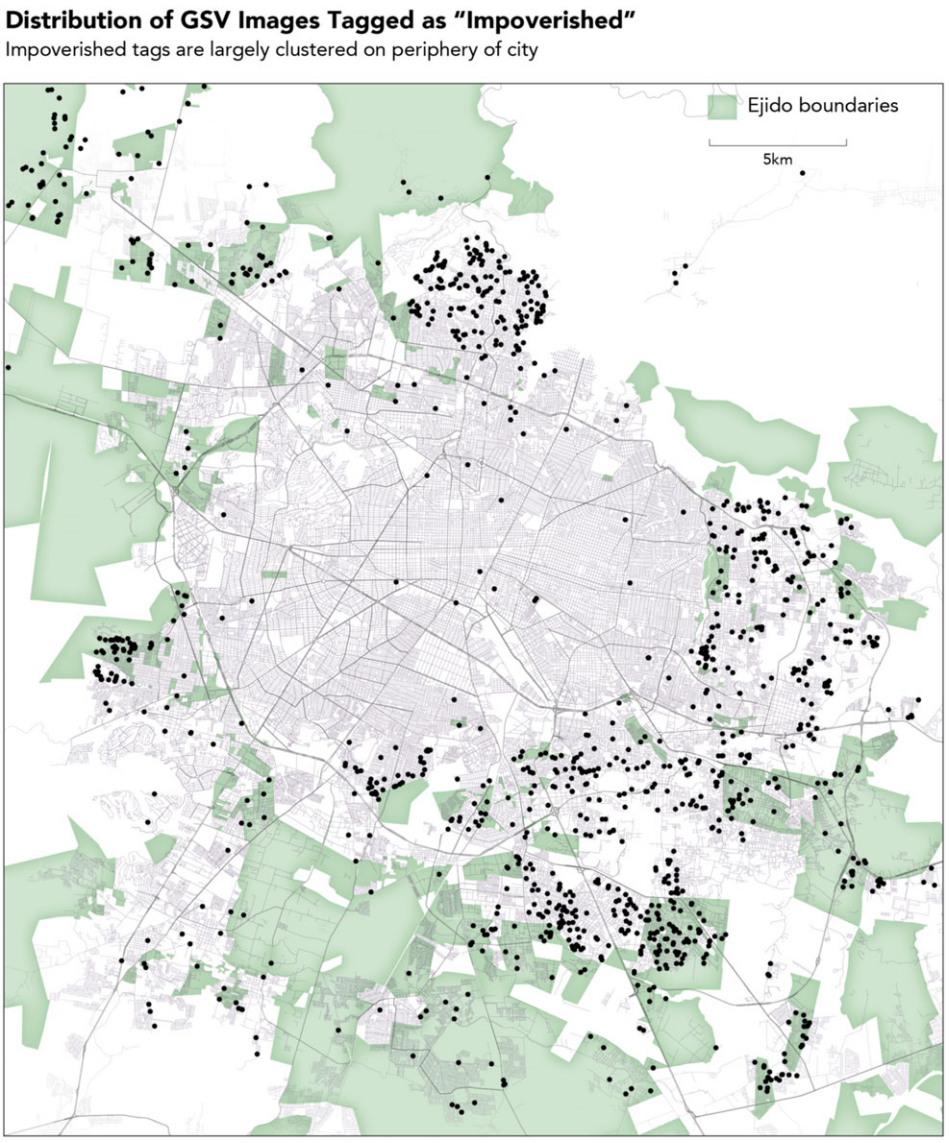

Figure 17. Distribution of GSV Images Tagged as Impoverished, Guadalajara, Jalisco. Sources: Open Street Map; Natural Earth Data; Registro Agrario Nacional; Google Street View. Credit: Leonardo Barleta.

northwest is home to Juárez's historic urban center and neighborhoods (*colonias*), not former or current ejidal lands. Income levels in the western sector also pale in comparison to Juárez's more formally developed eastern sector (excluding the current city's extreme south and southeast peripheries), which is home to private maquila industrial parks that occupy or abut the former and/or current periurban ejidal lands of Senecú, Salvárcar, and Zaragoza. Note the distribution of industrial parks and description of city sectors in Figure 18.

The distribution of GSV images tagged as impoverished differs markedly in Guadalajara. In Figure 17, impoverished tags cluster exclusively on the urban periphery, the location of the city's former and current periurban communal and rural lands. The positions of these clusters suggest successive waves of invasion of ejidal lands by migrants seeking housing

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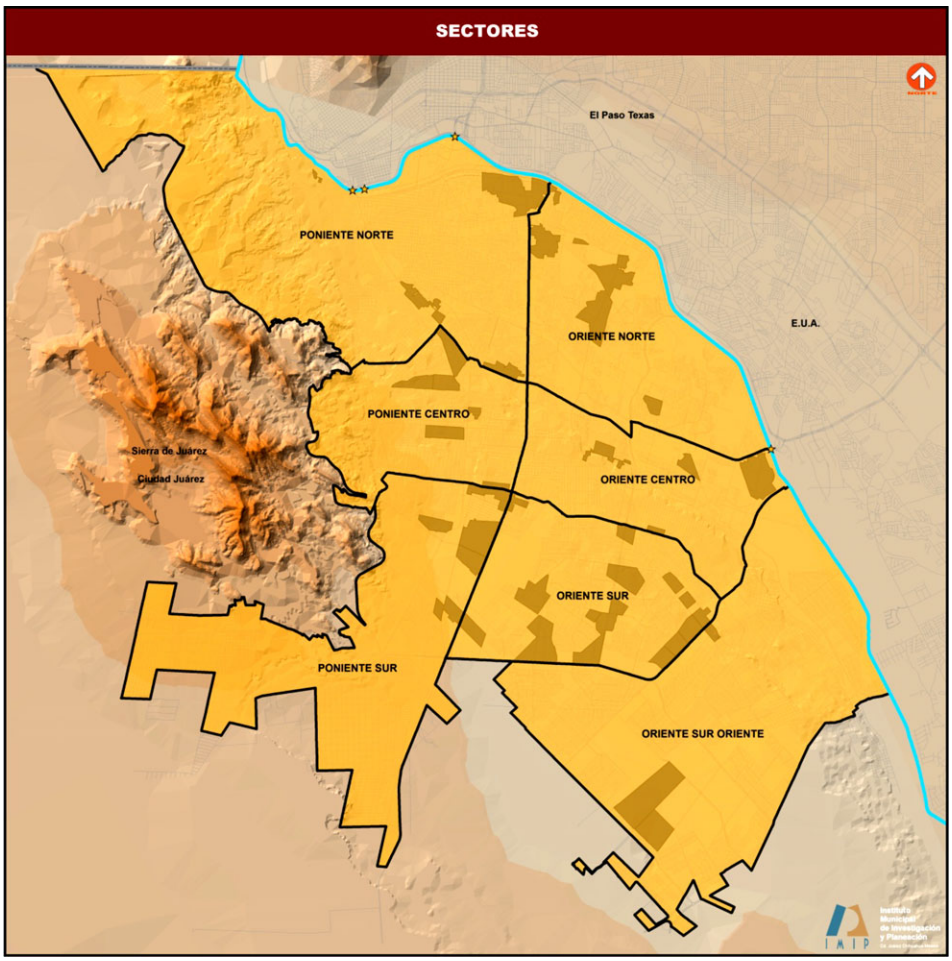

Figure 18. List of Juárez industrial parks and zones by urban sector. Source: IMIP, *Actualización diagnóstica sociodemográfica y económica del programa de desarrollo urbano de Ciudad Juárez, Chih*. (Juárez: IMIP, March 2014), 15.

on peripheral and vulnerable lands deficient in infrastructure and planning, a process that reflects Mexico's classic ejidal urbanization model. Guadalajara's historic (and geographic) urban center and surrounding older *colonias* do not demonstrate the low levels of infrastructure and investment that characterize Juárez's core. Plus, Guadalajara, located in the Atemajac Valley in western Mexico's Sierra Madre Occidental, was not shaped spatially or politically by an international border serving as the historical entrepôt for foreign capital, trade, and industry.

As Figure 16 indicates, the evolution of ejidal lands and ensuing concentration of investment and wealth in Juárez's eastern sector contributed to the concentration of informality and poverty in non-ejidal lands after 1960. Rather than clustering on the urban periphery like Guadalajara, informal settlements in Juárez grouped nearer the city's core, occupying or abutting the Sierra de Juárez mountains and hills immediately west and southwest of the historic city center. Since ejidal and riparian lands in the Valley of Juárez were coveted by officials and investors for their manufacturing potential (i.e., access to cheap land and water), the lands most available to poor rural-to-urban migrants were located mainly in arid, mountainous terrain. These informal settlements were often populated by workers from the maquila industry, Juárez's largest employer. Maquila

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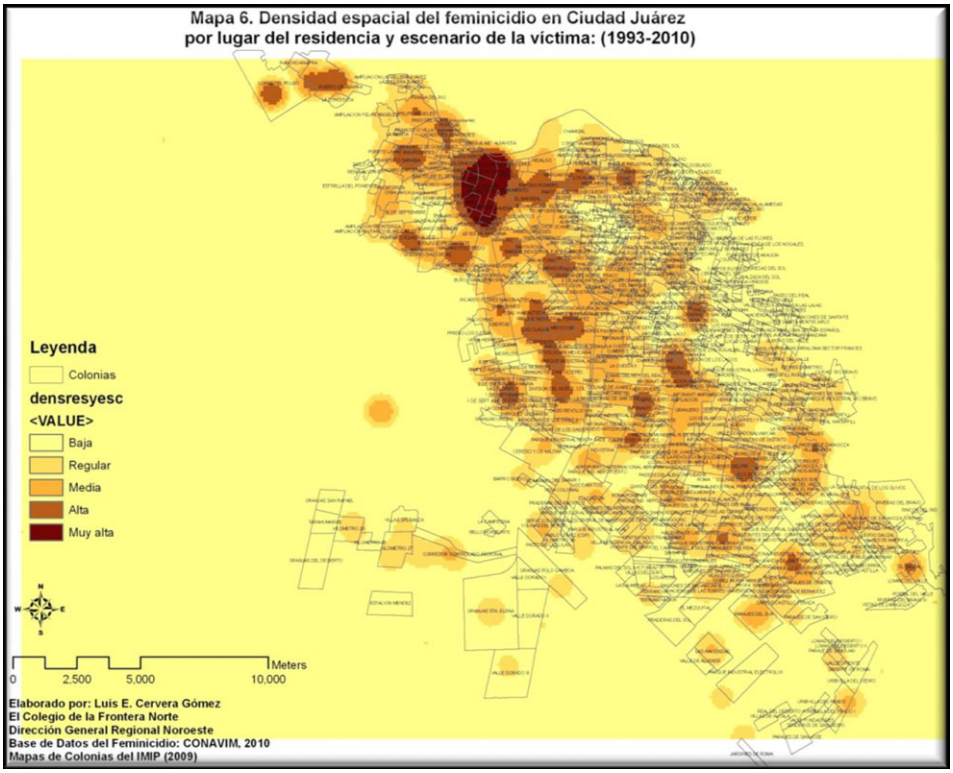

Figure 19. Spatial density of femicide in Ciudad Juárez by location of victim residence and crime scene, 1993–2010. Source: Map by Luis Cervera Gómez, in Luis Cervera Gómez and Julia Monárrez Fragoso, *Sistema de información geográfica de la violencia en el municipio de Juárez, Chihuahua: Geo-referenciación y su comportamiento espacial en el contexto urbano y rural, Reporte final* (Juárez: Secretaría de Gobernación, 2010), 59.

industrial parks were located disproportionately in the current city's east and center, as illustrated in Figure 18. Crucially, the maquila workforce was dominated by women by the 1990s (Wright 2004, 373).

Gendered poverty and violence were major outcomes of post-1960 industrialization and globalization trends in Juárez (González Rodríguez 2010; Bermúdez Urbina and Evangelista García 2017). While the processes of ejidal urbanization did not contribute directly to violence against women, GSV and GIS imagery provide insight into the evolution of ejidal land use and ensuing distribution of investment, inequality, and violence in Juárez. In particular, significant correlations emerge when comparing investment and femicide trends in the city. Because femicide is one of the most tangible manifestations of inequality and violence in late twentieth-century Juárez (along with narcoviolence)—and an act intimately associated with maquila work, poverty, public space, and a lack of investment and infrastructure—it is worth briefly exploring the linkages between investment and femicide patterns here.

Municipal data and GIS imagery demonstrate that gendered poverty and violence were concentrated largely—but not exclusively—to Juárez's western sector (Cervera Gómez and Monárrez Fragoso 2010, 14). In fact, by the early 2000s, six of the city's top seven "key femicide zones" were located in Juárez's northwest and center-west (Cervera Gómez and Monárrez Fragoso 2010, 60–61, 66). Figure 19 (taken from a municipal study of femicide trends from 1993 to 2010) reveals that the urban spaces where female victims' bodies were discovered map closely onto the distributions of impoverishment and income shown in

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Figure 16. Western Juárez's non-ejidal lands provided the bulk of informal housing for migrants and maquila employees, housing often constructed of cardboard or wood pallets.[32] As Figures 16 and 19 illustrate, these urban landscapes of poverty and violence were situated far from the private industrial parks, maquilas, and subdivisions dominating the city's east. Perhaps the most visible indicator of Juárez's unequal investment regime was the presence or lack of infrastructure (Grineski and Collins 2008, 261).

Access to water and its infrastructure played a principal role in the spatial distribution of invested and impoverished landscapes in Juárez. In the 1950s, municipal projects that sought to expand water and sewer infrastructure incorporated older communities abutting Juárez's historic center.[33] And *colonias* on the more immediate western and southern limits of the urban core were included in 1960s water studies.[34] However, by the early 1970s, shifting development priorities led to the rapid expansion of maquilas and industrial parks in Juárez's east.[35] These private industrial parks and subdivisions eventually dominated public water resources and infrastructure investment. By the late 1970s, subdivisions in Juárez's formerly rural, agricultural (and often ejidal) northeast were fully modernized.[36] In the meantime, the flow of migrants from the Mexican interior swelled Juárez's informal settlements on lands lacking water and infrastructure, which were located largely in the western sector. By the 1990s, female migrants, most of them low-wage industrial laborers or domestic servants, had "overwhelmed" these settlements.[37]

Road infrastructure, like that of water, reflected the duality of Juárez's built environment. In particular, public transportation embodied the gendered inequities wrought by the city's urbanization regime. Maquila workers, typically poor females, commuted long distances on foot from their *colonias*, often western slums lacking running water and basic services (González Rodríguez 2010). Once in the city center they boarded company buses that delivered them to industrial parks in eastern and central Juárez. This daily trek, frequently undertaken alone and at night along dirt roads lacking streetlights and police, could be dangerous and deadly (Livingston 2004, 61).[38] During the 1990s, for example, local bus drivers were charged with using their vehicles and knowledge of the city's less formal and secure road networks to prey on women traveling to and from work alone.[39] These serial murders were the most tangible manifestation of a stark correlation between the location of femicide crime scenes and Juárez's roads (Wright 2011, 713).[40] From 1993 to 2010 nearly a third of all femicide victims' bodies were discovered on the city's less invested and less secure western roadways (Cervera Gómez and Monárrez Fragoso 2010, 16).[41]

GSV, GIS, and municipal data demonstrate that where a woman lived and died correlated robustly with Juárez's disparate landscapes of investment and income. An "intimate connection" existed between a victim's residence and the location where her body was discovered (Cervera Gómez and Monárrez Fragoso 2010, 14). And from 1993 to

[32] Karl Kramer et al., "Maquiladora Workers Rising in Ciudad Juarez," *San Francisco Living Wage* (blog), https://www.livingwage-sf.org/fair-trade/maquiladora-workers-rising-in-ciudad-juarez/.

[33] "Expansión del servicio de agua potable," *El Fronterizo*, November 29, 1950.

[34] "Terminan instalación de agua potable," *El Continental*, January 26, 1962; "Introducción a servicios públicos a colonia Vicente Guerrero," *El Continental*, August 3, 1967; and "39 obras realiza el municipio," *El Continental*, September 25, 1970.

[35] "Perspectivas para la instalación de nuevas industrias," *El Norte*, June 14, 1971.

[36] "Las colonias del norte de la ciudad, ya fueron incorporadas a los servicios urbanos más indispensables," *El Norte*, July 10, 1977.

[37] Elena Poniatowska, "Ciudad Juárez: Matadero de mujeres," *El Diario de Juárez*, December 9, 2002.

[38] Poniatowska.

[39] Mary Beth Sheridan, "The Deaths That Haunt Juarez," *Los Angeles Times*, May 12, 1999.

[40] According to Wright, the visible presence of female workers in public spaces like city streets served to conflate them with prostitutes in the eyes of society.

[41] Today, *colonias* in northwestern Juárez still feature unpaved roads in poor condition and a lack of accessible, potable water. "Visita Maru Campos la colonia Felipe Ángeles en Ciudad Juárez," *El Fronterizo*, May 24, 2021.

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2010, nearly half of all victims' bodies were encountered in vacant lots (Cervera Gómez and Monárrez Fragoso 2010, 16). Where a woman lived and where her body was recovered were intrinsically linked to poor and divested, often public, spaces (Wright 2004, 369).[42] As Figures 16 and 19 show, these factors converged regularly in western Juárez. Contrast these vacant lots, unpaved and unlit roads, public spaces, informal housing, and lack of utilities (our model's classification of "impoverishment") with Juárez's more invested, planned, private, and generally wealthier eastern sector, home to the majority of the city's maquilas. Researchers have observed that Juárez's maquila industrial parks—featuring fewer public spaces, more robust planning and infrastructure, and ample access to water—were, by the 2000s, "more often located in formally developed areas inhabited by a more affluent populace" (Grineski and Collins 2008, 266).[43] These more private, secure, and wealthy landscapes were forged, in part, from former communal lands of Senecú as well as parcels from Zaragoza and Salvárcar.

While the causes of femicide are too multivariate and complex to fully explore here, our methodology provides a fresh perspective on the correlations between urbanization and violence trends in Juárez. Visual imagery reveals how the evolution of the city's periurban ejidal lands contributed to distinct and disparate patterns of investment and income. This process informed the distribution of inequality, which forged two spatially and economically distinct cities by the 1980s—one more industrial, private, and invested in the east, the other more informal, public, and impoverished in the west. And in the 1980s and 1990s this tale of two cities took a grim turn as financial crises and neoliberal reforms intensified poverty and violence in Juárez (Chew Sánchez 2014, 267–68). Nearly two hundred women were officially identified as murder victims from 1993 to 1999 in Juárez (in 1999, the city was home to 330 mostly US-owned maquilas).[44] Nowhere in Mexico are the correlations between ejidal land use, industry, investment, and gendered inequality clearer than in Juárez.

Conclusion

Visual imagery, when analyzed via a computer vision model in combination with conventional historical sources, reveals a process of ejidal urbanization in the northern Mexican borderlands that diverged from the classic model observed in interior metropolitan regions of Mexico. Furthermore, our use of visual data and machine learning exposes the essential role of private industrial parks and multinational maquiladoras in the (d)evolution of communal land tenure in Juárez, a trend that began in the 1950s and reached its zenith in the 1990s. The process of ejidal urbanization, shaped by Juárez's political, economic, and physical geographies, influenced the spatial distribution of investment and inequality in the city. This assertion is supported by GSV imagery sampled from various points throughout the city, as well as imagery from metro areas in interior Mexico. Regional variations in ejidal urbanization—particularly Juárez's lower incidences of informal housing and impoverished landscapes in periurban and urban ejidal lands and higher incidences of inequality and poverty in non-ejidal and/or nonperipheral lands—suggest that further research is necessary to fully understand the evolution of ejidal land tenure and rural modernization in the US-Mexico borderlands.

Last, further analyses of ejidal urbanization trends in the northern Mexican borderlands will provide valuable perspective for scholars examining US-assisted development in

[42] Wright contends that Juárez's elites "equate[d] the removal of women from public space with urban development and industrial progress" (369).

[43] Grineski and Collins (2008) clarify, however, that less affluent people were more likely to live in the immediate vicinity of a maquiladora.

[44] Sheridan, "The Deaths That Haunt Juarez." In the ensuing five years, nearly two hundred more femicides were officially reported; Richard Boudreaux, "Prosecutor to Probe Juarez's Serial Killings," *Los Angeles Times*, January 31, 2004.

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Mexico during the twentieth century. The growing literature on the decentralization of Latin American states and deregulation of these states' public resources and functions further emphasizes that Mexican neoliberal reform was less a period encompassing the late 1980s and 1990s and more a half-century-long process with roots in the 1930s and World War II (Offner 2019; Fajardo 2022). As one of the most celebrated social programs and radical commitments to resource sovereignty in Mexican history, the ejido remains a revelatory subject whose origin, (d)evolution, and ultimate fate continue to provide crucial insight into the global impacts of postwar modernization and globalization.

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