

Article

Evolution and Collapse of *Ejid*os in Mexico—To What Extent Is Communal Land Used for Urban Development?

Melissa Schumacher ¹, Pamela Durán-Díaz ^{2,*} , Anne Kristiina Kurjenoja ³ ,
Eduardo Gutiérrez-Juárez ⁴ and David A. González-Rivas ⁵

¹ Department of Architecture, Universidad de las Américas Puebla, Cholula 72810, Mexico; melissa.schumacher@udlap.mx

² Associate Professorship of Land Management, Technische Universität München, 80333 Munich, Germany

³ Department of Architecture, Universidad de las Américas Puebla, Cholula 72810, Mexico; annk.kurjenoja@udlap.mx

⁴ Department of Architecture, Universidad de las Américas Puebla, Cholula 72810, Mexico; eduardo.gutierrez@udlap.mx

⁵ Centro de Investigaciones Biológicas del Noreste CONACYT, La Paz Baja California Sur 23205, Mexico; dgonzalez@pg.cibnor.mx

* Correspondence: pameladuran@tum.de; Tel.: +49-89-289-25789

Received: 13 September 2019; Accepted: 2 October 2019; Published: 7 October 2019



Abstract: The *ejido* system, based on communal land in Mexico, was transformed to private ownership due to neoliberal trends in the 1990s. Based on the theory of stakeholders being agents of change, this study aimed to describe the land policies that changed the *ejido* system into private development to show how land tenure change is shaping urban growth. To demonstrate this, municipalities of San Andrés Cholula and Santa Clara Ocoyucan were selected as case studies. Within this context, we evaluated how much *ejido* land is being urbanized due to real estate market forces and what type of urbanization model has been created. These two areas represent different development scales with different stakeholders—San Andrés Cholula, where *ejidos* were expropriated as part of a regional urban development plan and Santa Clara Ocoyucan, where *ejidos* and rural land were reached by private developers without local planning. To analyze both municipalities, historical satellite images from Google Earth were used with GRASS GIS 7.4 (Bonn, Germany) and corrected with QGIS 2.18 (Boston, MA, US). We found that privatization of *ejidos* fragmented and segregated the rural world for the construction of massive gated communities as an effect of a disturbing land tenure change that has occurred over the last 30 years. Hence, this research questions the roles of local authorities in permitting land use changes with no regulations or local planning. The resulting urbanization model is a private sector development that isolates rural communities in their own territories, for which we provide recommendations.

Keywords: land tenure in Mexico; *ejido* system; land expropriation; gated-communities; San Andrés Cholula; Santa Clara Ocoyucan

1. Introduction

Mexico has an intricate land tenure system with historical bonds between communal lands and a combination of public and private ownership. The *ejido* (from the Latin word *exitus* or way-out, refers to the fields outside human settlements or towns for cattle or orchards. In the case of *Altépetl* (see Note 4), *ejido* refers to the land outside of the *calpulli* for agricultural purposes) is an endemic land tenure model and one of the most important bequests of the Mexican Revolution, consisting of

“an area of communal land used for agriculture, on which community members individually farm designated parcels and collectively maintain communal holdings” [1].

As a system, the *ejido* has been widely studied in Mexico and Latin America because of its complexity and importance as an agrarian land policy [2–4], its fragile socioeconomic structure [1], [5,6], its socio-spatial organization [7–9], its urbanization [10–12] and its liberalization [13–15] through the reforms of Article 27 of the Mexican Constitution. Most *ejido* land underwent a transformation in response to neoliberal trends during the 1980s and 1990s, when private ownership was secured by *ejidatarios* and farmers, which, despite appearing to be a positive step, subsequently opened the door to corporate predation due to *ejido* land being considered as potential urban land.

Ejidos were the axiom of Mexico’s rural land distribution, until they became an obsolete tenure system that did not achieve better quality of life or wealth for its tenants. The paradox of the *ejido* system is that although it is going extinct because it is considered an “irregular land tenure system” by modern land policies, half of Mexico’s territory is still held by *ejidos* and rural communities, including mountains, forests, natural reserves, mines and lakes, among others.

“More than 5.6 million *ejidatarios* offer food, cattle, raw materials, fodder, as well as construction materials, handcrafts and touristic services to National and international markets. Moreover, they provide invaluable environmental services for biodiversity conservation, carbon capture and aquifer recharge” [16].

Nevertheless, as land speculators crave cheap, available land to invest in, the privatization of *ejido* tenure in peri-urban areas leads to agricultural and natural lands becoming potentially urban in order to accommodate such investments. After the last Land Reform and liberalization of *ejidos* in 1992, low-priced *ejidos* and rural land were available for the big housing market, especially when conurbated with urban areas. Through this public policy and the influence of stakeholders, the urbanization of *ejidos* caused massive urban sprawl outside urban cores and thus huge peri-urban areas emerged.

An “irreversible urbanization process” [17] was triggered by the privatization of *ejido* land and the subsequent immiseration of many Mexican farmers. This jeopardized the survival of the agrarian sector and merged new socio-spatial processes. Within this, one of the greatest tragedies for Mexican and Latin American rural communities is that rural land use will sooner or later cease [18]. Nonetheless, Barnes [19] considers that *ejido* and rural communities are some of the most resilient communities in the world, as they have been able to adapt and transform their identities and economies. This type of adaptation has led, as a consequence, to stakeholder linkages between interests, affectations and benefits, resulting in a fractured urban territory with alternating urban developments, agricultural zones and natural reserves [20].

This paper contributes to the research on *ejidos* and peri-urban growth in order to answer three main questions—I. How much *ejido* and rural land is being used for urban development in the case study areas? II. How does land tenure change the shape of urban growth in Mexico? III. Which model of urbanization emerges from this? To respond to these questions, we first review the evolution of *ejidos* as a land tenure system in Mexico. Second, we conduct a visual geo-analysis of satellite images, selecting the municipalities of San Andrés Cholula and Santa Clara Ocoyucan as traditional *ejidos* to use as case studies and we quantify their urbanization from 1995 to 2018. Both case study areas have undergone different urbanization processes, despite having similar socio-spatial and economic features, in terms of having a native rural population relying on communal land tenure and on a mainly agrarian economy.

This research is divided into four sections. First, we present a theoretical framework on the premise of stakeholders acting as agents of change that drive urban development; second, we outline our approach to the evolution and collapse of the *ejido* land tenure system in Mexico; third, we conduct a geo-visual analysis to measure how much land was urbanized in the areas under study; fourth, we provide our results and discussion to critically assess private sector urbanization of *ejido* land and the roles of land tenure change and stakeholders in promoting land privatization; and finally, we

conclude that the tendency of the model of urbanization based on private development to isolate rural communities in their own territory means that the benefits are outweighed by the negative impacts.

2. Theoretical Framework—Stakeholders as Agents of Socio-Spatial Change

Population growth, decentralization of socioeconomic activities, flows and goods, fragmentation of the environment and new centralities, among others, are factors that play a role in expansive urban growth [21] and the production and control of urbanization [22]. These factors rely on key agents who (pro-) actively pursue their roles, interests and affectations, that is, stakeholders. In line with the definition set by the World Bank [23] stakeholders are agents of change when they can participate as decision-makers with positive or negative goals and when their stakes or interests can be connected to either individual or collective preferences towards change [24]. In other words, stakeholders are able to both change public policies and influence local reality as a manifestation of their socioeconomic and cultural values [25]. This constructivist view of stakeholders affects the choices and processes of spatial development. Stakeholders guide urban growth as both pro-active decision-makers on where and how space is planned and implemented and as affected or benefited actors in urban growth through their day-to-day transactions with each other, (non-) compliance to rules and regulation, and/or conformance or resistance to plans. This intrinsic relationship between stakeholders and the transformation of space and in particular of *ejidos*, is key to understanding why looking at land tenure changes is a crucial mechanism to understand the processes of conversion from *ejido* land to peri-urban land.

López-Tamayo [26] proposed that the rise of capitalist society is increasingly transforming urban land use planning into a process of optimizing capital production. In addition, Harvey [27] stated that urban land use choices are increasingly becoming the products of stakeholders seeking profits and revenues. Both authors' statements were used to form our analytical approach [28]. We first analyzed how and where urban growth is occurring (i.e., which kinds of optimization and priority setting processes seem to take place) and secondly, how socio-spatial construction is done by stakeholders (i.e., which values and exchange mechanisms seem to be involved).

In this regard, we consider the concept of stakeholders acting as agents of socio-spatial change to be relevant, as it describes how rural land is transformed into urban land, where stakeholders act as decision-makers who influence and construct the urban space and indirectly influence the effectiveness of local policies, urban planning practices, segregation of the rural population and housing demand. According to Schumacher's conceptual framework, based on López-Tamayo and Harvey [27], agents of change use land tenure as one of the mechanisms that triggers the private sector urbanization of former *ejido* land and transforms peri-urban morphology.

Notwithstanding, the rural identity of peri-urban and agrarian communities is the core of Latin America's struggle for land rights; thus, it is elementary to understand rural-urban ambiguity, where socioeconomic groups are physically and socially fragmented.

3. Historical Background—the *Ejido* Land Tenure System Approach

At the end of Colonial period in 1821, when Mexico achieved independence from the Kingdom of Spain, the new country inherited a complex land tenure system including the following:

- Communal land—the pre-Hispanic *ejido* and *Altépetl* ("Water-mountain" in Náhuatl language, was a complex socio-spatial and political system that gave order to former Mesoamerican cities. Each *Altépetl* had its own government as a City state and its own communal land outside the core areas for agricultural purposes. This was the primordial land tenure system in Mesoamerica and one of the factors influencing modern *ejido* implementation) system;
- Public land—owned by the Spanish Crown;
- Private land—owned by the Church and property owners or *hacendados*, which represented the new upper-middle-agrarian class.

During the 19th Century, Mexico took its first steps towards regulating the colonial system through land reforms. Wilkie and Hammond [28] consider 1853 as the year that modern land policy was initiated. This marked the beginning of the new function of the federal government as the National land administrator. President Benito Juárez introduced the policy from 1855 to 1861, when the Catholic Church's property, including *haciendas* and communal land from native groups, was confiscated to be used as small agrarian holdings.

The industrialization of the country in the 19th century boosted the monopolization of land and water resources for industrial production by *hacendados*, endorsed by the dictatorship of President Porfirio Díaz which was established in 1876. Wilkie and Hammond observed that, in comparison with former tenure policies, Porfirio Díaz radically changed land ownership from individual and communal properties to massive estates for proprietors and infrastructure development. Mining concessions, extensive farmland and more than 20,000 km of railway were built by foreign companies—mainly from the USA and the UK—during the dictatorship. This was made possible by expropriation due to an ineffective land tenure policy [29].

The routing of railways over rural land was based on connecting production with trading centers, that is to say, *haciendas* and industries being linked to cities by infrastructure. For this reason, the importance of *haciendas* in Mexico is twofold—on the one hand, the *haciendas* represent an unfair socioeconomic and labor exploitation system; on the other hand, the *haciendas* catalyzed modern agrarian production in Mexico. Some key features of the industrialization of the agrarian sector are land tenure, capital, cheap labor, technology and organization, as shown in Table 1. Although relatively small groups of *hacendados* controlled these features, most of the communal and native land suffered land tenure insecurity due to private appropriation and government expropriation.

Table 1. Agrarian Change in Mexico. Source: Melissa Schumacher and Teodoro Schumacher.

Agrarian System Features	Hacienda System 19th Century	Agrarian Reform 20th Century	Post-NAFTA 21th Century
Land tenure	Large estates Ancestral communal land Population concentrated in small villages and towns	<i>Ejido</i> , land distribution policies Small private properties Restrictions from <i>ejidos</i> regarding the open-land market	Private ownership and urbanization of communal and <i>ejido</i> land
Capital	Agro-industrial production Landlord investment International exportation of agricultural commodities	Public capital, subsidy policies to <i>ejidos</i> , public loans Protection of the National market Rise and fall of agrarian productivity Beginning of the importation of grains and goods from the USA	Subsidies to the agrarian sector International and private investment for the agrarian industry Importation of corn, grains and agricultural commodities from the USA and other countries
Labor	Cheap farming and peasant labor for <i>Haciendas</i> “Wage slavery” system	Self-consumption and individual production Rural–urban migration	Agro-industrial production, self-production Rural labor migration to the USA Abandonment of agricultural activities in Mexico
Technology	<i>Hacienda's</i> technology for agro-industrialization	Free distribution of farm equipment, livestock and farm goods to <i>ejidatarios</i> by subsidies Technical training from the State to the <i>ejidatarios</i>	Private development for agro-companies Distribution of farm goods from the State to small farmers Subsidies through rural and agricultural development projects
Organization	Landlords controlled the economy, commerce, transportation and labor structure.	Rural collectives Family labor organization inside and outside the <i>ejidos</i> for survival <i>Ejidatarios'</i> labor unions	Rural–local collectives, small producers, the association of small producers and rural cooperatives with big agro-industries “Employees in their own land” through a Neo-Latifundium system based on private investment and development. Peasants and farmers produce for big companies

NAFTA abbreviation stands for the North America Free Trade Agreement signed between Mexico, the United States and Canada in 1994.

Unable to make a living, and under the imminent threat of their lands either being grabbed by *hacendados* or expropriated by the Government, in 1910 farmers, workers and peasants came together to resist them in what was to become the Mexican Revolution. This social movement, spearheaded by farming and peasant leaders, such as Emiliano Zapata, who fought for the restitution of lands to their original owners, sought for democracy and social justice under the banners of “Land and Liberty” and “the land belongs to those who work it with their hands.”

It should be noted that the development of the Mexican Revolution was different in the North and South of Mexico. According to Katz [29], the social movement in the northern states was guided mainly by the rural middle class, working class and *hacendado* (most of the generals in the North were owners of small and large areas of rural land but the famous General Francisco “Pancho” Villa was a former *hacienda* worker and outlaw) who stood against the political system. The government of Porfirio Díaz favored the use of foreign companies in the development of mining, railroads, livestock and industrial agriculture in Mexican territory. In the south-central area of the country, the revolution had a strong ideology based on political change, social justice for peasants and the restitution of ancient lands to their original owners (for example, old *Altépetl* communal land and territories). In contrast, in the North, *hacendados* did not join the revolutionary forces and peasants were incited to fight against *hacendados*, supported by intellectuals, workers and local leaders.

The Mexican Revolution was the beginning of an extensive Land Reform that attempted to fulfill the land rights of peasants and indigenous people. In 1917, the addition of Article 27 to the Mexican Constitution conveyed the declaration of National ownership of water and territory to grant the State the right to secure tenure and private property. It also recognized three types of tenure—public, private and communal. With the stabilization of democracy, the Agrarian Reform (1920–1934) was launched as the modern land policy following the rise of the Mexican Revolution. In 1915, the Agrarian Law was created as a National land policy that ensured communal land tenure through *ejidos* and was an axiom of the Mexican Revolution’s ideals during the 20th Century. The aim of the Agrarian Law was to enable land distribution through the conversion of *haciendas* into *ejidos* as a type of communal land. As stated by Assenatto and de León [30], the *ejido* is a communal land tenure system that ensures the rights to use farmland, conduct collective activities and establish rural settlements. Furthermore, widely used since pre-Hispanic times, the modern *ejido* system granted *ejidatarios* the right to be communal landowners.

Due to its function as a social tenure system, the *ejidos* used to be divided into land for human settlements close to urban populations, communal land protected by the community and agricultural plots that were the basis for *ejido* tenure rights [31]. Therefore, an *ejidatario* was granted the rights to use the land but was not given legal ownership, because all *ejido* land was labeled as National goods. Robles stated that a typical *ejido* comprised 1822 hectares distributed among 104 *ejidatarios*. Normally, an *ejido* of this size would be divided in 134 plots of a maximum of 10 hectares each. The area for human settlements for *ejidatarios* and neighbors to live in had an average of 9.4 hectares per *ejido* [32].

Formerly, in order to acquire *ejidal* rights, a candidate needed to have inhabited and been registered in the rural community. A community assembly supported by a technical committee evaluated each request to be recognized as an *ejidatario*. After three assemblies, each new *ejidatario* was granted circa 8.8 hectares, varying from one geographic location to the other, depending on the availability of fertile land.

Warman’s [17] studies of the 20th century’s agrarian census observed that, throughout the 60 years of the Agrarian Reform history, 50% of Mexican territory was distributed to 3.5 million *ejidatarios* among more than 30,000 *ejidos*. Despite the fairness of the distribution of agricultural land based on an effective land policy, the agrarian economy and the living conditions of the rural population did not improve, as they lacked the ability to carry out further responsible investments in tenure, capital, labor, technology and organization. This meant that, while the *ejido* system did amend land tenure security for peasants and indigenous people, the government subsidies did not result in a reform of labor conditions or in an upgrade of agrarian technology for small producers.

Thus, the Revolution's promise of land justice and land rights was not fulfilled, as the lack of governmental capacity to improve the agricultural economy and the constant socioeconomic struggle in rural areas triggered a simultaneous migration of rural inhabitants to big cities and the U.S. as a permanent feature of 20th century urban growth. This situation has deteriorated since 1992 when the liberalization of *ejido* land and the negotiations of the North America Free Trade Agreement (NAFTA) occurred.

Agrarian reforms have continuously reshaped the distribution of land, for example, the 7000 *ejidos* that existed in 1935 multiplied to 29,983 agrarian nuclei by 1991 at the end of the agrarian distribution. However, their number had decreased to 29,942 by 2007 following neoliberal socioeconomic change [33].

The modification and liberalization of land policies was justified by the Federal government, first as a necessary measure for improving tenure security and allowing the "privatization of communal resources" [34] and second, to regulate informal settlements that were developed in peri-urban *ejido* land. Some large consequences that occurred with the reform of Article 27 from the Mexican Constitution were the expropriation of *ejido* land in the outskirts of the cities for private urban development, land use change from productive agricultural land into massive social housing developments and migration to the United States. According to Vereá [35], "the undocumented population in the U.S. tripled during the NAFTA era." In 1994 there were about 3.8 million illegal Mexicans and this peaked in 2007 with 12.2 million illegal Mexicans. This phenomenon is associated with the introduction of subsidies for foreign farm products, against which small scale farmers were not able to compete.

After the reforms to Article 27 in 1991, the process for recognizing the private property of *ejidatarios* was carried out by local assemblies based on Article 56 of the National Agrarian Law. This legal change transformed the legal protection status of *ejidos* into untouchable and indissociably goods; thus, assemblies were the entity to grant private ownership to *ejidatarios*. The Certification Program for *Ejido* Rights (PROCEDE) (nowadays, the certification program is the responsibility of the National Institute of Sustainable Land, formerly known as CORETT) was the Federal program responsible for the described procedure.

Privatization of *ejido* tenure means, thus, that agricultural and natural land are potentially urban areas. Adding *ejido* and communal land to urban development has occurred through different approaches, described by Riveros Frago in terms of their urban impact, ecological implications, transformation of the rural economy, socioeconomic issues, land policies and governance accountability [36]. The legal and tenure approach, however, has not been addressed before, although it is essential to get an integral understanding of the implications of the urbanization of the rural world.

Riveros Frago identified three main periods for *ejido* land incorporation into urban land use—1940–1973 (irregular tenure), 1970–1992 (regularization of *ejidos*) and 1992 until today (de-regularization of *ejidos*). During this latter period, the last *Ejidal* Census of 2007 counted 3,097,658.83 hectares of *ejido* land sold to buyers outside of rural communities. From 2017, the Agrarian Census recorded a decrease in the number of *ejidos* in Mexico from more than 31,000 to 28,000. While the number of *ejidos* has decreased at a rate of 10% over the last ten years, more than 198.5 million hectares of the National territory are still communal-based land tenure, such as *ejidos*.

These conditions were faced in the municipalities of San Pedro Cholula and San Andrés Cholula in the Metropolitan Area of Puebla-Tlaxcala, where the lifestyles of the rural population changed radically when the regional Government expropriated in 1993 [37–39]. Specifically, 1092 Hectares of *ejido* land was used for the implementation of an urban development plan called "Programa de Ordenamiento Territorial Angelópolis" (PROTA)—commonly known as *Plan Angelópolis*.

The implementation of PROTA was an exemplary case of urban planning in Mexico that shaped urban growth and gave tenure security to *ejidatarios* and farmers. Nonetheless, during its implementation, the plan triggered the fragmentation of *ejidos* and the segregation of the rural population [18]. These twin effects fueled the current debate about modern land policies in Mexico and the extent to which they promote urban-private development in the country.

4. Methods—Quantification and Analysis of Case Study Areas

4.1. Case Study Descriptions

The municipalities of San Andrés Cholula and Santa Clara Ocoyucan are part of the Metropolitan Area of Puebla-Tlaxcala, located 120 km from Mexico City. Both towns share a physical conurbation with the city of Puebla and had a largely agricultural economy until the late 20th Century (Figure 1).

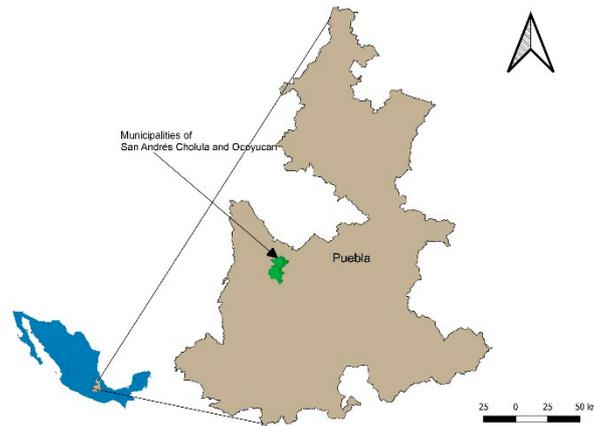


Figure 1. Locations of the case study areas in Mexico.

Due to the liberalization of *ejido* land, in 1992, Puebla's Government created a metropolitan plan that was first called Programa Regional de Ordenamiento Territorial Angelópolis (PROTA) and then updated to Programa de Desarrollo Regional Angelópolis (PDRA). As part of this plan, the land reserve "Reserva Territorial Atlixcáyotl-Quetzalcóatl" was created through a sub-regional implementation plan, Programa Sub-regional de Desarrollo Urbano de los Municipios de Cuautlancingo, Puebla, San Andrés Cholula y San Pedro Cholula (PSDUM), in 1994 (the PSDUM was updated five times—in 1997, 1998, 2000, 2004 and 2011). This sub-regional plan managed future urban growth for several municipalities and promoted housing development to fulfil immediate population needs.

For the creation of the land reserve, 1092 hectares of *ejido* land from the region of Cholula—from the municipalities of Cuautlancingo, San Pedro Cholula and San Andrés Cholula—were expropriated [40]. In addition to the mentioned municipalities, the master plan included 33 other localities with the purpose of generating the first integrated metropolitan development plan through PROTA [41]. Locally, the urban development plan was carried out through PSDUM [42] in which, for the first time, the urban context was considered as a whole. At regional and municipal levels, urban development plans are the most important implementation instrument. Thereupon, without operative programs, plans are ineffective, especially at a local level, as they must contend with the construction regulations, land uses, density, zoning and cadaster included in the municipal urban development programs.

In 1995, San Andrés Cholula began its urban metropolization process with the implementation of PDRA and Santa Clara Ocoyucan. This mainly occurred from 2010 onwards when private developers bought cheap *ejido* land in order to catalyze urban development. The names and sizes of *ejidos* from both municipalities are presented in Table 3.

In 2018, the Sustainable Urban Development Program of San Andrés Cholula recognized 5943.95 Ha (95.63%) of the municipal territory as being private property and the remaining 271.53 (4.37%) as being *ejido* tenure [41]. On the other hand, according to the 2016 *Ejidal* Census, the land tenure system in Santa Clara Ocoyucan consisted of mainly *ejido* tenure (5533.44 Ha, 52.76%) and only 1603.70 Ha (15.29%) of privately owned land from a total of 10,487 Ha of municipal territory. The remaining land was the natural reserve of Sierra del Tentzo [43,44].

Although Santa Clara Ocoyucan was not considered part of PDRA implementation and urban growth, the housing market demand turned the area into a new area for residential development

due to the flexibility of the urban regulations—a legacy of its status as a former rural municipality. Nowadays, both locations present a modern urban image with luxury residential areas and towers, gated communities and several shopping and entertainment centers. Table 2 shows the population growth in the case study areas in order to allow readers to visualize the extent to which both municipalities have developed in comparison to the main urban core, Puebla and the whole Metropolitan Area of Puebla-Tlaxcala. The latest statistics are based on the National Census of 2010, Metropolitan Statistics from CONAPO (Consejo Nacional de Población – National Population Council) [45] and National Polls from 2015 [46,47]; however, it would be worthwhile monitoring the results from the next National Census in 2020.

Table 2. Population Growth and density. Source: INEGI (2010, 2015), CONAPO (2018).

Municipality	1990	2000	2010	2015	DENSITY
San Andrés Cholula (77.182 km ²)	37,788	56,066	100,439	137,290	2171.7 pop/km ²
Pop. Growth	2.5%	5.8%	7%		
Santa Clara Ocoyucan (120.165 km ²)	17,708	23,619	25,720	28,220	214 pop/km ²
Pop. Growth	2.9%	0.8%	2.0%		
Puebla (Capital) (548.889 km ²)	1,057,454	1,346,916	1,539,819	1,576,259	2805.34 pop/km ²
Pop. Growth	2.5%	1.3%	0.6%		
Metropolitan Area of Puebla-Tlaxcala (2394.4 km ²)	1,776,884	2,269,995	2,728,790	2,941,989	76.6 pop/Ha
Pop. Growth	2.5%	1.8%	1.6%		

4.2. Geo-Visual Analysis from Satellite Images

How much of the rural territory of San Andrés Cholula and Santa Clara Ocoyucan is now urban? As shown in Table 3, data from INEGI (Instituto Nacional de Estadística y Geografía – National Institute of Statistics and Geography) show the exponential population growth of San Andrés Cholula and Santa Clara Ocoyucan compared to that of other areas, demonstrating that both municipalities are attractive places for new incomers.

Table 3. Names and sizes of *Ejid*os in San Andrés Cholula and Santa Clara Ocoyucan. Source: VII *Ejidal* Census.

Municipality and <i>Ejid</i> os before 1995	Total Hectares of <i>Ejid</i> os in 1995	Urban Development after 1995	Total Hectares of <i>Ejid</i> os Transformed into Urban Areas From 1995 to 2018
SAN ANDRÉS CHOLULA			
<i>Ejido</i> San Andrés Cholula	1986.00	Land Reserve Atlixcáyotl—PSDMU Several gated communities, high-towers and retail areas	1222.00
<i>Ejido</i> San Bernardino			
Tlaxcalancingo			
SANTA CLARA OCOYUCAN			
<i>Ejido</i> Emilio Portes Gil	3614.50	Lomas de Angelópolis (gated community developed by Grupo Proyecta)	4204.00

In order to visualize the urban growth in the case study areas, we made use of satellite images of the urban settlements. We used images from the satellites Landsat 5 and Landsat 8 from dates corresponding to summers of 1995 and 2018 to measure the urbanization of *ejido* and rural land and to determine the total area used.

The digital level values of all images were converted to Top of Atmosphere Radiance (TOAR). The use of the Dark Object Subtraction (DOS1) method in QGIS 2.18 was necessary to correct the atmospheric effects. To obtain the total farmed area and urban area per year, as well as its geographical location, we used a supervised classification—the maximum likelihood algorithm of GRASS GIS 7.4—and categorized each of the images into four groups—cultivation area, urban area, soil area and vegetation area.

We applied the method developed by Olofsson et al. [48] to validate the classification and estimation area of each category. The method includes calculating the sample size and assigning it to the coverage type categories based on the best result of five hypothetical assignments. Moreover, to assign the land-use of reference coverage, we performed a visual inspection of each of the sample units using a set of Landsat images together with Google Earth™ images with a difference of 3 months per 2018 image. Google Earth™ 1995 satellite images were available. In accordance with Olofsson et al. [48], after the visual inspection, we calculated the estimation area and error through pixel precision using the confusion matrix relative to the confidence intervals. This procedure was followed for both images from the total study area and for each of the previously determined sub-areas using a confidence interval of 95% and a standard error of 0.015 for the sample size calculation.

Five possible “allocations” were constructed for each year, with an average of 800 samples distributed over four classes per year, based on the confusion matrix suggested by Olofsson et al. As a result, for each class, we obtained the total estimated area and a 95% confidence interval, as described in Table 4 and Figure 3.

Table 4. Sampling Size calculation for the case study areas according to Olofsson’s method. Source: David A. González-Rivas (2019).

<i>Ejido Santa Clara Ocoyucan</i>				
STRATA	Hectares	Land use development	95% confidence interval	95% confidence interval
		Cultivation area		
1995	6665	41.70% (Overall Average)	562 Hectares	8%
2018	4012	25%	255	6%
		Urban		
1995	1230	7.7%	203	16%
2018	4204	26.30%	343	8%
		Soil (vacant)		
1995	1756	11%	234	13%
2018	1032	6.5%	264	26%
		Vegetation		
1995	6336	39.63%	563	9%
2018	6739	42.20%	383	6%
TOTAL	15,987	100%		
<i>Atlixcáyotl-Quetzalcóatl Land Reserve</i>				
STRATA	Hectares	Land use development	95% confidence interval	95% confidence interval
		Cultivation area		
1995	811	66% (Overall Average)	31 Hectares	4%
2018 (Vacant Land)	447	36%	46	10%
		Urban		
1995	410	33%	31	7%
2018	775	63%	46	6%
Total	1222	100%		

5. Results and Discussion

5.1. First Statement—Ejido Land Was and Still Is Potential Privately Developable Land

From 1995 to 2018, how much *ejido* land from San Andrés Cholula and Santa Clara Ocoyucan was transformed into urban areas? According to Figures 3 and 4 and Table 3 (in Table 4, we recorded 1222 Hectares rather than 1092 because some selected plots correspond to the Atoyac River being used as a boundary for the land reserve), the land uses of the *ejidos* changed radically over a period of 23 years. The Santa Clara Ocoyucan *ejido* devoted 41.7% of its territory to farming in 1995 but this had decreased to 25% by 2018. Its urban area, which accounted for only 7.7% of the territory in 1995, increased to 26.3% by 2018 due to the construction of the “Lomas de Angelópolis” gated community.

In 1995, 33% of the Atlixcáyotl-Quetzalcóatl land reserve (shared with San Pedro Cholula and Cuautlancingo municipalities) in San Andrés Cholula was classified as urban and 66% as farmland.

In contrast, in 2018, 63% of the land reserve was classified as urban while the remaining 36% of farmland had changed its land use to vacant land for development. In addition, the Atoyac River was the natural border between San Andrés Cholula and the city of Puebla. However, the transfer of 38,100 Hectares of San Andrés Cholula's land reserve to the city of Puebla in 2014 by the Local Congress [49] changed the territory's shape and value, as the ceded territory in 2019 is one of the most lucrative and expensive areas in terms of tax and cadastral value [50].

In Figure 2, the Atlixcáyotl-Quetzalcóatl land reserve is shown at the moment of expropriation in 1995 in blue. According to PSDUM, this land reserve shares its boundaries among San Andrés Cholula, San Pedro Cholula, Cuautlancingo and the conurbation with the City of Puebla. The two other main *ejidos* from San Andrés Cholula and Santa Clara Ocoyucan, the *ejido* of San Bernardino Tlaxcalancingo and the *ejido* of Santa Clara Ocoyucan, are delineated in red.

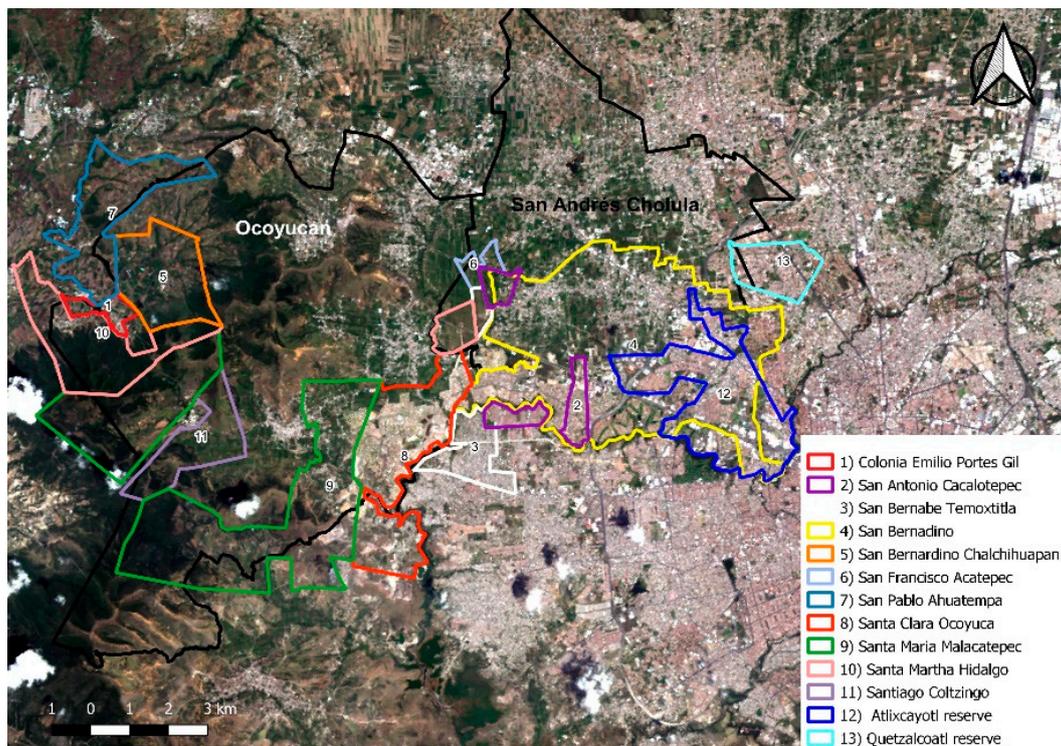


Figure 2. Distribution of Ejidos in San Andrés Cholula and Santa Clara Ocoyucan.

Figures 3 and 4 show the spatial development of the *ejidos* and rural areas in San Andrés Cholula from 1995 (a) until 2018 (b). It is striking that the land reserve is now almost completely built up and developed. For Santa Clara Ocoyucan, the *ejido* demarcated in red has been completely urbanized by the “Lomas de Ángelópolis” gated community. In the satellite image, Santa Clara Ocoyucan shows up as a rural municipality with small urban cores; however, this municipality was not part of the PROTA or PSDUM plans but it was progressively urbanized as a crossing municipality to the city of Atlixco.

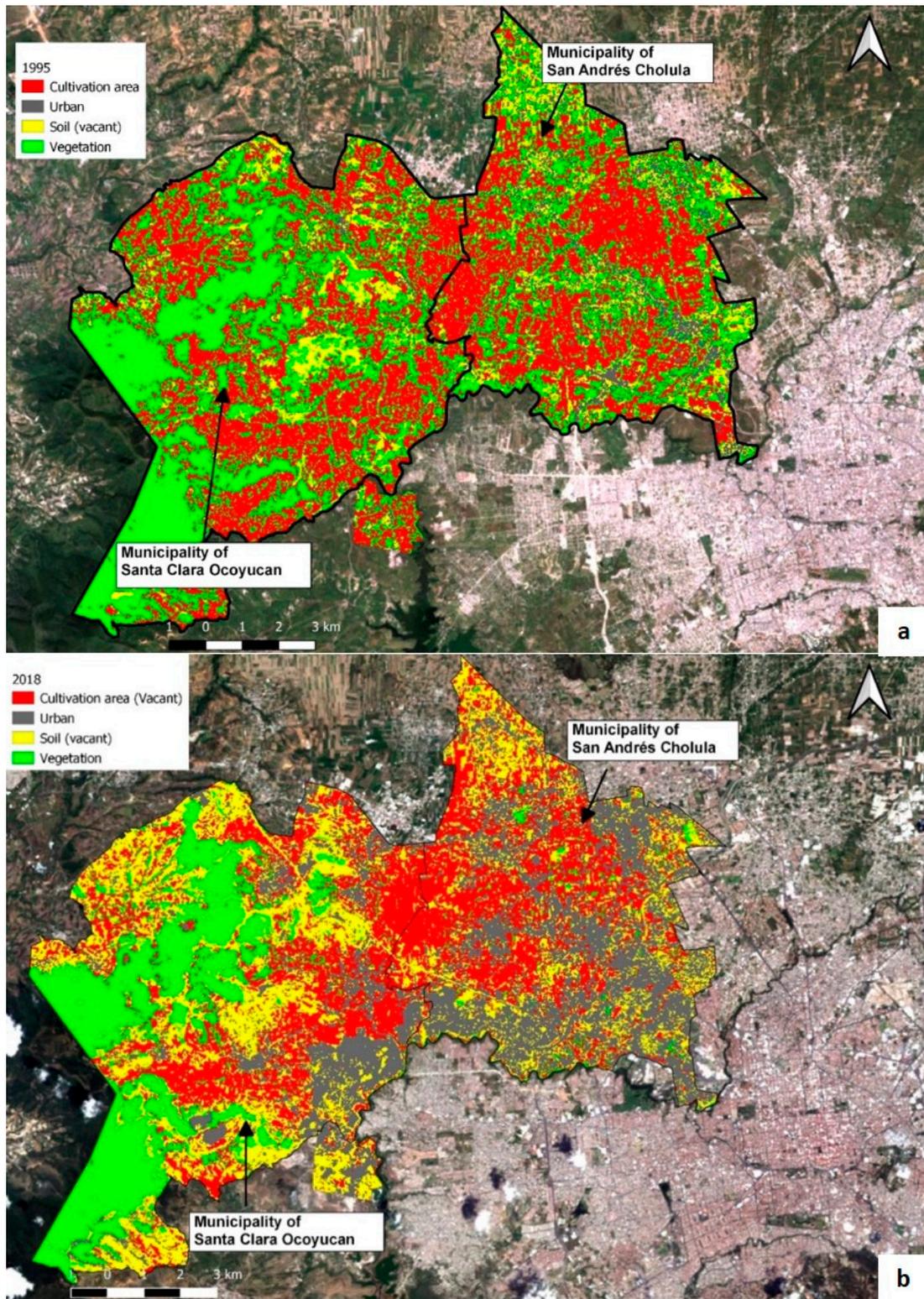


Figure 3. Land use classification data in (a) 1995 and (b) 2018.

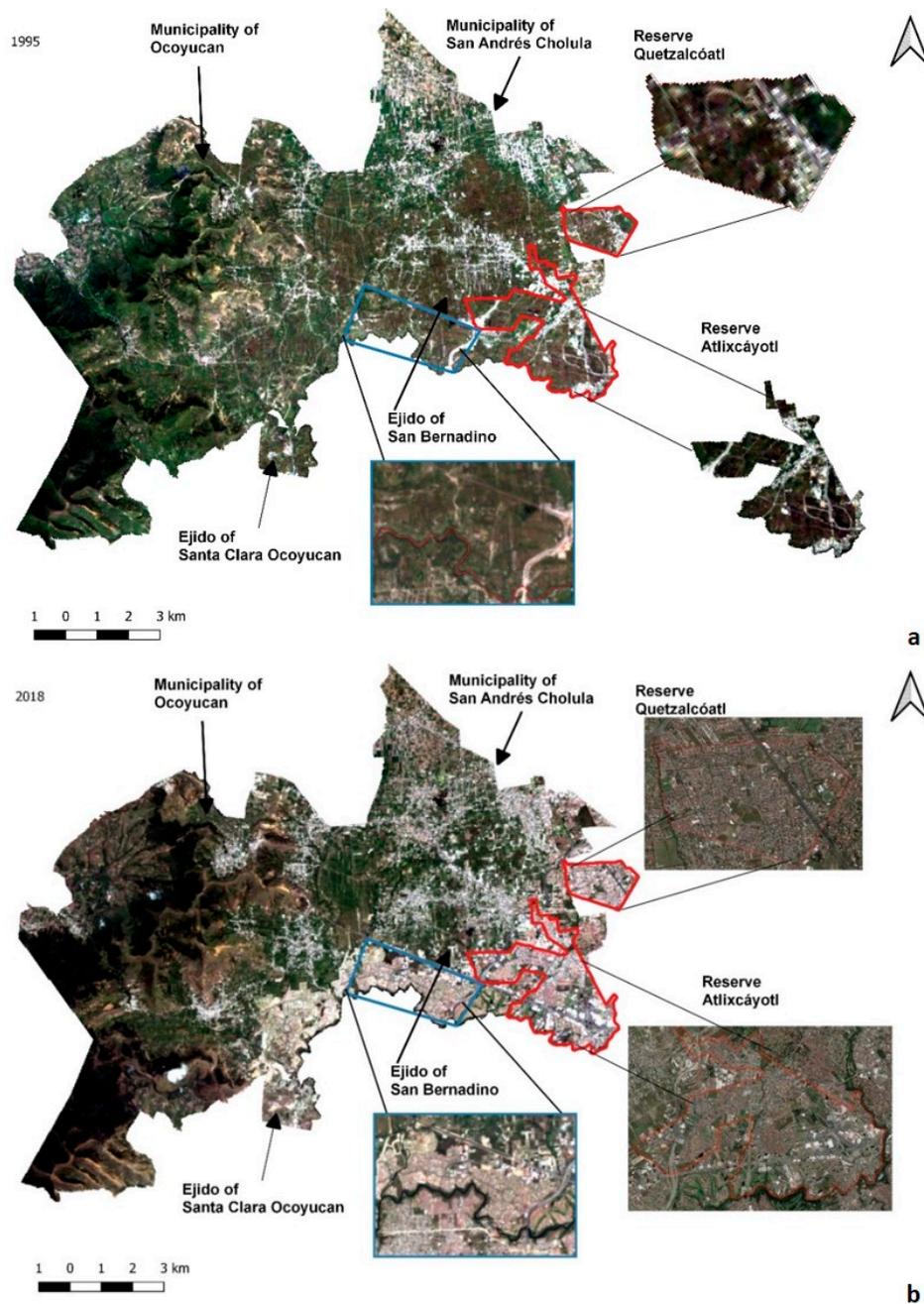


Figure 4. Spatial development in (a) 1995 and (b) 2018.

The *ejidos* of San Andrés Cholula and Santa Clara Ocoyucan are used as case studies to display planned versus private sector development over former communal land tenure. Additionally, the motorway to Atlixco acts as a route encouraging urban growth, while the natural reserve “Sierra del Tenzo” is the border that prevents gated communities from being conurbated with Atlixco. Despite this, the “Lomas de Angelópolis” gated community is reaching Santa Clara Ocoyucan, as displayed in Figure 3.

The Atoyac River is an urban–rural fringe of the municipality of Puebla, which serves as a natural border at the east of the land reserve and “Lomas de Angelópolis.” As shown in Figures 2 and 3, this border territory became highly dense and the border that corresponds to “Lomas de Angelópolis” has many informal settlements of low-income socioeconomic groups. In contrast, “Lomas de Angelópolis” is an area populated by middle- to higher-income groups.

With the presented data, we may state that most of *ejido* land can be converted into developable land, especially that in Santa Clara Ocoyucan and its peri-urban communities.

5.2. Second Statement—Land Tenure Changes Benefit Private Developers

When the first expropriations began in 1989 in San Andrés Cholula, the government paid 0.90 Mexican Pesos per m² of agricultural land. Later on, in 1993–1994, after the protests by the populations of the local rural communities, the price went up to 21.00 Mexican Pesos per m². The State government then sold the land to private developers to make a profit. Private developers, in turn, were already re-selling the same land extensions as residential lots for 9500 Mexican Pesos (500 US dollars) per m² [51]. By 2017, the cadastral value of the land occupied by the real estate business in “Lomas de Angelópolis” area had reached a minimum price of 8,044.00 Mexican Pesos per m² in the commercial zone and 6002.00 Mexican Pesos per m² in the residential area [52].

Regarding the commercial value, current real estate advertisements reveal that, to date, the best located commercial land in this zone is sold for 19,178.95 Mexican Pesos (1000 US dollars) per m² and in the residential area, land is sold for 7000.00 Mexican Pesos per m² to up to 18,000.00 Mexican Pesos per m² [53]. How have the local communities profited from this increment of land value? They have simply traded their lands and their usufruct for a ridiculously low amount of money while the private sector is profiting from the *ejidatarios*’ loss. As the economic interests are constantly threatening the coexistence between the rural and urban worlds, socio-economic conflicts have arisen in the border areas between the different cells of the urban “galaxy,” where the threat for more expropriation is latent.

This condition can be observed in the Atlixcáyotl-Quetzalcóatl Land Reserve and in the Santa Clara Ocoyucan municipality. Because of *ejido* urbanization and land privatization, groups of landowners have imposed ethical, aesthetic, lifestyle and racial limitations inside residential ghettos. Former *ejidatarios* and peasants are forced to sell their lands, leave their rural communities and abandon agricultural activities to work for new householders and landowners. Those stakeholders are linked to land use change that works according to their interests and needs.

A number of positive and negative aspects are generated when land tenure change is used as an instrument for private development, as summarized in Table 5.

Table 5. Positive and negative aspects of the urbanization of Ejidos in the case study areas. Source: Melissa Schumacher (2019).

Key Aspects and Stakeholders	San Andrés Cholula		Santa Clara Ocoyucan	
	Positive aspects	Negative aspects	Positive aspects	Negative aspects
PSDMU (urban plan) → Local authorities	Plan that managed urban growth	Did not consider local needs Regulations were updated according to private needs.	New urban land uses for tax collection.	Urban plan made to benefit urban developers and urban sprawl beyond land reserve
Private master plans → Private investors	National investment	Land use change to benefit land speculation	Local and National investment in infrastructure and housing	Construction of gated communities and luxury buildings that isolate local communities
Cadastral and market values → Local authorities and real estate developers	Higher market value, more taxation	Speculation with land market value	Added value through land use change	Cheap <i>ejido</i> and rural land in the borders
Rural communities → Ejidatarios and land owners	Added value to land	Expropriation, migration to the USA and abandonment of agricultural activities Socio-spatial segregation	Added value to land	Land speculation and intimidation by developers Abandonment of agricultural activities
New incomers → New inhabitants and local population	Modern areas to live and work in with private security	Very expensive area to buy or live in	Residential areas with new houses, parks, schools, leisure and entertainment areas with private security	Socio-spatial segregation Not integrated with local communities

5.3. Third Statement—Spatial Segregation beyond Peri-Urban Morphology

Which types of cities are emerging from the urbanizations of *ejidos*? As analyzed in former figures, the market pressure is guiding urban sprawl for gated communities through infrastructure. This condition is changing peri-urban morphology due to the imposition of the urban pattern while *ejido* land is put under real estate pressure. Hence, the process of privatization of *ejidos* is shaping five different morphologies for urban growth.

In the *ejido* of Santa Clara Ocoyucan, the rural plots are aligned in a linear grid network perpendicular to water streams, that has adapted to the contour lines of the topography. In *ejido* tenure, edification in productive farmland is not allowed. As a result, rural settlements tend to follow a PE (according to Solà-Morales, U is for Urbanization, meaning the introduction of urban services, furnaces and infrastructures; P is for Parcelation, denoting the subdivision of the land; and E is for the Edification of buildings) [54] pattern in a linear tree network from a livestock road that delimits the cultivation area of plots and encircles the rhithron of the runoffs. Densification of the rural core follows a corridor cellular pattern in an organic manner, as in type 1 “Organic Pattern” (Figure 5).

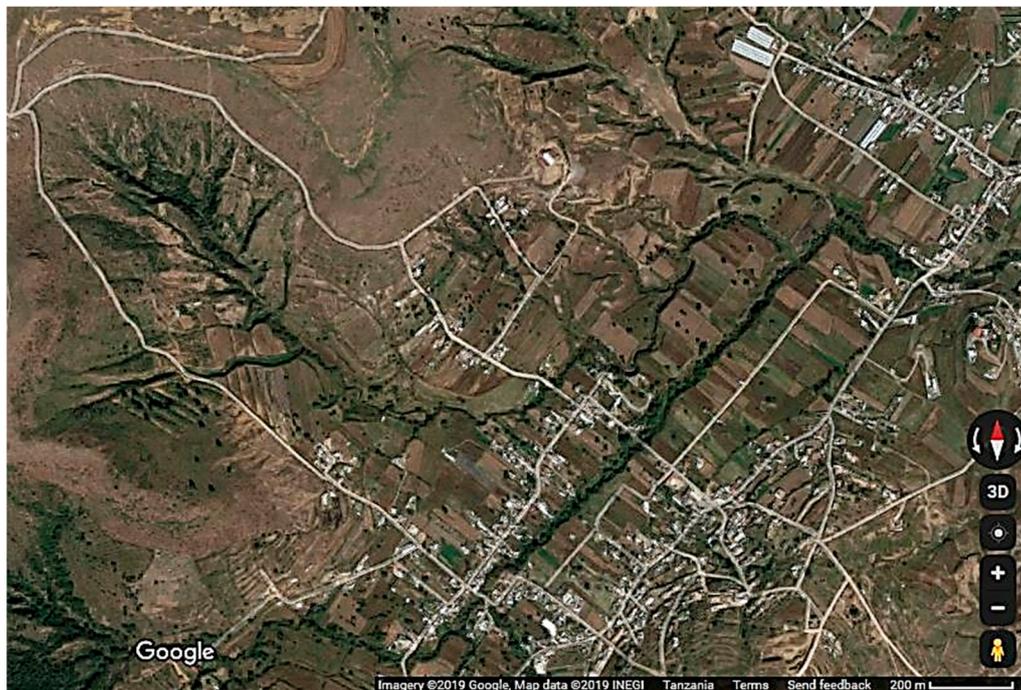


Figure 5. Ejido of Santa Clara Ocoyucan. Source: Google Maps (accessed on 23 July 2019). Land use: Rural–farming land; Tenure System: communal land/*ejido*; Stakeholders: *Ejidatarios*.

Type 1: Organic Pattern

When an *ejido* is regularized, urban growth reaches it and the former livestock roads transform into urban infrastructures, activating the edification of single-family housing over the farmland plots in a U+P+E pattern, as seen in type 2 “Ribbon Pattern” (Figure 6). As growth by polarization materializes, the plot is densified with further edification of informal single-family houses, typically inhabited by the extended family of the farmer. This marginally urbanized P+E pattern respects the sizes, shapes and orientations of the parcels, although it is not necessarily aligned to the roads; thus, it follows a free corridor matrix within the boundaries of the plots, as in type 3 “Corridor Matrix” (Figure 7).



Figure 6. Built Ejido land in Santa Clara Ocoyucan. Source: Google Maps (accessed 23 July 2019). Land use: Rural–farming land; Tenure System: Communal land/*ejido*; Stakeholders: *Ejidatarios*, Rural population, Local authorities.

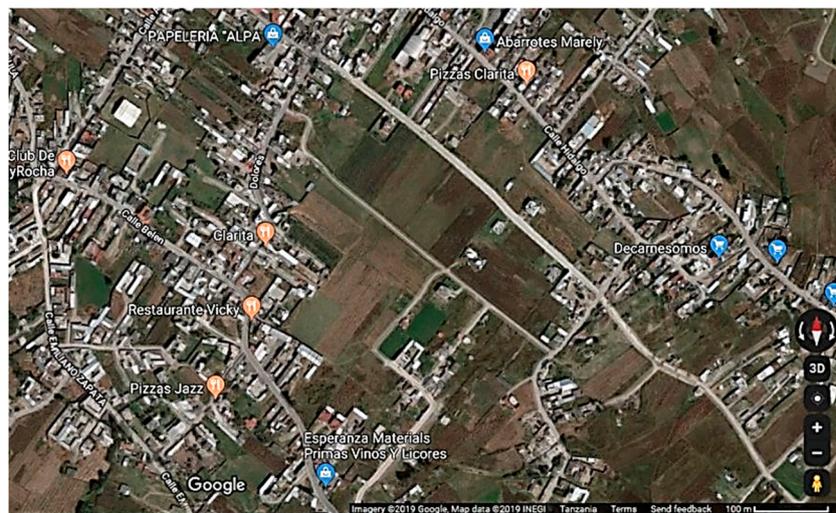


Figure 7. Informal housing in *Ejido* in Santa Clara Ocoyucan. Source: Google Maps (accessed 23 July 2019). Land use: Rural–informal; Tenure System: Regularized *ejido*; Stakeholders: *Ejidatarios*, Landowners, Local authorities, Regularization agency (Institute for Sustainable Land).

Type 2: Ribbon Pattern

Type 3: Corridor Matrix

The regularization of *ejidos* catalyzes a land use change from rural to urban. In cases such as San Andrés Cholula where the *ejido* land of Atlixcáyotl was part of the land reserve for further urban housing, the extension of infrastructures triggered an ordered grid of urban growth usually radiating from the different highways and ring roads that fracture the territory and overlap with the rural parcels; thus, the edifications tend to be middle-class housing aligned to the parcels and roads in order to occupy most of the surface of the plot. This morphology follows a suburban U+P+E pattern and could either shape an axial lattice or cell strands, depending on the urban clusters and their public spaces, as seen in type 4 “Cluster Zoning” (Figure 8).

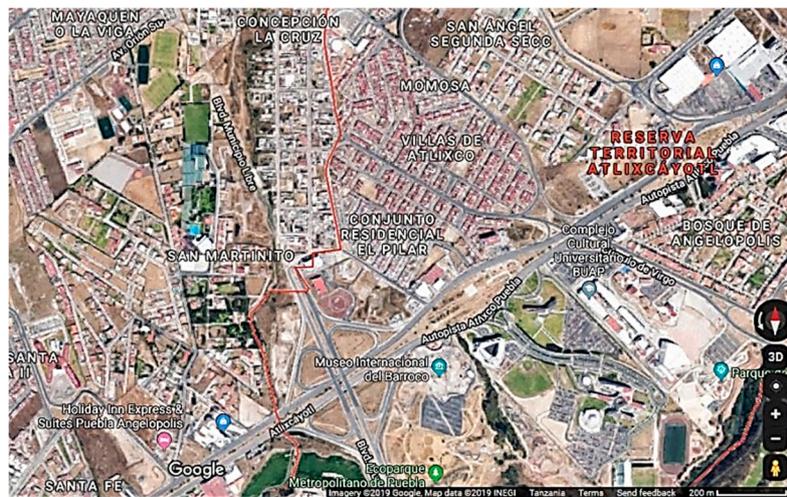


Figure 8. Middle class housing in Atlixcáyotl. Source: Google Maps (accessed 23 July 2019). Land use: Urban, commercial services, Middle-class and social housing; Tenure System: Expropriated *ejido* for urban development; Stakeholders: *Ejidatarios*, Regional authorities, Regularization agency (Institute for Sustainable Land), Private developers.

Type 4: Cluster Zoning

In the case of Santa Clara Ocoyucan, the urban pressure from the gated community of “Lomas de Angelópolis” coming from the west is evident, as shown by the UP+E urbanization model, with branched cul-de-sac and crescent street types of the garden city outlined over the rural land, regardless of the orientations, sizes or shapes of the rural plots of the original *ejidos*. As seen in Figure 10, the traced streets of “Lomas de Angelópolis” remain open for further development of *ejido* land. This pattern is archetypal of private tenure, as seen in type 5 “Gated Community” (Figure 9).



Figure 9. “Lomas de Angelópolis” Engulfing Santa Clara Ocoyucan. Source: Google Maps (accessed 23 July 2019). Land use: Gated community; Tenure System: Regularized *ejido* transformed into individual private ownership; Stakeholders: *Ejidatarios*, Landowners, Regularization agency (Institute for Sustainable Land), Private developers.

Type 5: Gated community

As illustrated in Figure 10, and based on the results of the case studies, new territorial dynamics are driven by different schemes of land tenure, which means that a strong trend in private urbanization is driving hyper-speculation practices that are leading to the exponential growth of gated communities and urban developments with flexible construction regulations and no local planning.

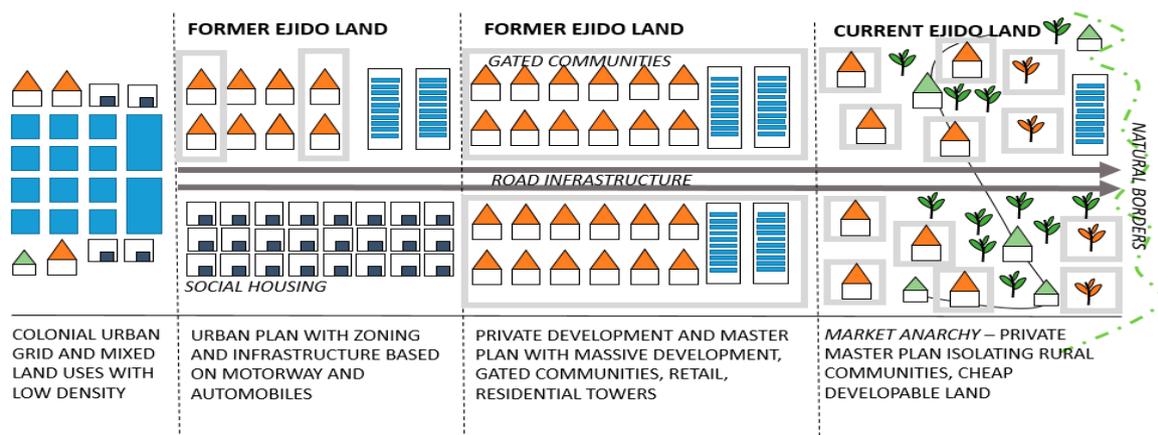


Figure 10. Segregation and urbanization model of former Ejido land. Source: Melissa Schumacher (2019).

This leads us to question whether gated communities benefit or jeopardize land management. The logic behind any closed community—regardless of its scale—goes against the principles of a healthy urban fabric. In other words, the mixture of people and land use are threatened by the private sector, which is unconcerned with the socio-spatial effects. Furthermore, this new model implies the arrival of a new urban population and often generates null integration and instead leads to local population dispersal.

The activation of urban growth by the private sector over former *ejido* land was a trend initiated by flexible local policies, which enabled land privatization and the transformation of agricultural land into urban land. The roles of the public sector and local administrations as key stakeholders in this process are highly questionable. Historically, land tenure was based on obtaining common good for rural communities after the Mexican Revolution but through neoliberal economic reforms, land tenure has become fundamental for economic development and urban growth. These changes caused the loss of good urban–rural public spaces as elements that contribute to the construction of a healthy urban or rural–urban fabric [55], as in our case study areas. If these common public spaces are not considered for new land tenure schemes, territories are condemned to the disappearance of public areas as spaces for community and identity construction. Jeopardizing these features entails the loss of socio-cultural cohesion.

6. Conclusions

Our case study areas, San Andrés Cholula and Santa Clara Ocoyucan, exemplify how traditional *ejidos* are being developed through different urbanization process yet with analogous results. This means that, although both case studies should have benefited from the liberalization of *ejidos* in terms of securing land tenure, San Andrés became urbanized through land expropriation and Santa Clara Ocoyucan succumbed to market pressure through urban development driven by the private sector. The consequences for both municipalities were similar: the segregation of peri-urban communities, a rise in land value and weak local policies.

The utilization and choice of the theoretical and analytical framework based on stakeholders as agents of socio-spatial change and a visual geo-analysis of satellite images has proven useful and allowed us to answer to our research questions, as depicted below.

I. How much *ejido* and rural land has been used for urban development in the case study areas? It has proven difficult to estimate the precise percentage of *ejido* and rural land that has undergone land use change to favor urban development, as the municipal urban development programs, the *Ejidal* Census, the National Geo-statistics Institute and PROTA show varying figures. However, the data prove that local urban plans have benefitted infrastructure and zoning development for private developers through tenure change, transforming roughly 60% of San Andrés Cholula's and up to 100%

(which expands to the 16% of the agricultural land beyond *ejido* tenure) of Santa Clara Ocoyucan's productive agricultural land into urban area.

II. How does land tenure change shape urban growth in Mexico? Land tenure changes are shaping urban growth in the form of five different urban patterns that replace the rural plots and materialize as cluster zoning and gated communities when private developers are among the stakeholders, as a consequence of market pressure reaching *ejidos* after land tenure changes.

III. Which model of urbanization has emerged from this? The current urbanization model has its origin in the liberalization and expropriation of *ejido* land 30 years ago and entails no boundaries between formal and informal peri-urbanization. It responds to private developers' demands but tends to disregard the needs of *ejidatarios*, rural landowners and local populations, since cluster zoning and gated communities do not follow the organic array of the land's biophysical matrix, nor do they consider cultural heritage or available resources—and thus compromise current and future food security. Moreover, the new urbanization model, with the use of gates and fences, prevents the integration of rural and urban lands and limits the access of the native rural population to the newly built urban infrastructures.

This research concludes that stakeholders are both proactive actors of change as well as indirect actors of change. They play a key role, where *ejidatarios*, investors and local land policies create a new urbanization model ruled by the private sector and market forces, who decide where, how and when land will be developed. Our findings support that the optimization of capital has been a key driver of change and a crucial common element among stakeholders in decisions to approve and accept *ejido* and rural land for urban conversion. The planning operations carried out by PROTA seem to have contemplated only the participation of the private sector, following an economic developmental logic valid only for investment. However, the excessive participation of the sector has not only led to the extinction of *ejidos* but has also small rural communities at risk, as they have become isolated in their own territories.

Our recommendation for further research is to study the tools and means to regulate the urbanization of *ejido* land, considering the following key issues:

IV. Remote sensing: A deeper study of SPOT images with 15 m precision for smaller spaces within the metropolitan areas around the case studies, for a more accurate detection of land uses at edification level is required. Due to the unavailability of digitized geographical information about land tenure changes, we strongly suggest overlapping cadastral and land use maps to the SPOT images in order to appreciate the land tenure changes in regular and informal settlements. This procedure would allow the spatial visualization and accurate quantification of the extension of *ejido* land that has been urbanized after privatization.

V. Transparency and land governance: Based on the challenges we faced while gathering reliable data for this study, attributable to the data inconsistencies between the municipal development plans, the municipal programs for urban sustainable development, INEGI *Ejidal* Census and the National Agrarian Registry, it is necessary to set the basis for the normalization of geographical data and cadastral maps among the different local, regional and national institutions to enable a better access to more consistent information. This initiative would support the transparency on the formulation, implementation and enforcement of land policies and on tracing responsible land management strategies.

VI. Stakeholders' accountability: Grounded on López-Tamayo and Harvey's understanding that stakeholders are agents of socio-spatial change, we suggest a participatory planning approach on *ejido* interventions which should involve active stakeholders and members of the local *ejidal* community. Considering the New Urban Agenda from Habitat III [56] and the Principles for Responsible Investment in Agriculture and Food Systems (CFS-RAI) [57] would form a suitable environment of responsible investment on *ejido* land. With these guidelines in mind, the policies, laws, regulations and institutional framework should establish a strategy for socio-economic development that legitimizes *ejidatarios'*

tenure rights. Identifying the roles and accountability of the different stakeholders is fundamental for creating an enabling environment with changes that benefit the community.

The urban development promoted by public policies should privilege the improvement of current socio-economic conditions of the local population through long term strategies focused on economically and environmentally sustainable land use, renovated agricultural production practices, egalitarian urbanization considering bottom-up planning strategies and legal regulations protecting communities from external commercial and economic pressures. The public policy should thus develop new prosperity models for *ejido* land instead of regarding it as a potential source for fast economic benefits reached through expropriations and other state-directed maneuvers that promote excluding urbanization processes.

Author Contributions: Conceptualization, M.S. and P.D.-D.; methodology, M.S. and D.A.G.-R.; validation, D.A.G.-R.; formal analysis, P.D.-D. and A.K.K.; investigation, M.S., P.D.-D. and E.G.-J.; resources, E.G.-J.; data curation, E.G.-J.; writing—original draft preparation, M.S. and P.D.-D.; writing—review and editing, M.S. and P.D.-D.; visualization, D.A.G.-R.; supervision, A.K.K.; funding acquisition, M.S. and P.D.-D.

Funding: This work was supported by the Science and Technology Council of State of Puebla (CONCYTEP), the German Research Foundation (DFG) and the Technical University of Munich (TUM) in the framework of the Open Access Publishing Program.

Acknowledgments: The authors would like to thank Teodoro Schumacher, Nicolás López Tamayo for their knowledge regarding *ejido* history and the current situation of the rural world in Mexico. We would also like to express our gratitude to Walter Timo de Vries, Karl Hughes and the MDPI English editing service for their comments and suggestions when proofreading this paper.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Appendini, K., II. La transformación de la vida rural en tres ejidos del centro de México (II. The transformation of rural life in three *ejidos* in central Mexico). *Rural. Sin Agric.* **2008**, *27*–58.
2. Simpson, E.N. The Ejido: Mexico's Way Out. Ph.D. Thesis, The University of North Carolina, Chapel Hill, NC, USA, 1937.
3. Warman, A. *El Campo Mexicano en el Siglo*; Fondo de Cultura Económica: Mexico City, Mexico, 2001.
4. Karst, K.L.; Clement, N.C. Legal institutions and development: Lessons from the Mexican Ejido. *Ucla L. Rev.* **1968**, *16*, 281.
5. Singelmann, P. Rural collectivization and dependent capitalism: The Mexican collective Ejido. *Lat. Am. Perspect.* **1978**, *5*, 38–61. [[CrossRef](#)]
6. Cord, L.; Wodon, Q. Do agricultural programs in Mexico alleviate poverty? Evidence from the ejido sector. *Cuad. Econ.* **2001**, *38*, 239–256. [[CrossRef](#)]
7. Torres-Mazuera, G. La territorialidad rural mexicana en un contexto de descentralización y competencia electoral. *Rev. Mex. Sociol.* **2009**, *71*, 453–490.
8. Torres-Mazuera, G. Transformación identitaria en un ejido rural del Centro de México. Reflexiones en torno a los cambios culturales en el nuevo contexto rural. *Rural. sin Agric.* **2008**, 239–255.
9. Méndez-Lemus, Y.; Vieyra, A.; Poncela, L. Periurbanization, Agricultural Livelihoods and Ejidatarios Social Capital: Lessons from a Periphery Municipality in Michoacán, Mexico. *Procedia Eng.* **2017**, *198*, 428–443. [[CrossRef](#)]
10. Jones, G.A.; Ward, P.M. Privatizing the commons: reforming the ejido and urban development in Mexico. *Int. J. Urban Reg. Res.* **1998**, *22*, 76–93. [[CrossRef](#)]
11. Olivera, G. *La Urbanización Social y Privada del Ejido. Ensayos Sobre la Dualidad del Desarrollo Urbano en México*; Universidad Nacional Autónoma de México: Mexico City, Mexico, 2015.
12. Iracheta, A.X. Acceso a terrenos con servicios para los pobres urbanos: la paradoja de la regularización en México. *Econ. Soc. Y Territ.* **2000**, *II*, 754–789. [[CrossRef](#)]
13. Alarcón, A.R. La organización ejidal en el desarrollo rural de México. *Estud. Agrar.* **2015**, *59*, 181–204.
14. Stanford, L. The privatization of Mexico's ejidal sector: Examining local impacts, strategies and ideologies. *Urban Anthropol. Stud. Cult. Syst. World Econ. Dev.* **1994**, *23*, 97–119.

15. De Grammont, H.C. El campo mexicano a finales del siglo XX (The Mexican Countryside in the Late 20th Century). *Rev. Mex. Sociol.* **2001**, *81*–108. [CrossRef]
16. Morett-Sánchez, J.C.; Cosío-Ruiz, C. Panorama de los ejidos y comunidades agrarias en México. *Agric. Soc. y Desarrollo.* **2017**, *14*, 125–152. [CrossRef]
17. Warman, A. Mexican land reform: a long-term perspective. *L. Reform L. Settl. Coop.* **2003**, *84*, 95.
18. Schumacher, M. Peri-urban development in Cholula, Mexico: towards a socio-spatial management model. Ph.D. Thesis, Technische Universität München, München, Germany, 2016.
19. Barnes, G. The evolution and resilience of community-based land tenure in rural Mexico. *Land Use Policy* **2009**, *26*, 393–400. [CrossRef]
20. Vázquez, C.G. *Teorías e Historia de la Ciudad Contemporánea*; Editorial Gustavo Gili: Barcelona, Spain, 2016.
21. Font, A. *L'explosió de la Ciutat: Transformacions Territorials Recents en les Regions Urbanes de l'Europa Meridional*; Col·legi d'Arquitectes Catalunya: Barcelona, Spain, 2004.
22. Lefebvre, H. The production of Space (1991). In *The People, Place and Space Reader*, 1st ed.; Jack Gieseking, S.S., Mangold, W., Katz, C., Low, S., Eds.; Routledge: London, UK, 2014.
23. The World Bank. "Stakeholder Analysis," *What is Stakeholder Analysis?* 2001. Available online: <http://www1.worldbank.org/publicsector/anticorrupt/PoliticalEconomy/stakeholderanalysis.htm>. (accessed on 13 August 2019).
24. Schmeer, K. Guidelines for Conducting a Stakeholder Analysis. 1999: Bethesda, USA. Available online: <https://www.who.int/management/partnerships/overall/GuidelinesConductingStakeholderAnalysis.pdf> (accessed on 21 July 2019).
25. Pérez, P. Actores sociales y gestión de la ciudad. *Rev. Ciudad.* **1995**, *28*, 8–14.
26. López-Tamayo, N.E. a Urbanización Periférica mercado de suelo urbanización popular en la Ciudad de Puebla entre 1970 y 1990. Ph.D. Thesis, UNAM, Mexico City, Mexico, 1995.
27. Harvey, D. *Rebel Cities: From the Right to the City to the Urban Revolution*; Verso: London, UK, 2012.
28. Wilkie, J.W.; Hammond, M. Primera Reforma Agraria en México, 1853-1909, a través de la estadística nacional. *Mex. World.* 1998, Volume 3. Available online: http://www.profmex.org/mexicoandtheworld/volume3/3summer98/laestadistica_economicap2.html (accessed on 21 July 2019).
29. Katz, F. *La Guerra Secreta en México*; Ediciones ERA: Mexico City, Mexico, 1982.
30. Assennatto Blanco, P.; de Leon Mojarro, S. La democracia interna en el ejido. *Estud. Agrar.* **1996**, *2*, 117–132.
31. De Diputados, C. Ley Agraria. *H. Congreso de la Unión.* 2017. Available online: http://www.diputados.gob.mx/LeyesBiblio/pdf/13_250618.pdf. (accessed on 18 July 2019).
32. Robles, H.M. Tipología de los sujetos agrarios Procedo. *Estud. Agrar.* **1996**, *4*, 11–39.
33. Ake, C.; Flores, M.J.D.F. *Análisis de la privatización de la tierra de régimen social en México. (Bachelor thesis)*; Universidad Autónoma Agraria Antonio Narro: Saltillo, Mexico, 2007; Available online: <http://repositorio.uaaan.mx:8080/xmlui/bitstream/handle/123456789/920/T16538%20COLLI%20%20AKE%2C%20JUAN%20GABRIEL%20%20MON.pdf?sequence=1&isAllowed=y> (accessed on 21 July 2019).
34. Perramond, E.P. The rise, fall and reconfiguration of the Mexican ejido. *Geogr. Rev.* **2008**, *98*, 356–371. [CrossRef]
35. Vereá, M. Immigration trends after 20 years of NAFTA. *Norteamérica* **2014**, *9*, 109–143. [CrossRef]
36. Riveros, L. La incorporación de terrenos ejidales y comunales al desarrollo urbano. *México Procur. Agrar.* **2000**, *9*, 87–124.
37. Haenn, N. The changing and enduring ejido: a state and regional examination of Mexico's land tenure counter-reforms. *Land Use Policy* **2006**, *23*, 136–146. [CrossRef]
38. De la Federación, D.O. Solicitud de expropiación de terrenos pertenecientes al ejido Santiago Momoxpan de San Pedro Cholula, antes Cholula, Pue. *Diario Oficial de la Federación.* Available online: http://www.dof.gob.mx/nota_detalle.php?codigo=4646595&fecha=27/01/1992. (accessed on 26 March 2019).
39. De la Federación, D.O. Decreto por el que se expropia por causa de utilidad pública una superficie de terrenos de temporal de uso común del poblado San Bernardino Tlaxcalancingo, Municipio de San Andrés Cholula, Pue," *Diario Oficial de la Federación.* Available online: http://dof.gob.mx/nota_detalle.php?codigo=4664172&fecha=04/05/1992. (accessed on 26 March 2019).
40. Aguirre, A.M. *Megaproyecto de Salinas y Bartlett*; Proceso: Mexico City, Mexico, 1993; Available online: <https://www.proceso.com.mx/162157/megaproyecto-de-salinas-y-bartlett> (accessed on 21 July 2019).

41. Secretaría de Finanzas y Administración. *Actualización del Programa Regional de Desarrollo, Región Angelópolis 2011–2017*; Gobierno del Estado de Puebla: Puebla, Mexico, 2011.
42. *Programa Regional de Ordenamiento Territorial Angelópolis*; Puebla: Mexico City, Mexico, 1993.
43. Agbel, C.E. *Programa Municipal de Desarrollo urbano Sustentable de San Andrés Cholula 2014–2018*; Ayuntamiento de San Andrés Cholula: San Andrés Cholula, Mexico, 2018.
44. INEGI. Actualización del marco censal agropecuario 2016. Available online: www.inegi.gob.mx (accessed on 10 May 2019).
45. CONAPO. *Delimitación de las zonas metropolitanas de México 2015*, 2018th ed.; SEGOB, SEDATU, CONAPO: Mexico City, Mexico, 2018.
46. INEGI. *Encuesta Intercensal 2015*; INEGI México: Mexico City, Mexico, 2015.
47. INEGI. *Puebla Resultados Definitivos VII Censo Ejidial*; INEGI: Mexico City, Mexico, 1994.
48. Olofsson, P.; Foody, G.M.; Herold, S.V.; Stehman, C.E.; Woodcock; Wulder, M.A. Good practices for estimating area and assessing accuracy of land change. *Remote Sens. Environ.* **2014**, *148*, 42–57. [CrossRef]
49. Hernández, G. Define congreso límites entre municipios de Puebla y Cholula. *Proceso*, 6 December 2018.
50. Ruiz, L. Crece 813 pesos valor catastral de Angelópolis y Atlixáyotl. E-Consulta, Puebla. 2018. Available online: <https://www.e-consulta.com/nota/2018-12-12/economia/crece-813-pesos-valor-catastral-de-angelopolis-y-atlixayotl> (accessed on 10 may 2019).
51. Santos, P.V. Por la Buena o Por la mala' El Estado y la Lucha por la Tierra en Santa Maria Tonantzintla, Puebla. Una Historia Ejidal (Bachelor thesis) Universidad de las Américas Puebla. 2005: Cholula, Mexico. Available online: http://catarina.udlap.mx/u_dl_a/tales/documentos/laac/velasco_s_p/ (accessed on 14 June 2019).
52. *Zonificación Catastral, Tablas de Valores Unitarios de Suelos y Valores Catastrales de Construcción de Puebla*; Gobierno del Estado de Puebla, Secretaría General de Gobierno: Puebla, Mexico, 2017.
53. Terrenos en Venta en Reserva Territorial Atlixáyotl, San Andrés Cholula. 2019. Available online: <https://www.inmuebles24.com/terrenos-en-venta-en-reserva-territorial-atlixayotl.html> (accessed on 23 July 2019).
54. Solà Morales Rubio, M. *Las Formas de Crecimiento Urbano*; Universitat Politècnica de Catalunya: Barcelona, Spain, 1997.
55. Borja, J.; Muxí, Z. *El espacio Público: Ciudad y Ciudadanía*; Electa Editores: Barcelona, Spain, 2003.
56. United Nations. *New Urban Agenda*; United Nations: New York City, NY, USA, 2017.
57. Committee on World food Security. *Principles for responsible investment in Agriculture and Food Systems*; Committee on World food Security: Rome, Italy, 2014.



© 2019 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).