

## The “Xochimilco model” for managing irregular settlements in conservation land in Mexico City

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### ABSTRACT

Mexico City has long been known as one of the world's largest mega-cities. Although, the city's growth rates have slowed since the 1980s, this process is not manifested evenly in spatial terms. Peripheral municipalities continue to grow at higher rates, including those municipalities in the southern part of the Federal District that contain its remaining conservation land. This growth is largely, but not exclusively, driven by the ongoing search for housing among lower-income households in the form of irregular settlement. Over time, this incremental pattern of settlement expansion has fragmented conservation land and impaired its ecological functioning. Given their role in land use planning with the reintroduction of elected local governments in the Federal District in 1997, this situation has placed municipalities quite literally at the “frontlines” of this planning and sustainability challenge. This paper examines the approach for managing land use regularization processes related to irregular settlement in conservation land adopted by the municipality of Xochimilco in its 2005 urban development plan, with reference to the experience of a specific case study community. Based on a series of interviews with residents and planning officials, the paper documents the highly-negotiated nature of “normative” planning that focuses on mitigating the impact of settlement in the conservation zone rather than stopping it completely. Given the enormous social pressures to access land for housing, the paper concludes that realistic efforts to preserve the remaining conservation land must involve a more comprehensive approach that better integrates environmental and social equity issues within and among municipal and upper-levels of government.

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### Introduction

With a current population of approximately 19.2 million, Mexico City remains one of the largest mega-cities in the world, although perhaps not for much longer.<sup>1</sup> The city's population grew most rapidly between 1950 and 1970, when its population increased from approximately 3.1 million to 8.6 million people, amounting to almost a tripling of its population in only 20 years (see Table 1). Beginning in the 1980s, however, growth rates began to decline, although this slowing of growth rates has been manifested unevenly in spatial terms. Peripheral municipalities – both in the metropolitan zone and the Federal District – continue to grow at faster rates than more central parts of the city.<sup>2</sup> This reflects the difficulty of finding

affordable land within the built-up area of the city, combined with the availability of cheaper land for irregular settlement on the metropolitan periphery (Connolly, 1999; Pezzoli, 1998).<sup>3</sup> Within the Federal District, this growth pattern now involves the urbanization of the so-called conservation land (*suelo de conservación*), an area comprising approximately 88,442 ha or 59% of the Federal District's total area (GDF, 2003, 2005a).

The remaining conservation land is found in nine municipalities in the Federal District, located mostly in the southern part of the city (see Table 2 and Fig. 1). Although, the official line between “urban land” and “conservation land” has not changed in recent years, substantial land use changes are taking place within the conservation zone. In the period 1970–1997, the conservation zone lost an estimated 239 ha of forest cover and 173 ha of agricultural land on an annual basis. In contrast, settlement areas increased on average by 289 ha per year in the same period (GDF, 2003). Although, there is evidence to suggest that the expansion of

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<sup>1</sup> A “mega-city” is conventionally defined as an urban agglomeration of 10 million people or more (Cohen, 2004). Faster-growing mega-cities such as Sao Paulo, are likely to soon surpass the size of Mexico City.

<sup>2</sup> Unless otherwise specified, “Mexico City” or the “city” refers to the Mexico City Metropolitan Zone. The “Federal District” refers specifically to the part of the city contained within the Federal District boundaries. There are 16 municipalities (*delegaciones*) within the Federal District. The central part of the city includes the municipalities of: Benito Juárez, Cuauhtémoc, Miguel Hidalgo and Venustiano Carranza.

<sup>3</sup> As it remains the only affordable housing option for about 60% of the population, irregular settlement represents at least 40% of the city's built-up area and a significant impetus of its outward expansion (Cruz, 2001; Villaviencio, 1997). Although, irregular settlement is most often associated with lower-income groups, it may also involve more affluent households in the metropolitan periphery of Mexico City (see Aguilar, 2008; Schteingart and Salazar, 2005).

**Table 1**

Population and growth rates, Mexico City Metropolitan Zone (1950–2005). Sources: All figures from Schteingart and Salazar, 2005, pp. 69–71, except for 2005 figures which are from the Cuento de Población y Vivienda (INEGI, 2005a).

Year	Population (#)		Time period	Average Annual Growth Rate (%)	
	Federal District	MCMZ <sup>a</sup>		Federal District	MCMZ
1950	3,050,442	3,137,553	–	–	–
1960	4,870,876	5,231,643	1950–1960	4.78	5.24
1970	6,874,120	8,656,704	1960–1970	3.64	5.36
1980	8,362,711	12,994,450	1970–1980	1.91	4.00
1990	8,350,595	15,054,006	1980–1990	–0.01	1.67
2000	8,605,239	17,968,895	1990–2000	0.30	1.80
2005	8,720,916	19,239,910	2000–2005	0.24	0.80

<sup>a</sup> The Mexico City Metropolitan Zone (MCMZ) is defined as comprising the Federal District, and over time, a growing number of conurbated municipalities in adjacent states. As of 2005, the MCMZ included the 16 municipalities of the Federal District, 40 municipalities in the State of Mexico, and one municipality in the State of Hidalgo.

irregular settlements in conservation land has diminished somewhat in recent years (see Aguilar, 2008), there are now approximately 836 irregular settlements in 2747 ha of conservation land in the Federal District (GDF, 2005a).<sup>4</sup> Approximately 37% or 300 of these irregular settlements are located in the municipality of Xochimilco, covering some 814 ha. If current development trends continue, an estimated 30% of conservation land will be lost by 2030 (GDF, 2009a).

This situation raises a number of significant issues related to environmental planning and urban sustainability. The conservation zone represents a vital area of rainwater infiltration required for the re-charging of the aquifer that supplies 57% of the city's drinking water (GDF, 2003). It is estimated that for every square meter paved over for urbanization or settlement purposes, between 2000 and 2500 l of water is diverted from the aquifer each year (GDF, 2009a). The increasing level of human settlement and activity in conservation land (e.g. conversion of forested land to agricultural use) has also resulted in soil erosion, loss of habitat, declining biodiversity and the contamination of rivers. Notably, many of the municipalities with conservation land are not only the fastest growing in the Federal District, but also display higher "marginality" levels (see Table 2). For example, the proportion of the population earning less than one minimum salary per day is higher on average in the conservation zone than in the Federal District (Aguilar, 2008).<sup>5</sup> In this way, the conservation zone represents a "test-case" for planning for more sustainable forms of development in Mexico City, as it underlines the quintessential difficulties of integrating social and environmental imperatives in the face of pressing needs such as affordable housing. Moreover, local municipalities with conservation land are likely to be central actors in this significant planning and sustainability challenge.

The following paper explores this challenge through the lens of the municipality of Xochimilco, and in particular, an irregular settlement in the conservation zone of Xochimilco. As elaborated below, the 2005 urban development plan for Xochimilco articulates an approach (hereafter referred to as the "Xochimilco model") for managing land use regularization processes related to irregular settlements in conservation land that is intended to serve as a prototype for other municipalities in the Federal District (4 March

2008).<sup>6</sup> The Xochimilco model assigns irregular settlements to zones subject to "special regulation", "specific study" and "control." These categories serve to differentiate irregular settlements in conservation land, as well as framing their respective treatment by local government, including their eligibility for the much-coveted land use change to residential use.<sup>7</sup> Of the three irregular settlement types in conservation land identified by Aguilar (2008), this paper focuses on those occupied by lower-income households.<sup>8</sup> The case study community of *El Asentamiento* ("the settlement") in Xochimilco is used to illustrate the application of the model to a "regularizing" irregular settlement located on "private" property in the conservation zone.<sup>9</sup> The paper shows that the efforts of the municipality are mostly focused on mitigating the impacts of human settlement in the conservation area, rather than stopping it completely. While this approach may seem at odds with new longer-term policy initiatives related to sustainability in the Federal District, it responds to strong social pressures manifested at the local or municipal level to access land for housing. These apparent policy differences highlight that planning in the Federal District is not a monolithic exercise given the highly-negotiated nature of "normative" planning frameworks and the resultant gap between plans and implementation.

Following this introduction, the paper briefly outlines several high-profile sustainability initiatives spearheaded by the Mayor's Office and central planning departments in the Federal District. The paper then goes on to describe and analyze the so-called Xochimilco model for managing irregular settlements, focusing on the *chinampas* zone, one of the most-regulated conservation areas in the Federal District, at least on paper. This detailed look at the challenge of managing irregular settlement at the municipal level complements recent work examining this important phenomenon within the conservation zone as a whole (see Aguilar, 2008) and in other municipalities of the Federal District (see Schteingart and Salazar, 2005). The paper concludes with a number of reflections on the significance of the research for urban and environmental planning in Mexico City. Research for the article is based on a series of semi-structured interviews with officials working in various planning capacities in Mexico City (see Appendix A), as well as interviews with residents in *El Asentamiento*. These anonymous interviews were conducted between January and July of 2008, with

<sup>6</sup> To be clear, other municipalities (e.g. Tlalpan) have also developed approaches for managing informal settlements in conservation land. In this way, the so-called "Xochimilco model" is not new *per se*, as it incorporates strategies for managing irregular settlements in conservation land also found in other municipalities. As such, it should not be considered either unique or the only prototype in the Federal District. Still, it was presented as a prototype by local officials in interviews for this research.

<sup>7</sup> In interviews with residents, this land use change is typically referred to as simply "land use" (*uso de suelo*), underlining the view that residential land use is the one that matters most to those residing in irregular settlements.

<sup>8</sup> These include: the expansion of rural towns, land occupations by more affluent households and irregular settlements occupied by mostly lower-income households (see Aguilar, 2008), and those termed "irregular settlements" by the 2005 municipal urban development plan for Xochimilco (see GDF, 2005b).

<sup>9</sup> *El Asentamiento* is a pseudonym for the community. The Mexican Constitution defines three types of property: federal or public land, communal and *ejidal* lands, and private property. Communal and *ejidal* lands represent a particular form of land tenure (communal land or social property) enshrined in Article 27 of the post-revolution Constitution of 1917 (Duhau and Schteingart, 2002). This paper focuses on a case study community located on private property. It is important to note, however, that regularization processes for different property types involve distinct state and social actors. For example, the federal-level Commission for the Regularization of Land Tenure (*Comisión para la Regularización de la Tenencia de la Tierra*) manages the regularization of communal or *ejidal* lands, and the city-level General Division of Territorial Regularization (*Dirección General de Regularización Territorial*) manages the regularization of private property within the Federal District (DDF, 1994a). In the case of *ejidal* and communal lands, the involvement of federal agencies in municipal planning introduces additional complexities to the processes described here. For a detailed account of regularization processes in *ejidal* land, see Schteingart and Salazar (2005). Regularization of land tenure is required to obtain legal property titles (*escrituras*), a process that varies by property type. This article focuses on the municipal regularization of land use and zoning, a component of this larger process.

<sup>4</sup> This report actually refers to only 756 irregular settlements because it excludes, for example, the 67 irregular settlements subject to "special regulation" in Xochimilco and therefore eligible for a land use change – eventually. In the meantime, I use here the larger number of irregular settlements that appears in the document (see GDF, 2005a).

<sup>5</sup> As of January 1, 2009, the minimum daily wage in the Federal District was \$54.80 MXN pesos or \$4.20 USD per day (SAT, 2009).

**Table 2**  
Selected land use and demographic characteristics, Federal District (various years).

Municipality	Population <sup>a</sup>		Average annual growth rate <sup>b</sup>		Conservation land <sup>c</sup>			Pop with very high to high levels of marginality (%) <sup>e</sup>
	2000	2005	1995–2000	2000–2005	Hectares	% of total municipal land area	% of total conservation land in Federal District	
Federal District	8,605,239	8,720,916	0.32	0.24	88,442	–	59.00	–
<i>Central municipalities:</i>								
Benito Juárez	360,478	355,017	–0.61	–0.27	–	–	–	0.00
Cuauhtémoc	516,255	521,348	–1.06	0.17	–	–	–	13.04
Miguel Hidalgo	352,640	353,534	–0.76	0.04	–	–	–	12.24
Venustiano Carranza	462,806	447,459	–1.12	–0.59	–	–	–	16.14
<i>Municipalities with conservation land:</i>								
Álvaro Obregón	687,020	706,567	0.35	0.50	2735	30.9	3.1	53.80
Cuajimalpa	151,222	173,625	2.36	2.46	6593	81.4	7.5	46.84
Gustavo A. Madero	1,235,542	1,193,161	–0.40	–0.61	1238	14.2	1.4	40.25
Iztapalapa	1,773,343	1,820,888	1.04	0.47	1218	10.5	1.4	61.09
Magdalena Contreras	222,050	228,251	1.10	0.54	5199	78.7	5.9	68.11
Milpa Alta	96,773	115,895	4.22	3.23	28,464	100.0	32.2	100.00
Tlóhuac	302,790	344,106	4.01	2.28	6405	77.0	7.2	74.60
Tlalpan	581,781	607,545	1.21	0.77	26,042	84.4	29.4	57.51
Xochimilco	369,787	404,458	2.53	1.59	10,548 <sup>d</sup>	82.2	11.9	72.44
<i>Other municipalities:</i>								
Azcapotzalco	441,008	425,298	–0.73	–0.64	–	–	–	24.29
Coyoacán	640,423	628,063	–0.47	–0.34	–	–	–	34.44
Iztacalco	411,321	395,025	–0.43	–0.71	–	–	–	35.87

<sup>a</sup> *Censo General de Población y Vivienda (INEGI, 2000)* and *Conteo de Población y Vivienda (INEGI, 2005a)*.

<sup>b</sup> Figures for the Federal District are from INEGI (2000, 2005a). Figures for municipalities are taken from *Perfil Socio-Demográfico para el Distrito Federal 2005 (INEGI, 2005b)*.

<sup>c</sup> *Estadísticas del Medio Ambiente del Distrito Federal y Zona Metropolitana 2002 (INEGI, 2005c)*.

<sup>d</sup> The more recent figure of 10,012 ha provided in the 2005 PDDU for Xochimilco – and cited in the text – differs only slightly from this figure. I have used the figures here because they add up to 88,442 ha, the most commonly-cited total amount of conservation land in the Federal District (see GDF, 2000, 2003). As noted by CDHDF (2005), there are inconsistencies in various GDF documents regarding the total amount of conservation land and the number of irregular settlements found there.

<sup>e</sup> These figures are taken from the “marginality index” developed for the *Programa Integrado Territorial para el Desarrollo Social (2000)* in the Federal District. It uses a range of indicators related to housing conditions, health, education and access to urban services to compile a composite index of “marginality” which serves as a basis for directing social development resources. The percentages presented here are calculated by the author based on data from GDF.

several follow-up interviews in August 2009. This primary data is complemented by reference to existing research, census data, planning documents and newspaper articles.

### Planning for “unplanned” growth?

The expansion of settlement activities in the conservation zone represents a key governance challenge for the Government of the Federal District (GDF). Since the re-establishment of locally-elected government in the Federal District in 1997, the GDF has developed a number of increasingly sophisticated planning programs, policies and tools (see GDF, 2000, 2003, 2005b, 2007, 2009a). While the Secretary of Urban Development and Housing (SEDUVI) assumes primary responsibility for elaborating the overall urban development program for the city (*Programa General de Desarrollo Urbano del Distrito Federal* or PGDU), the Secretary of the Environment (SMA) takes the lead role in developing the General Program for Ecological Planning (*Programa General de Ordenamiento Ecológico del Distrito Federal* or PGOE). In this capacity, the PGOE establishes specific zoning categories for conservation land; areas with the strictest environmental controls include Natural Protected Areas (*Áreas Naturales Protegidas* or ANP). Both of these programs also refer to the “line” that separates urban land and conservation land within the Federal District.<sup>10</sup>

Presently, both plans are being updated, with these processes ostensibly focused on achieving greater sustainability. For exam-

ple, the citizen-based Council for Sustainable Urban Development is “constructing the thematic agenda to update the PGDU with a focus on sustainability, and in this way, lead the city, with a modern planning instrument, towards a new urban order that ensures equity, sustainability and competitiveness” (GDF, 2009c). The “modern planning instrument” referred to here includes the development of a new PGDU that would then be renamed the General Program for Sustainable Urban Development (*Programa General de Desarrollo Urbano Sustentable* or PGDUS). In the case of the PGOE, the SMA is planning to introduce compensatory mechanisms for those living in conservation land who provide important “environmental services” (e.g. water) for the city. These compensatory mechanisms are to be complemented by the array of programs designed by the recently-created Secretary for Rural Development and Community Equity (SEDEREC) to assist agricultural production and rural communities in the Federal District (GDF, 2009d). Together, this approach represents a shift away from the PGOE’s previous focus on prohibitive forms of planning and zoning to a more pro-active approach that includes greater recognition of important social and economic issues for those living and working within the conservation zone. It also attempts to provide economic incentives for conservation, thereby recognizing the substantial difference that currently exists between the monetary value of cultivating a hectare of land versus selling it for settlement purposes.

An important part of local planning now also includes the municipal urban development programs (*Programa Delegacional de Desarrollo Urbano* or PDDU).<sup>11</sup> Since 2005, all 16 municipal urban

<sup>10</sup> In accordance with the Urban Development Law of the Federal District (*Ley de Desarrollo Urbano del Distrito Federal*), the Federal District is divided into two primary land use zones: urban land (*suelo urbano*) and conservation land (*suelo de conservación*) which account for 41% (61,082 ha) and 59% (88,442 ha) of the Federal District’s total area, respectively (GDF, 2003).

<sup>11</sup> These programs are intended to serve “as a planning tool that refines and complements the General Urban Development Program of the Federal District within each of its 16 municipalities” (GDF, 2009b).

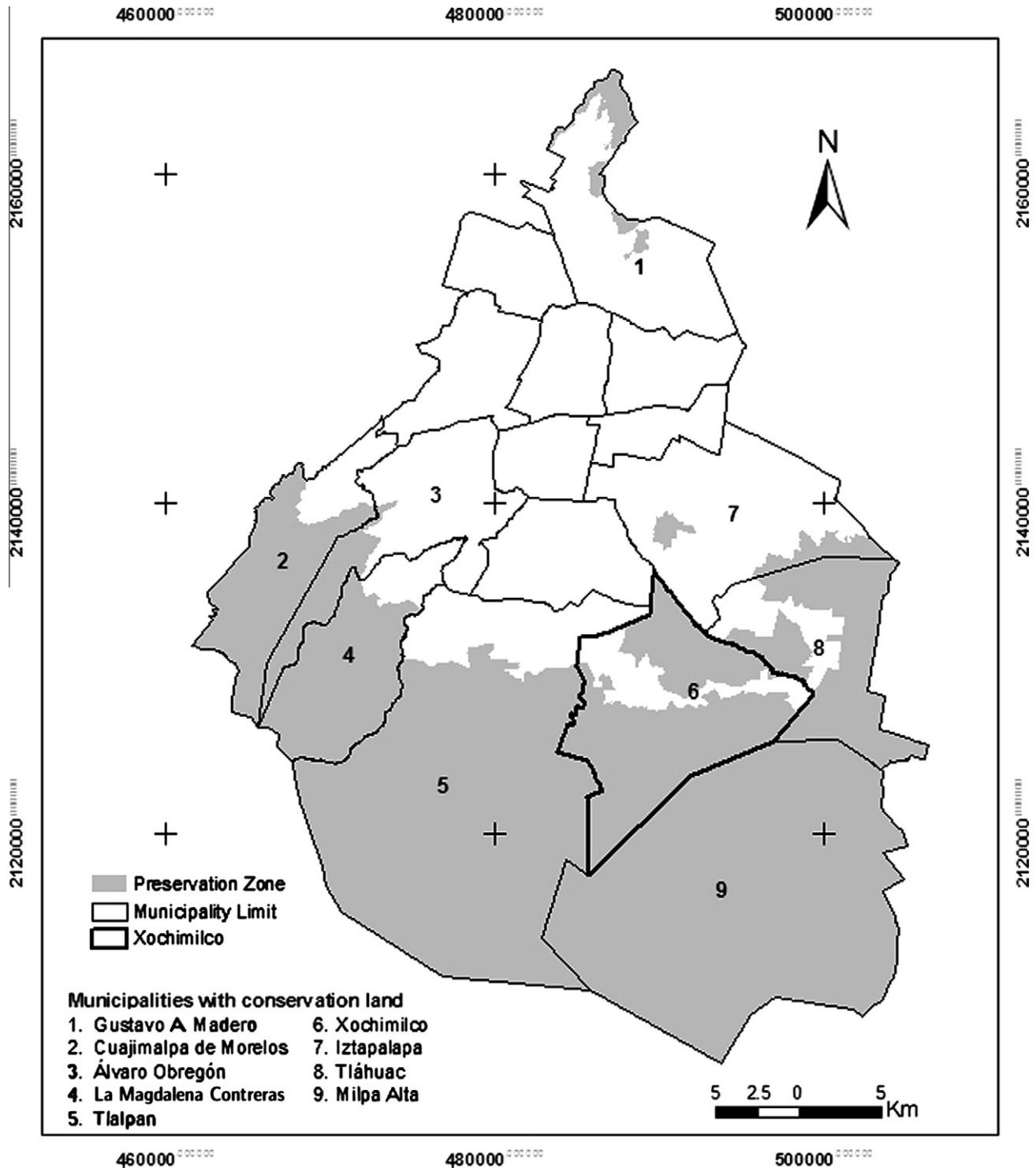


Fig. 1. Map of conservation land, Federal District. Map elaborated by Adele Michon, Carleton University.

development programs have been in the process of being updated, including the nine municipalities that contain the city's remaining conservation land.<sup>12</sup> In the case of the municipality of Xochimilco, the updated PDDU articulates a specific framework for the management of irregular settlements in conservation land (see GDF, 2005b). Intended as a possible prototype for other municipalities with conservation land, elements of the Xochimilco model are also reflected in the

updated PDDU for the municipality of Tláhuac (see GDF, 2008). These initiatives underscore the growing recognition of the planning challenge presented by irregular settlement in conservation land, as well as the prominent role that municipalities are likely to play in this regard, especially in terms of land use designations and zoning issues.

#### Planning as discourse and negotiation of the “normative”

The southward expansion of the city also poses a governance challenge in that it challenges many of the “flagship” planning ini-

<sup>12</sup> The approval process for other updated municipal urban development plans remained underway at the time of writing this paper. Xochimilco was one of the first municipalities to update its 1997 PDDU and have it approved (see GDF, 2005b).

tiatives promulgated by the current administration of Marcelo Ebrard Casaubón (2006–2012), a mayor with probable presidential ambitions. Among others, these initiatives include *The Environmental Agenda for Mexico City* (2007–2012), *The Green Plan* (2009) and the *Council for Sustainable Urban Development* (see above). For example, the *Environmental Agenda for Mexico City* states its overall objective as “protecting conservation land as a key space for the environmental equilibrium of the city, through protecting its ecosystems as well as preserving its natural flora and fauna in order to ensure the existence of environmental services” (GDF, 2007, p. 23). To this end, the document declares as one of its key strategies the “implementation of normative and regulatory tools, in terms of land use in conservation land, for the control and ordering of irregular settlements” (p. 24). Similarly, one of the key objectives of the Green Plan is to “rescue conservation land as a key space for the ecological equilibrium of the city” through a number of strategies, including “zero growth of irregular settlements” in the conservation zone (GDF, 2009a, p. 12). These rather buoyant policy statements will face their sternest challenge at the municipal level where highly-localized social struggles related to access to land, and therefore affordable housing, exert stronger political pressure on the implementation of policy than the normative “best practice” discourse emanating from the Mayor’s Office and other central planning departments.

The ongoing expansion of irregular settlements in conservation land is often cited as concrete evidence of the lack of planning control and implementation in the city (Aguilar, 2008; Ruiz-Gomez, 2006). This situation is commonly attributed to a number of factors such as the lack of inter-departmental coordination, weak enforcement of existing norms and regulations, and inadequate monitoring systems (GDF, 2005b; PAOT, 2005), as well as the ambiguous definition of responsibilities between SMA and SEDUVI for managing irregular settlements in conservation land (Schteingart and Salazar, 2005). As highlighted by Aguilar (2008), this situation is reflected in the conflicting approaches to land use zoning adopted by these agencies in the conservation area, thus undermining efforts to effectively coordinate land use policy in the zone. At a more general level, the ongoing gap between official plans and actual urbanization patterns has led some to dismiss planning in Mexico as a futile, “virtual” exercise for its lack of effectiveness in guiding urban growth in accordance with existing planning programs and norms (Garza, 1997).

Still, normative planning frameworks remain meaningful in several ways. First, they “frame” and “map” the contours of irregular settlements in the city. In turn, these mapped spaces serve as crucial reference points in the negotiating process between irregular settlements and local governments regarding possible regularization. As such, normative planning instruments establish a frame for not only defining regularity/irregularity, but also for the ensuing negotiations that take place between local government and communities. For this reason, those living in irregular settlements tend to be extremely well-versed in the planning norms affecting their communities. In this sense, planning understood as a negotiated process between local government and communities can be seen as validating existing normative frameworks, even if only in a fleeting manner. The establishment of entire planning bureaucracies to regulate so-called irregular settlements reflects the longstanding dialectical nature of this relationship in Mexico.

As examined in the next section, the Xochimilco model for managing irregular settlements is another example of the establishment of formal, normative frameworks for dealing with “unplanned” or irregular settlement. The model permits for the continuation of the highly-negotiated nature of planning in Mexico City, a process that often uses “normative” planning frameworks as a discursive guise to obscure the political nature of planning deci-

sion-making, as convenient. Given the array of planning policies and land use norms that exist to regulate and/or control irregular settlements in conservation land, this situation is perhaps more accurately considered as the selective negotiation and application of existing planning frameworks, rather than the lack of planning *per se*.

## Planning for the “unplanned” in Xochimilco

### *Municipal context and the chinampas zone*

The municipality of Xochimilco is situated in the city’s “third ring” of development and within the ambit of poorer south-eastern and eastern sections of the Federal District. “Xochimilco” is a *náhuatl* word which means “in the cultivated land of flowers” (Mora Vasquez, 2008, p. 33), a reference to the unique, human-made agricultural system known as *chinampas* (see Fig. 2).<sup>13</sup> The *chinampas* are delimited by canals which permit year-round irrigation and cultivation, yielding up to three crops per year (UNESCO, 2006). Up until the 1950s, *chinampas* existed in several parts of Mexico City; the largest remaining *chinampas* zone is now found in Xochimilco. In 1987, the United Nations Educational, Scientific and Cultural Organization (UNESCO) designated the historic centres of Mexico City and Xochimilco, including much of its adjacent *chinampas* zone, as a World Heritage Site. In 1992, the federal government established a 2657 ha Natural Protected Area (ANP) covering most of the remaining *chinampas* zone.<sup>14</sup> As an ANP “subject to ecological preservation”, the area is under stricter environmental controls than other areas of conservation land including a recently-developed management plan for the ANP (*programa de manejo*) (GDF, 2006b).

Given these various declarations and programs, the *chinampas* zone represents perhaps one of the most-intensively regulated and high-profile conservation areas in the Federal District, at least on paper. Yet, these various programs and measures have slowed, but not prevented, the denigration of the remaining *chinampas*.<sup>15</sup> The disincorporation of several irregular settlements, including *El Asentamiento*, from the ANP in 2006 reduced its size to 2522 ha (GDF, 2006a). An estimated 11.6% of the reported 300 irregular settlements in Xochimilco are located in the ANP (GDF, 2005b).<sup>16</sup> This situation is consistent with what Aguilar (2008) refers to as the “excessive” but “insufficient” regulations governing conservation land in the Federal District (p. 137).

While the urbanization of Xochimilco began in the late 1950s, this process accelerated during the 1960s. In the *chinampas* zone, this process was facilitated by the widespread desiccation of the *chinampas* caused by the overexploitation of Xochimilco’s aquifer to provide potable water for residents in downtown Mexico City (Aréchiga, 2004; Terrones López, 2004, 2006). This process also overlapped with the construction of infrastructure in the southern part of the city in preparation for the 1968 Olympic Games (Barbosa Cruz, 2004; Terrones López, 2006). Faced with declining agricultural productivity and increasing demand for land for housing, *nativos* (locals) began to sell and/or settle their *chinampas* land (DDF, 1994a,b). Though municipal growth rates in

<sup>13</sup> *Chinampas* are built from organic materials into a rectangular form that is usually about 10 m wide and 100 m long (Genovevo, 2008).

<sup>14</sup> The ANP is called the *Ejidó de Xochimilco y San Gregorio Atlapulco*.

<sup>15</sup> Since the 1940s, the size of the *chinampas* zone has diminished by an estimated 30–40% (Robles, 2007).

<sup>16</sup> As indicated earlier, this paper deals with “irregular settlements” as defined by the 2005 PDDU for Xochimilco. The same document also refers to 291 “isolated nuclei” (*nucleos aislados*), smaller areas of settlement expansion, often not contiguous with nearby settlements, but which effectively represent the “sprawl of tomorrow” (21 August 2009).



Fig. 2. Chinampas in the Natural Protected Area (ANP) of Xochimilco. Source: Author (2009)

Xochimilco have slowed since 1990, they continue to exceed those of the Federal District as a whole (refer back to Table 2). Today, Xochimilco's 10,012 ha of conservation land represents approximately 80% of the municipality's total area and 11% of the total amount of conservation land in the Federal District. As of 2004, an estimated 300 irregular settlements in Xochimilco housed over 133,000 residents, amounting to 46.5% of the municipality's total population (GDF, 2005b). In other words, so-called "irregular" settlement in Xochimilco is a highly "regular" social phenomenon serving as the primary mode for accessing affordable housing.

#### The "Xochimilco model"

Since the re-establishment of local democracy in the Federal District, the municipality of Xochimilco has produced urban development plans (PDDU) in 1997 and 2005 (see GDF, 1997, 2005b). The 2005 PDDU for Xochimilco is significant in that it institutionalizes a municipal approach for dealing with irregular settlements in conservation land. This approach is intended to "better integrate urban and environmental planning in one single body of land norms that regulates land use in order to completely control irregular human settlements in conservation land" (GDF, 2005b, p. 76). A municipal official working in urban development provided the following rationale for the new model: "To deal with reality and to generate not only the recognition of these spaces [irregular set-

tlements], but also a territorial order through the norms that we have and that people are aware of" (25 January 2008). According to a municipal advisor, the model is intended to serve as "a paradigm for the municipalities of the south; a particular approach for dealing with irregular settlements" (4 March 2008). Although, not all of the municipalities with conservation land have yet had their updated municipal development programs approved, the most recent PDDU for Tláhuac does indeed incorporate elements of the Xochimilco model (see GDF, 2008).

Although the Xochimilco model is intended to serve as a kind of paradigm for land use regularization processes for irregular settlements in conservation land, the model is not entirely new as it also borrows from existing practices. For example, one instrument that has been used at the local level to try to control the growth of established irregular settlements is the so-called "zero growth agreement" (*convenios de crecimiento cero*). These highly-localized containment measures required that those living in informal settlements sign an "accord" with local governments. Part carrot and part stick, such accords stipulated specific growth control measures within particular irregular settlements. In return, irregular settlements were mostly left alone, or in some cases, provided urban services (see Ruiz-Gomez, 2006). Over time, changes in local officials made these accords difficult to enforce. As one SEDUVI official explained: "More than anything it is a moral and social commitment with the authorities, but it has no legal weight" (6 March 2008). Not surprisingly, such containment measures are generally considered highly ineffective (Schteingart and Salazar,

2005). Still, these kinds of accords continue to appear in the current Xochimilco model for managing irregular settlements in conservation land.

The Xochimilco model divides irregular settlements into three categories based on an assessment of their existing level of consolidation: “zones subject to special regulation”; “zones subject to specific studies”; and “zones subject to control” (see Fig. 3). Levels of consolidation are determined by analyzing a range of social, environmental and urban variables, such as access to water and other urban services, total population, proximity to built-up urban areas, and settlement size, age and housing materials. In the words of a SEDUVI official: “Those settlements subject to special regulation are already totally consolidated. If one enters one of these settlements, they have all the services – water, sewage, electricity, pavement, public telephones, street lighting” (6 March 2008). While there is an attempt to present this process as being entirely “rational”, factors other than consolidation may also enter into this assessment process. These include the degree of social organization and political participation in particular settlements. In the words of one municipal official, such considerations are “important, but not determinant” (13 May 2008). The Xochimilco model, therefore, must be considered as a somewhat mutable planning approach or framework, or even as a representation of how land use regularization *should* happen in Xochimilco rather than how it *actually* takes place on a case-to-case basis. Still, the significance of the model lies in the distinctions it now creates among irregular settlements in conservation land, and in the manner in which this “normative” framework is used to guide, legitimize and rationalize planning decisions at the local level.

The assessment of consolidation levels in irregular settlements influences the options for subsequent action. In accordance with the model, only those irregular settlements categorized as displaying medium to high levels of consolidation can qualify for the much sought-after land use change to residential use (*uso habitacional*) which allows for residential construction and the (formal) extension of urban services in the conservation zone.<sup>17</sup> First, however, irregular settlements must pass through a series of studies. These studies include “an urban–environmental study” for highly-consolidated irregular settlements, and a “specific study” for irregular settlements with medium levels of consolidation.<sup>18</sup> According to a municipal official, the “specific study” is more comprehensive than the “urban–environmental study” (18 February 2008), although this is disputed by a SMA official (21 February 2008).

Of the 300 irregular settlements in Xochimilco, 67 are presently categorized as “zones subject to special regulation.” According to a municipal official, the “land use change is a given, but with conditions” for those irregular settlements that display a high level of consolidation and fall into this “special regulation” category (18 February 2008). The urban–environmental study is used to determine the payment of “environmental damages” and the identification of “mitigation measures.”<sup>19</sup> The proposed mitigation measures amount to a series of in situ construction techniques and/or ecological measures, including: the introduction of “closed” sewage and water systems, tree planting, rainwater collection facilities and the

use of permeable paving materials (18 February 2008).<sup>20</sup> Payment of the environmental damages is to be made to a special fund (*fideicomiso*) to be reinvested in the zone through the implementation of mitigation measures.<sup>21</sup>

One municipal official describes the payment of environmental damages in the following manner:

It is not a prize we are giving; it is order, and that implies a sanction...they have to pay for the environmental services [lost]. It is not that we are giving out a little star because they invaded and damaged conservation land for so many years, and now ‘here, I’ll give you the ‘yellow’ [the colour used for urban land use in official zoning maps] so that they get residential use. It is not like that...it’s that they did a bad thing, but here they are, and I have to order things like a government (25 January 2008).

The inclusion of mitigation measures and payment for environmental damages are key elements that distinguish this approach from previous ones (Sánchez Barrientos, 2005). Once the urban–environmental study is complete, it is forwarded to the “Commission of Special Regulation for Xochimilco” whose key voting members include representatives from SMA, SEDUVI and the municipality.<sup>22</sup> The Commission reviews the study and issues its decision in the form of a report. This report establishes the terms for the land use change, including payment of environmental damages and required mitigation measures.<sup>23</sup> These terms are then formalized through a collaboration agreement (*convenio de colaboración*) signed with the community.

The process is less certain for those settlements with a “medium” level of consolidation, which account for 83 of the 300 irregular settlements in the municipality (GDF, 2005b). According to a SEDUVI

<sup>20</sup> According to municipal officials, once the municipality has received more than half of the payments for environmental damages, the installation of urban services for the exclusive use of the community may begin. The certificate required for the designation of a rural residential zoning is issued only once environmental damages are paid in full by each lot. With this certificate, residents gain official land use permission for residential use in conservation land and can register their properties in order to initiate the process of obtaining full legal titles (*escrituras*) (25 January 2008; 18 February 2008). (This process is simpler for private property as fewer state and social actors are involved than in the case of *ejidal* land, as indicated previously). In some settlements, these payments may exceed the amount required for mitigation measures and can therefore be directed towards the purchase of lands to “relocate” less-consolidated irregular settlements from ecologically-sensitive areas (6 March 2008).

<sup>21</sup> At the time of conducting this research, this fund was not yet operational. SEDUVI’s annual report for 2009, however, suggests that the fund (referred to as the *Fideicomiso del Sistema de Transferencia de Potencialidades F 54*) is now functioning (GDF, 2009e).

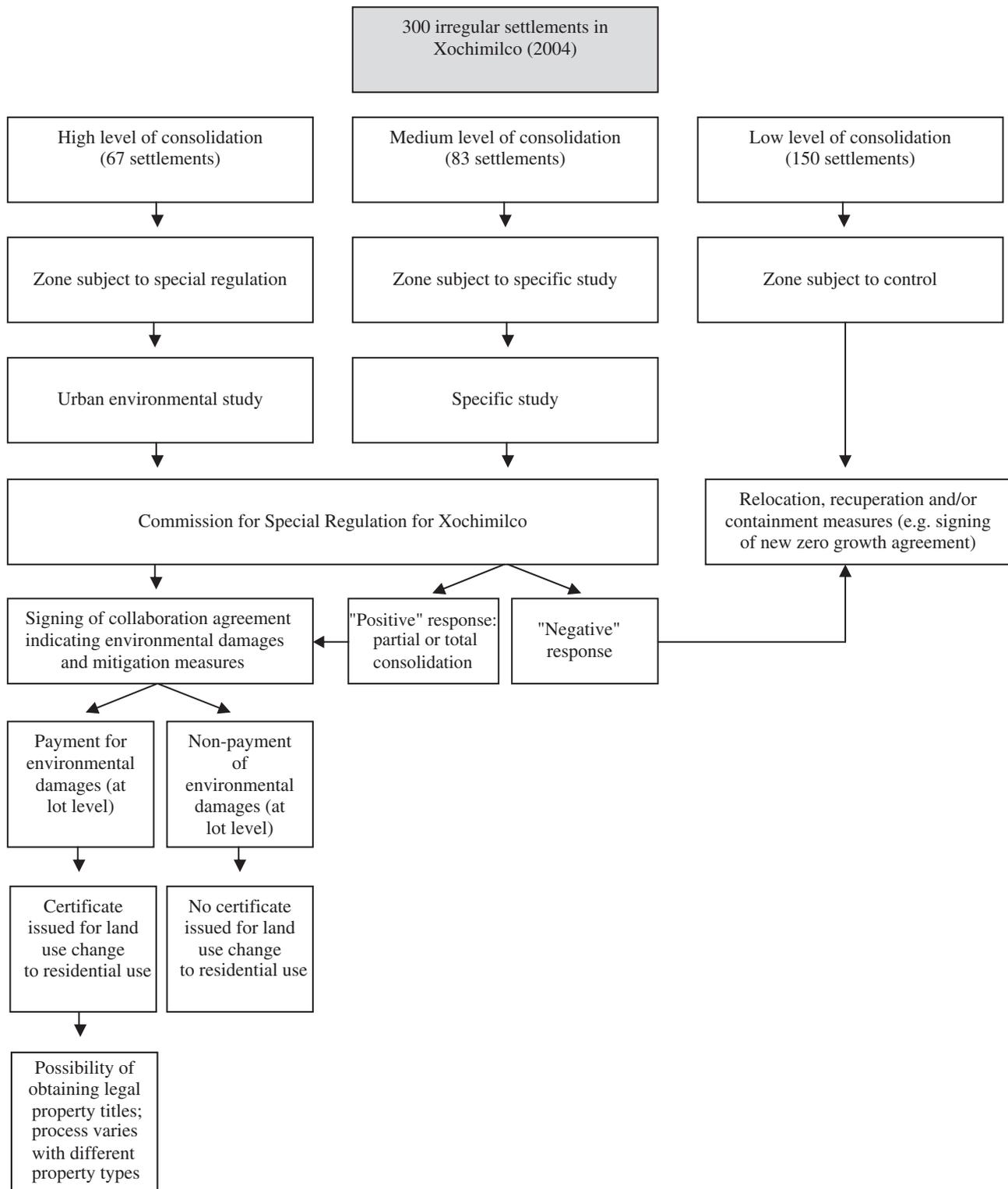
<sup>22</sup> Other parties participating in these discussions include elected local representatives and the *Procuraduría Ambiental y del Ordenamiento Territorial del Distrito Federal* (PAOT). A recent SEDUVI report (2009e) states that the objective of the Commission is to “avoid the occupation and expansion of irregular settlement in conservation land; contribute to the rehabilitation, protection and mitigation of the damage caused by such irregular settlements; and to issue decisions on urban environmental impact studies subject to specific zoning as indicated in municipal urban development plans” (p. 83).

<sup>23</sup> According to a SEDUVI official, the Commission was established shortly after the approval of the Xochimilco PDDU in 2005. Between September and December 2005, the Commission reviewed 38 studies (6 March 2008). In 2007, the Commission was not active, following the transition to the new administration of Mayor Marcelo Ebrard (2006–2012). A municipal official says it is active again and the Commission is ready to issue a decision on five irregular settlements (8 May 2008), although this process will likely take place after the recently-elected head of the municipality assumes office in October 2009 (21 August 2009). Presently, municipal officials and residents in some irregular settlements are exerting pressure on SEDUVI to reactivate its work with the Commission (20 August 2009). More recently, a SEDUVI report (2009e) indicates that the Commission has now reviewed 34 studies and issued a “positive” decision (e.g. land use permissions granted) for nine irregular settlements in conservation land.

<sup>17</sup> Many informal settlements have access to urban services on an informal basis, that is, they have illegally connected themselves to municipal water and sanitation networks.

<sup>18</sup> Until these studies are conducted, the zoning for these settlements stipulated in the 1997 PDDU remains in place.

<sup>19</sup> According to the municipality, environmental damages focus on the loss of rainwater infiltration capacity and are based on the footprint of the house and the construction materials used. Larger homes built with impermeable materials likely to block rainwater infiltration are to be charged more (25 January 2008; 18 February 2008).



**Fig. 3.** The 'Xochimilco Model' for managing irregular settlements in conservation land. Sources: Compiled by author based on GDF (2005b), PAOT (2005) and interviews with municipal and SEDUVI officials.

official, this refers to settlements with "some services, some consolidated housing because it has been established for some time, we are talking about between 5 and 12 years. . ." (6 March 2008). Such settlements may also present some urban or environmental risk or impact (GDF, 2005b). These areas are located in "transition zones", usually with a mix of both residential and agricultural activities. In some cases, all or part of these settlements may be transferred into the "special regulation" stream and move towards the desired land

use change, and in other cases, they may be relegated to the "zones subject to control" and denied the right to obtain their residential land use, although this decision is subject to change over time. "Zones subject to control" applies to "the settlements that have been established only for a few months" that are contained (or relocated) because of their "growth tendency" (25 January 2008). They may also be located in areas more remote from existing urban areas or within ANPs. These irregular settlements are subject to containment

measures, eviction or relocation. As of 2004, half of the total number of irregular settlements in Xochimilco (i.e. 150) were assigned to this category (25 January 2008).

#### *The case of El Asentamiento*

*El Asentamiento* is an irregular settlement established in the *chinampas* zone of Xochimilco in the early to mid-1980s. As such, the community's inception pre-dates the establishment of the ANP in 1992. The community's population is now an estimated 1150 persons living in 150 houses covering approximately 57,000 sq m (GDF, 2005b), with a mixture of outsiders and *nativos* living in both owned and rental housing in various stages of consolidation. The community draws upon existing municipal networks in an adjacent "regular" community to informally access urban services such as water and sanitation. Access to these essential urban services is not uniform across the entire community, however, and in many cases, the quality of available services is questionable. Shortly after the declaration of the ANP, *El Asentamiento* signed a zero growth agreement, but to little effect:

"Yes, we signed a zero growth agreement sometime ago, but it was never carried out. . . the agreement is not respected. Before, the community limit was the Jacaranda trees, and *El Asentamiento* extended to there, but the growth continued" (16 April 2008).

In the 1997 PDDU, *El Asentamiento* was designated a "rescue zone" within the ANP.<sup>24</sup> After years of pressuring local government, *El Asentamiento* was officially disincorporated from the ANP in 2006 (GDF, 2006a), along with a number of other irregular settlements. *El Asentamiento* still remains, however, part of the conservation zone. Upon its disincorporation from the ANP, the community moved from being a "zone subject to control" to a "zone subject to special regulation" (18 February 2008) and therefore eligible to receive official permission for residential use within the conservation zone. According to a community leader, the response of residents to their disincorporation from the ANP has been one of relief:

Content, very content because they gave us a big step forward when they disincorporated us from the ANP. We are no longer "ANP" but they still have not authorized the next step. They [residents] are very pleased because after so many years of seeking a change in land use, it is being given (14 March 2008).

Officials working in the Commission for Natural Resources and Rural Development (CORENA) now call the band of irregular settlements recently disincorporated from the ANP the "white belt" (*cinta blanca*) – a reference to its nebulous status as an area with residential use within conservation land (4 April 2008).

In 2007, *El Asentamiento's* urban–environmental study was completed.<sup>25</sup> Presently, the community is waiting upon the decision of the Commission for Special Regulation for Xochimilco. Municipal officials expect that *El Asentamiento* will be granted permission for a zoning of low-density rural residential (*habitacional rural de baja densidad* or HRB) and be provided closed-loop urban services limited to those residents counted in the most recent community survey in *El Asentamiento*. The various steps involved in this process are clearly summarized by a resident:

<sup>24</sup> Irregular settlements were commonly labelled "ecological rescue zones" (*zona de rescate*) in the 1997 PDDU. They are defined as: "Those areas whose natural conditions have been altered by irregular settlement. . . all projects and activities in these areas will be oriented towards re-establishing ecological balance, environmental health and rainwater capture and will be consistent with the norms established in the PGOE" (GDF, 2005b, p. 67).

<sup>25</sup> Although the study was completed, it was not publicly available at the time of conducting this research.

Speaking with the authorities, they say they are going to sign a new agreement [the collaboration agreement] to stop the urban sprawl and so that the growth does not continue. This is part of the paperwork that continues. As well, they told us that they are going to put a large water tank, only and exclusively for us in *El Asentamiento* (16 April 2008).

Still in limbo as of August 2008, residents planned to make a visit to the offices of SEDUVI in downtown Mexico City to exert pressure on them to expedite the actions of the Commission for Special Regulation. In August 2009, the community was being told by municipal officials that their sought-after land use change is likely to take until later in the year (20 August 2009). As of October 2009, the community was still waiting to hear about the status of its land use change.

The case of *El Asentamiento* highlights several important points about the Xochimilco model. First, this model rewards those irregular settlements that have existed for the longest periods of time in the conservation land and are therefore more consolidated. While this may seem perverse from an environmental perspective, this approach recognizes the arduous investment and struggle of lower-income households to construct shelter on an incremental basis over time. As such, the model ostensibly focuses on patterns of human settlement rather than ecological considerations. As elaborated below, the case of *El Asentamiento* is also indicative of how municipal decisions about individual irregular settlements accumulate over time to produce increasing fragmentation of conservation land, while leaving the "line" between urban and conservation land unchanged.

#### **"Ant-like" sprawl and the fragmentation of conservation land**

A comparison of the zoning maps for Xochimilco in the 1997 and 2005 PDDUs reveals a number of key dynamics affecting conservation land. First, the actual line dividing conservation land and urban land in the Federal District has not changed. What has changed, however, is the functional use of land within the conservation zone, with a diminution of the amount of continuous tracks of land zoned for ecological preservation (*preservación ecológica* or PE) and an increase in the amount of land zoned rural agro-industrial production (*producción rural agro-industrial* or PRA). In the 2005 PDDU, there is also the emergence of new areas that combine low-density residential rural land use with rural agro-industrial production (PRA-HRB or vice versa). The 2005 PDDU also shows an extremely intricate pattern of small areas of distinct land use zoning in conservation land. Together, these patterns reflect the disappearance of land zoned for preservation purposes, as well as the increasing fragmentation of the preservation areas that remain within conservation land. Despite this, the conservation "line" continues to be defended by some municipal officials:

Has the line worked? Not completely. However, if it wasn't for this conservation line, urbanization processes on conservation land today would be a lot more aggressive than we are currently seeing. For better or worse, it has allowed for the development of a series of policies. . . it has required a number of government agencies like SMA to carry out monitoring programs to try to prevent land use changes, deforestation and the invasion of irregular settlements. So it has served a purpose, perhaps not as hoped for, but it has been useful (21 February 2008).

This emerging land use pattern also reflects the fact that the extension of irregular settlement in Xochimilco seems to be following what is known locally as *mancha hormiga* ("ant-like" sprawl), a

pattern of small but creeping settlement areas in conservation land that has also been identified in the neighbouring municipality of Tlalpan (see Ruiz-Gomez, 2006).

This settlement pattern follows a particular socio-spatial logic that works lock-step with local approaches to managing the expansion of irregular settlement in conservation land. More specifically, many irregular settlements start out as small-scale occupations, but increase in size over time. First, the small size of the initial settlement is less likely to be noticed, reported, or to elicit a strong state response. In turn, this provides the much-needed time to begin the process of consolidation, negotiation with local government, and eventually, further growth. As one SEDUVI official explained: “People have adopted this mechanism, principally, because they have fewer problems than they would if 100 people arrived. . . smaller ones [settlements] are more easily accommodated” (16 May 2008). At the same time, this pattern of “ant-like” growth creates a myriad of political opportunities over time for the state to exploit insecurity as “an object of political trading and influence” (Stren and Polese, 2000, p. 27), even as it is presented as part of a “rational” planning process granting land use change to some irregular settlements but not others:

Everyone asks for a land use change. . . everyone asks for the same, but as we explained in the public consultation [related to the 2005 PDDU], the territory will be examined from a rational perspective. They saw that an educational institute [a Mexican university worked with the municipality to develop the model] came and did the work, so they saw a logical and rational reasoning (25 January 2008).

The fact that many residents living in irregular settlements in the Federal District obtain their voting credentials before access to urban services or tenure security attests to the political nature of this process.

In addition, the Xochimilco model establishes a differentiated land use regularization process in which a palette of incremental concessions may be granted to irregular settlements in varying degrees of consolidation over time (e.g. zero growth agreement, special study, payment of environmental damages, and installation of mitigation measures). To some extent, the Xochimilco model formalizes “ant-like” sprawl by granting these incremental concessions over time, moving irregular settlements along a continuum of interventions from “control” to “special regulation” as levels of consolidation increase. While this staged-approach represents a long and arduous process for communities, it provides the state with multiple opportunities for garnering political support in exchange for concessions. Given the widespread need to access land for affordable housing, this social and political dynamic is likely to continue at the municipal level. A SEDUVI official explains the situation in this way:

You can’t avoid their [irregular settlements] growth in conservation land. When you hear a slogan or when you hear environmental policies that claim ‘we are going to prohibit growth in conservation land’ – you are not going to be able to prevent it, that is, you can prohibit it [in law], but in reality, I see it as being very difficult to stop. So, efforts must focus on providing order (16 May 2008).

Ostensibly, then, the Xochimilco model focuses on mitigating rather than preventing the expansion of irregular settlements in conservation land, as evidenced by its emphasis on in situ mitigation and containment measures. A municipal advisor describes the situation in the following way:

How much are we halting urban sprawl? If we implement the [Xochimilco] municipal urban development plan, we will stop

the sprawl about 50%; we are not going to stop it 100%. That has been clear to us since the beginning. The “ant-like” sprawl – the kind of urban growth in which one occupied area leads to another – continues to operate by the same logic – opening more possibilities for urban growth. This is why I say, the problem of irregular settlements will not be solved. The commission [of special regulation], the fund and the municipal plan – these are all planned to mitigate, to reduce the impact in this zone by reducing the growth of irregular settlement by 50% (4 March 2008).

The focus on mitigating rather than eliminating the impact of irregular settlements on conservation land necessarily responds to the significant social and political pressures that municipalities face from lower-income communities seeking affordable ways of accessing land and shelter. As a PAOT official told me: “The basic question is: where are people going to live? It has to be somewhere” (11 February 2008). This clearly underlines the importance of developing pro-poor housing and land policies in conjunction with any serious environmental planning effort, supported with resources and better coordination at municipal and upper-levels of government.

## Conclusions

Although, more time is needed to analyze the implementation and impact of the Xochimilco model, this preliminary research highlights a number of important points. The model explicitly establishes formal planning procedures for informal settlements in conservation land. As such, the model conforms with recent UN-HABITAT (2009) recommendations to recognize all forms of urban development by extending land use regulations to informal urbanization. Given that 80% of land in Xochimilco is conservation, the model also therefore creates a prominent role for the municipality in managing land use regularization processes for irregular settlements. Moreover, this role is likely to command a significant part of the municipality’s time and resources given the prevalence of irregular settlements in conservation land in Xochimilco. At a general level, this research also suggests the ways in which irregularity is closely integrated with “normative” modes of local planning and governance. The model effectively establishes a differentiated process for regularizing land use in conservation land among irregular settlements of varying degrees of consolidation under the guise of a “normative” planning framework that is highly susceptible to political interference. In effect, this planning framework provides a way to rationalize political decision-making and to both legitimate and control irregular settlements at the same time. In this context, categorical constructions of regularity/irregularity no longer capture the nuances of regularization processes that are now differentiated by distinct categories of irregular settlements. Finally, the enormous social and political pressures to convert conservation land into affordable housing in the form of irregular settlement means that it is unlikely that the Federal District’s remaining conservation land can be preserved by approaches that rely on the disparate efforts of municipalities working on a case-by-case basis with the numerous irregular settlements that exist in conservation land both in Xochimilco and other municipalities in the Federal District. Although the Government of the Federal District (GDF) as a whole may have an interest in preserving conservation land as a key site for re-charging the aquifer that serves as its primary supply of drinking water, these settlement pressures suggest that municipalities will continue to focus on in-situ mitigation measures, rather than on ways to actually preserve conservation land and prevent its fragmentation. If the GDF is serious about backing its sustainable development discourse, it will provide more resources for affordable housing, local agricultural producers and ecological preservation while working closely with municipalities to realize a more comprehensive and equitable approach to sustainable development.

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## Appendix A. List of interviews cited

1. Municipal official, CORENA, Secretaría de Medio Ambiente (SMA), Gobierno del Distrito Federal (GDF). First interview: 18 January 2008; second interview: 4 April 2008.
2. Municipal official, Municipality of Xochimilco. First interview: 25 January 2008; second interview: 13 May 2008.
3. Official, Procuraduría de Medio Ambiente y del Ordenamiento Territorial del Distrito Federal (PAOT), 11 February 2008.
4. Municipal official, Municipality of Xochimilco. First interview: 18 February 2008; second interview: 8 May 2008.
5. Municipal official, Secretaría de Medio Ambiente, GDF. First interview: 21 February 2008; second interview: 19 May 2008.
6. Municipal advisor, Municipality of Xochimilco, 4 March 2008.
7. Municipal official, Secretaria de Desarrollo Urbano y Vivienda (SEDUVI), GDF. First interview: 6 March 2008; second interview: 16 May 2008; third interview: 21 August 2009.
8. Resident, *El Asentamiento*. First interview: 14 March 2008; second interview: 12 June 2008; third interview: 20 August 2009. Follow-up telephone conversation: 12 October 2009.
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