GEOPOLITICAL ECOLOGY OF REBELLION

ON ENVIRONMENTAL QUALITY IN NORTHEAST CHIAPAS, MEXICO

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GEOPOLITICAL ECOLOGY OF REBELLION
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ABSTRACT

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A two-part problem of geopolitical subdivision and political ecology of rebellious Zapatista areas of Chiapas, Mexico are examined in this research. Quantitative and qualitative (mixed) methods are used to evaluate geopolitical size and reasons for rebellion as well as environmental practices of selected official and rebellious entities.

Literature review of settlement patterns and the current rebellion reveals that land disputes have a long history in Chiapas. Chiapan environmental impact also proves to have a storied past.

Five rebellious, autonomous county seats (*cabeceras)* are compared with five official *cabeceras* in primarily highland, northeastern Chiapas, the region of Zapatista occupation. These administrative/market/transportation central places are evaluated as case studies in terms of demographic and environmental health parity.

This dissertation concludes that disparity exists between the largely latino *cabeceras* and the more rural, indigenous, declared autonomous centers of political administration. Argued is that official municipal administrations are operating beyond their carrying capacities creating a service/access deficit to the hinterlands of many Chiapan counties. Models and thresholds of administrative size are offered as solution to further insurgency.

CHAPTER I

INTRODUCTION:

STUDYING CHIAPAN SETTLEMENT, ENVIRONMENT, AND REBELLION

The aim of this research is to identify factors that are involved with both the political geographic factors leading up to the Zapatista Rebellion of January 1, 1994 in Chiapas, Mexico as well as how the impact of rebellion affects environmental quality. These problems call for analyzing dynamics through the theoretical perspectives of political geography and political ecology forming a concept specific to this research—"geopolitical ecology." An in-depth introduction is necessary for establishing important supporting elements of the study such as antecedents, pertinent theoretical foundations, and methods. Following the Introduction, the salient research and findings of the present study are organized under three main headings in order to frame the importance of the theoretical pillars used here to analyze and understand the net environmental impacts of rebellion and status quo political structures: political geography and political ecology (see Chapter III, Geopolitics in Northeast Chiapas and Chapter IV, The Political Ecology of Selected *Municipios* in Northeast Chiapas). The main objective of this research is to develop an integrative model (Creswell and Clark 2007, 6) to illustrate and facilitate understanding of how variables interact and relate to rebellion and through this theoretical construct recommend policy that might mitigate the problems of rebellion and

environmental practice in northeast, highland Chiapas as well as generic regions of conflict.

As introduced above, the theoretical construct that will be developed as a result of this research may be best termed as "geopolitical ecology" because, "it is clear that environmental researchers with an interest in politics and political geographers with an interest in the environment are on parallel, but distinctly separate tracks (Robbins 2003, 641)." The synthesis of political geography and political ecology with the conclusions, discussion, and recommendations will fall under the third and final main heading of geopolitical ecology (see figure 1 and Chapter V).

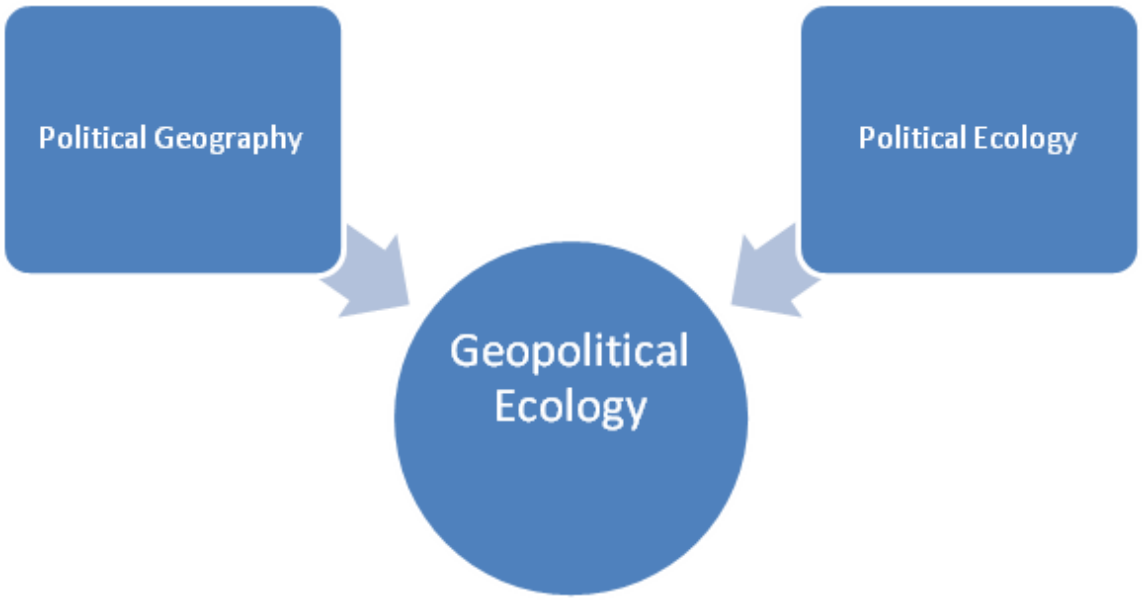

Figure 1. Visual representation of disciplinary synthesis.

This research considers a two-part problem of the Zapatista rebellion primarily in the northeastern highlands of Chiapas, Mexico (figure 2). The Zapatistas (also known as the *Ejército Zapatista de Liberación Nacional* - Zapatista Army of National Liberation, or EZLN) have geopolitically organized themselves into *municipios autonomos (*autonomous counties) juxtaposed within *municipios oficiales* (official counties of the smaller administrative units such as cities, townships, or villages) dating from State of

Figure 2. Relief map of the state of Chiapas, Mexico exhibiting the northeastern highland region, home to most Zapatista *municipios autonomos. Source:* Google 2008

Chiapas). The *municipio,* or tertiary level, is the smallest geopolitical subdivision in Mexico (somewhat analogous to U.S. counties, excepting that there are no early Spanish

colonial occupation in the New World (McAlister 1984, 136). The space for these *municipios* is not mutually exclusive with the *municipios autonomos* currently existing within the *municipios oficiales* (see figure 3).

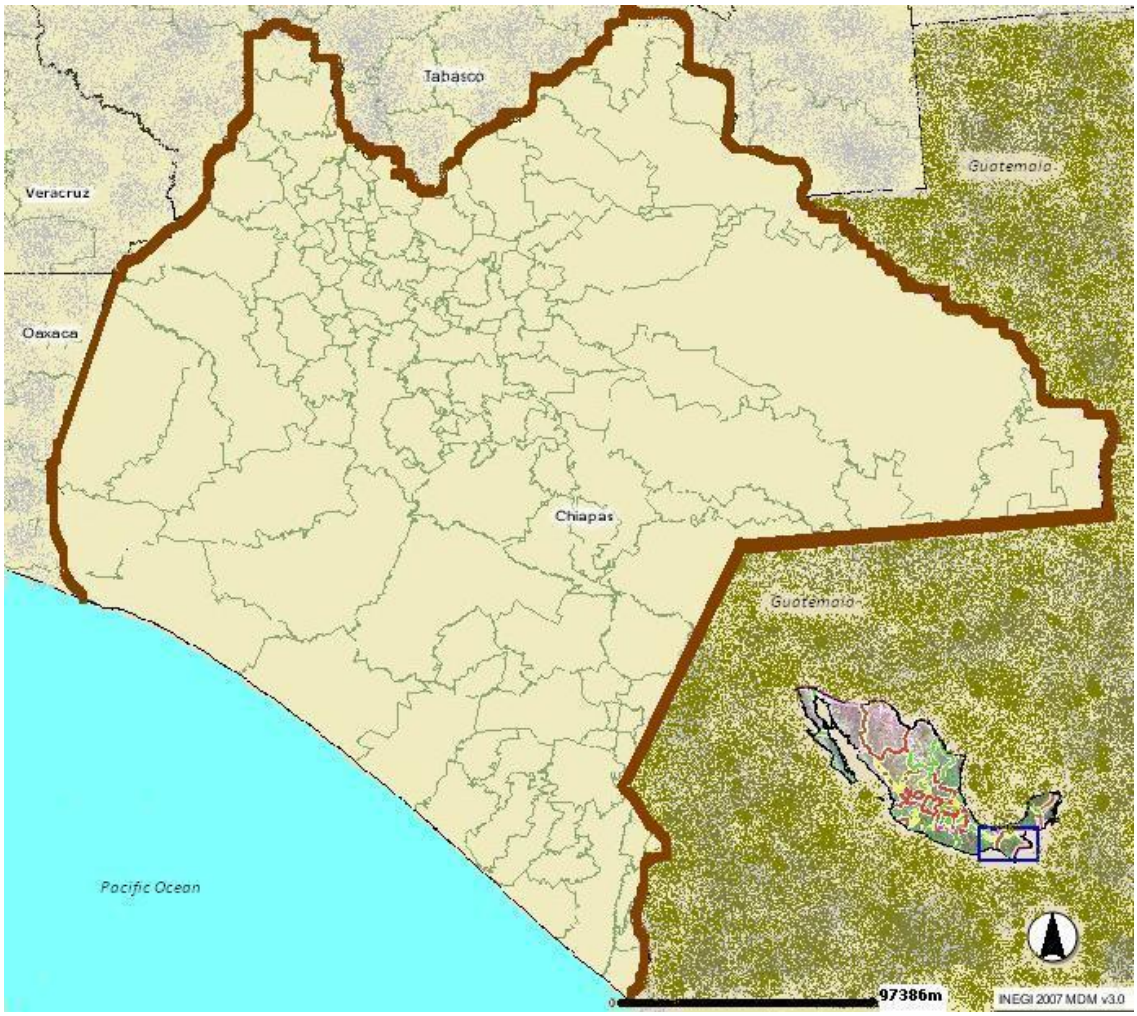

Figure 3. Current Municipios oficiales boundaries in Chiapas, created following the colonial Spanish model of metes and bounds, are wide ranging in shape and size. *Source:* INEGI/IRIS 2007.

The first problem this study examines is how Chiapans have organized themselves historically in terms of settlement patterns and geopolitical subdivisions and ultimately asks, "What issues with the *status quo* of the official *municipios* in

Chiapas led to rebellion and why have the Zapatistas organized themselves autonomously?" This question will form the basis of Chapter III.

The second part of the problem examines the political ecology, the treatment of environmental resources as republican governance as a result of the formation of Zapatista rebel areas in Chiapas while pre-rebellion status quo structures are still in place. This teatment is presented in Chapter IV, The Political Ecology of Selected *Municipios* in Northeast Chiapas. Compared are the environmental practices and conditions of the *municipios autonomos* and the *municipios oficiales* posing the question of, "How has Zapatista autonomy changed the environmental landscape of Chiapas?'

The result of an armed insurgency that occupied six Chiapan cities and scores of ranches on January 1, 1994 (Harvey 1998, 1; Hernandez Navaro 2002, 61-68; Marcos 2001, 5-16; Womack 1999, 245-56), the EZLN condensed its efforts around some thirty-eight declared autonomous *municipios* on 19 December 1994 (EZLN 1994). Five regional centers known as *caracoles* (snails) were instituted in 2003 to institute a new layer of administration to the *municipios autonomos* (EZLN 2003). "The number of Zapatista autonomous municipalities and regions has not remained constant. Some have been very successful, while others have not been able to organize themselves after their initial declaration (Burguette Cal y Mayor 2003, 204)." While much has been written on the historical and ideological reasons for the Zapatista rebellion (Harvey 1998; Hernandez Navaro 2002; Marcos 2001; Nash 2001; Stephen 2002; Tavanti 2003; Womack 1999), precious little has approached the practical and spatial aspects of instituting new government (Rus, Hernandez Castillo, and Mattiace 2003). The spatial aspects of the *municipios autonomo* and *caracoles* follow models of administrative

central place (Christaller 1966; Dacey 1966; Dacey, et al. 1974; Lösch 1954, Thunen 1966), colonial settlement patterns (Gerhard 1979; Knight 2002; McAllister 1984), and more ancient Mayan emergent seats of power (Driver and Garber 2004; Fash 1994; Hamond 1972).

The emergent autonomous *municipios* are the problem for this academic examination in terms of environmental quality, but they are also a very real problem for the population and government of Chiapas. Warfare insurgency is a disaster and causes problems for civil society making the whole population vulnerable (Hewitt 1994, 360-88). The State of Chiapas has the legislative power to legitimize the autonomous *municipios* under Title 1, Chapter II, Article 12 of the *Ley organica municipal del estado de Chiapas* (organic municipal law of the state of Chiapas):

> Municipalities shall be the territory within the limits as they have been recognized at present. The State Congress, has the power to amend its territorial extent and to abolish existing municipalities and create others in their place as is suitable in the public interest and complies with the formalities established by article 63, second and third paragraphs of the political constitution of the state. (Chiapas 2008.) (See Appendix II for original Spanish.) [You will note below that article 63 does not list any paragraphs, however, "reforms" are noted for 1984 and 2001 that may have eliminated such articles.]

and Article 63 of the state constitution:

> In no case may the incorporating or separating of one municipality to another be done without the approval of the majority of the municipal councils of the state, who shall issue their approval within sixty days from the date when they are presented with the matter in accordance with the provisions of the legal regulations. Abstention signifies approval. Said procedure requires the prior approval by congress of the state after having heard from the interested councils. (Chiapas 2008a.) (See Appendix II for original Spanish.)

Such remunicpalization (Chapter III) would grant the home rule needed to provide redistribution of federal and state revenues to the *municipios autonomos.* But these autonomous entities are poorly defined and still subject to boundary issues such as

disputes, simple definition, and, more importantly. In general, Zapatistas reject association and aid with/from the official government on any level (as discussed in Chapter III, Geopolitics in Northeast Chiapas and Chapter IV, The Political Ecology of Selected *Municipios* in Northeast Chiapas). This study analyzes the *municipios autonomos* and *municipios oficiales* as part of producing a normative model in the processes of geopolitics and political ecology – perhaps geopolitical ecology (Robbins 2003) (as presented in Chapter V, The Geopolitical Ecology of Northeast Chiapas). It is hoped that this study serves as a resource to mitigate problems resulting in conflict in Chiapas and contributes to geographic understanding of emergent central places, hazards, and environmental quality rebellion prone regions.

The Insurgency in Chiapas since 1994

Before and since the Zapatista rebellion began in Chiapas, New Year's Day 1994, inequities in the distribution of resources have been an on-going problem in Chiapas and generally most of Mexico (Díaz-Briquets and Weintraub 1991, 3-4; Stephen 2002; Womack 1999). There were initially 38 autonomous municipalities declared in Chiapas on December 9, 1994 (EZLN 1994). Autonomy for these municipalities is, as yet, not recognized by the state or federal governments of Mexico. Information on exact locations, names and boundaries of the new municipalities has varied over time (Burguete 2003, 204).

The right for autonomy, beyond rebellious declaration, is reinforced by Article II of the San Andres Accords between the Zapatistas and the Mexican Government which says in part:

> The union between townships and predominantly indigenous populations is proposed, not as a different type of municipality, but as one which, within the framework of the general concept of this political institution, may allow indigenous participation in its composition and unity, while, at the same time promoting and integrating indigenous communities into the municipal government. As to what constitutes a municipality on which federalism is based, it is considered necessary that the organizations be constitutionally strengthened, … (Bermudez-Ballin 1996.)

This accord, which took more than a year to negotiate, was signed by the Zapatistas and the Mexican government but is notorious for the Mexican government's refusal to implement the agreement (Bermudez-Ballin 1996). The general attitude stated in the accord toward the evolution of municipal government is in keeping with the *Ley Organica Municipal del Estado de Chiapas* which sets forth the political infrastructure to tax and distribute the municipalities' resources (Chiapas 2005).

"[I]n a dramatic march to Mexico City in 2001, the Zapatistas declared an end to the war and the conversion of their movement into a political, rather than military, one (Cohen 2003, 134)." The promise of the installation of Vicente Fox as President of Mexico in December of 2000, ending a 71-year hold on power by one party, dissipated with the failure of the Mexican legislature to pass an indigenous rights bills and the continued failure to honor the San Andres Accords (Craddock 2001, Cruz 2008). Strategies by the EZLN to manage and defend the declared autonomous *municipios* indicate that the Zapatistas are dedicated to their autonomy (Herrera 2003, B8; Ruiz 2003, 3A; Ruiz 2003a, 3A).

Some effort to solve the geopolitical problem stated by this study, "What was the problem with the *status quo* of the official *municipios* in Chiapas and why have the Zapatistas organized themselves autonomously?," has been endeavored by the State of Chiapas. In July 1999 then Governor Roberto Albores Guillén pushed through a

remunicipalización program instituting seven new *municipios* – all created as *municipios oficiales* in Zapatista territory without any effective consultation with the EZLN (Burguete Cal y Mayor 2004, 142).

There has been analysis painting a bright future for Zapatista and indigenous hegemony in Chiapas with the acquiescence of power by latino landholders (Bobrow-Strain 2007). But in the words of de Jouvenel, "If there is in power's make-up an egoistical urge combined with the will to serve society, it is a natural supposition that, the weaker the former, the stronger will be the latter: perfection of government would consist in the complete elimination of the egoistical principle (1993, 133)." In the temporal framework of the present, which this research ultimately represents, Zapatistas will continue their autonomous quest and resolve, albeit under the shadow of a new Mexican president, Filipe Calderon (elected in a highly divisive context in 2006), the ideology of neoliberalism and reconstituted federal military and paramilitary pressures (Cruz 2008). Promises of changing cooperation between latinos and indigenous people seem to be regressing back to thirty years before the rebellion when, "... there is no effective moral solidarity of the bicultural community as a whole. Clearly this condition is an important impediment to community-wide cooperative efforts (such as working on the road) which are designed to bring about 'modernization' or economic and social change (Hill 1964, 113)."

Methods

The operative hypothesis of this investigation is that there are environmental effects, both positive and negative, from far flung state administration and rebelliously declared centers. Mixed research methods (Creswell and Clark 2007, 11) are used to

explore the research questions of this dissertation to discern how newly created administrative subdivisions *(municipios autonomos)* enhance or degrade the environment in the forms of insurgency and human impact. Quantitative and qualitative methods are employed as appropriate to create case history snapshots in the selected *municipios oficiales y rebeldes* of the different effects rebel and state administrations have on the land.

Quantitative methods used here take advantage of existing data available through the 2000 and earlier censuses of the *Instituto Nacional de Estadística Geografíca e Informática* (INEGI – National Institute of Geographic Statistics and Information) of Mexico to produce descriptive statistics about Chiapan demographics. Analysis by point biserial correlation is used here to analyze relationships between population, area, and their hybrid, density, to explore associations where rebellion occurs. Descriptive statistics also come from original research through a questionnaire on environmental practices answered by officials at *municipios autonomos* and *municipios oficiales.* Data on administrative size was also collected for the two types of *municipios* and is presented descriptively. The INEGI *Información Refernciada Geospacialmente Integrada en un Sistema* 4.0.1 (IRIS) geographic information systems (GIS) are used for theme maps and modeling of normative conclusions for geopolitical subdivisions.

Qualitative methods employed here include grounded theory (Glaser 1967), case study (Creswell 2003, 15), and action research (Stringer 2007). The original research design for this study called only for grounded theory, which was used, but methods were expanded into case studies because of the differing natures of the Zapatista communities. In addition, action research methods were deemed necessary due to on-site visits to some

communities that brought out large groups of people curious about why this research focused on them. Questions from the investigator often became discussions with the people who themselves had questions about environmental practices. Thus, answers were provided that could not profess objective observer silence. Field observations and experiences in the Chiapan highland region each summer since 1995 also served as qualitative data and background for this study.

General Limitations of the Research

The scope of this research subject, people in northeastern, highland Chiapas and their treatment of the land as well as each other, can be seen as finite or infinite space with similar paradox in consideration of time. While I represent this work to be sedulous, earnest, and rigorous, it is not comprehensive, positivistic, or representative. I would like to say that my perspective of the issues that are presented with this research were objective along with the reports of the people interviewed and studied but a quote from Karl Marx is illustrative of reporting on both sides:

> Men make their own history, but they do not make it as they please; they do not make it under self-selected circumstances, but under circumstances existing already, given and transmitted from the past. The tradition of all dead generations weighs like a nightmare on the brains of the living. And just as they seem to be occupied with revolutionizing themselves and things, creating something that did not exist before, precisely in such epochs of revolutionary crisis they anxiously conjure up the spirits of the past to their service, borrowing from them names, battle slogans, and costumes in order to present this new scene in world history in time-honored disguise and borrowed language. (1852 I.)

CHAPTER II

THEORETICAL FOUNDATIONS AND LITERATURE REVIEW

Wallerstein, in his undertaking to describe a world-system, sets out the importance of the interrelation between theory and data:

> Theorizing is not an activity separate from the analysis of empirical data. Analyses can only be made in terms of theoretical schema and propositions. On the other hand, analyses of events or processes must include as a starting point a whole series of specific values of certain of the variables, on the basis of which one can explain how the final outcomes were arrived at. In order to convey the historical explanation with clarity, it is often the case that one has to assume or glide over the exposition of the formal interrelations between variables. (1974, Vol. 1, 347.)

This section enumerates established theories applicable to the study of rebellious geopolitical division on environmental quality in northeast Chiapas, Mexico, while Chapter III, "Geopolitics in Northeast Chiapas," and Chapter IV, "The Political Ecology of Selected *Municipios* in Northeast Chiapas," present data specific to the area of study. The concluding Chapter V, The Geopolitical Ecology of Northeast Chiapas approaches new theory and analysis from data collected or mined for this understanding of the central problems of why there was Chiapan rebellion and how subsequent partitioning affects environs, hopefully without too much of Wallerstein's "assumption" or "gliding".

The titular importance of political geography and political ecology signify much of the theoretical weight of this dissertation (figure 4). These major tenets are introduced from a historical perspective in this section leading to full application in succeeding

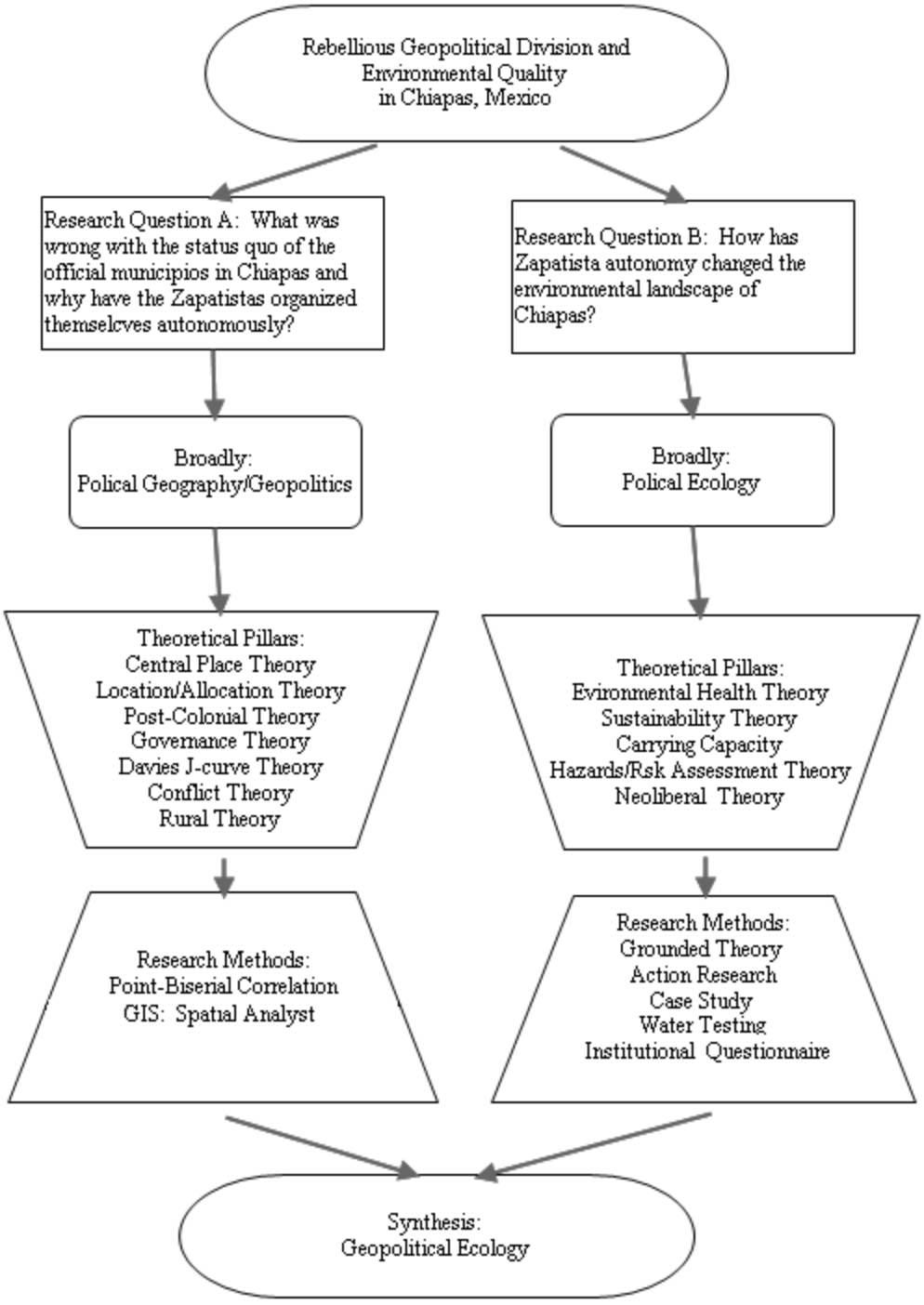

Figure 4. A schema of the current research.

Chapters (III and IV) and ultimately synthesized in Chapter V, "The Geopolitical Ecology of Northeast Chiapas." Among other theoretical pillars subordinate to this work and reviewed in this section are Central Place Theory, rural theory, carrying capacity, conflict theory and Davie's J-Curve, location/allocation theory, hazards/risk assessment theory, postcolonialism, governance, environmental health. Practically applied research theories in this dissertation (Grounded Theory, Action Research Theory) are discussed under "Methods" in the introductory chapter.

Political Geography

Agnew repeatedly asserts that political geography, as a branch of geography, is not some inherent taxonomic structure in a natural order of classification but is rather a subdiscipline that has been made over the history of the emergence of geography as a formal academic discipline in the late 19th century and as a *made* construct, political geography is biased by its makers and utilized to solve their problems (2002). He also gives a pithy definition: "The commonsense meaning of political geography is the study of how politics is informed by geography (2002, 1)."

Political geography is traditionally headed by the subject of the state, in general, and further subdivided into two sublevels: locality and internationality (Agnew 2002, 1-2; Husain 2007, 1-2; Blacksell 2006, 2-10; Jones, Jones, and Woods 2004, 2-4). These aforementioned authors also argue an emergence of another global level in this mix but the ramifications of globalization to the Zapatistas are mentioned here more in terms of an externality rather than a functional process of the region under study. Though world systems theory (Taylor and Flint 2000; Taylor 1989; Wallerstein 1974) might drive much

of the objection of Zapatista rebellion, such an approach is not seen as a normative solution to its own rejection. While this dissertation concerns itself with the local level political subdivision in Mexico, the *municipio*, there are also strong ramifications of geopolitics (the international level) because of the autonomous nature of the declared Zapatista regions. Strong also are the post-colonial (discussed later under its own subheading) overtones of *irredentism* (territorial claims of one group while the territory is controlled by another group) in the demand for indigenous autonomy in Chiapas. Such autonomy raises the question of whether or not the Zapatista rebellion has effectively made a new sovereign nation, or will in the future.

A large element of political geography is statecraft and its sordid history of power politics and environmental determinism (Parker 1982). Surely, with any manipulation or normative direction of political structures, we must distinguish between the early meanings of geopolitics as statecraft of domination and imperialism now often cited under critical geopolitics (Dodds 2003; Kearns 2003; Luke 2003; Natter 2003; Routledge 2003) and its more modern usage. Geopolitics have evolved into an understanding, "… not as a school of thought, but as an analysis, relating diversity in content and scale of geographical settings to exercise of political power, and identifying spatial frameworks through which power flows (Cohen, 2003, 12)."

The contribution this work offers in terms of political geography is perhaps global in a world systems kind of way, "… whose expansion has eliminated all other systems – hence our 'one-society assumption' for studying contemporary social change (Taylor and Flint 2000, 9)." This is to say that if we find truths analyzing the political geography of

Chiapan *municipios*, we can hopefully apply these truths to the political geographies of other conflict regions or subvert growing conflicts before they break into warfare.

On a practical scale of understanding variants of similar terms we have political geography, geopolitics, and geopolitical. Herein the following meanings will attempt to adhere to this usage: *political geography* – theory and the subdiscipline of geography encompassing the intersection of the two disciplines; *geopolitics* – the relations between states or factions of power within states often with spatial ramifications; and *geopolitical* – an adjectival usage signifying tacit boundaries that represent local, regional, or national subdivisions.

Political Ecology

Some understanding of political geography leads us to *political ecology*, a term originated as the titular description of Eric Wolf's Alpine study where, "…much of the data on cultural ecology in the Alps could be phrased as the outcome of a continuing game against a centrifugally organized environment by populations equipped with two sets of ambiguous and often contradictory rules (1972, 201)." Certainly a description that will ring more familiar as this study progresses to describe Zapatista and official municipal environmental practices.

Wolf expands on a definition of political ecology on a microscopic scale ultimately hinting toward the more macroscopic scale of the present study:

> Thus rules striving to direct and contain the dynamics of ownership may on occasion dove-tail with the long-range strategies utilized by a community to expand, intensify or regulate its own ecological niche. Ideal rules of inheritance may sometimes confirm efforts at regulation in yielding a finite set of homesteads with viable combinations of resources. On the other hand, rules of partibility may threaten to fragment resource combinations and thus endanger the regulatory mechanisms …. The

same may happen in situations where ideal impartibility is not followed in fact, as in any situation where the short-range interests of households run counter to regulatory controls of the community (1972, 203).

As political ecology has evolved into a formal discipline, Paul Robbins, whose work (2003) will play a large part in the synthesis of this study in the concluding chapter, launches several perspectives on defining this interdisciplinary endeavor with one of the more practical being:

> [P]olitical ecology is something that people *do*, a research effort to expose the forces at work in ecological struggle and document livelihood alternatives in the face of change. This does not mean that political ecology is something that people do all the time. Much of this work is carried out by people who might never refer to themselves as political ecologists, or who might do so in only one sphere of their work. Neither is political ecology restricted to academics from the "first world." Indeed, the ongoing, small-scale, empirical research projects conducted by countless non-governmental organizations (NGOs) and advocacy groups around the world, surveying the changing fortunes of local people and the landscapes in which they live, probably comprise the largest share of work in political ecology. Published only in local meeting and development reports, this work is as much a part of the field as the well-circulated books or refereed journal articles of formal science. (2004, 13.)

Getting more practical and applied to the point of the regional nature of the Zapatista area of rebellion in northeast Chiapas is a passage defining political ecology by Piers Blaikie and Harold Brookfield with regard to their approach to *Land Degradation and Society* – the subject and title of their monograph:

> The complexity of [relationships] demands an approach which can encompass interactive effects, the contribution of different geographical scales and hierarchies of socioeconomic organizations (e.g. person, household, village, region, state, world) and the contradictions between social and environmental changes through time. Our approach can be described as *regional political ecology.* The adjective 'regional' is important because it is necessary to take account of environmental variability and the spatial variations in resilience and sensitivity of the land, as different demands are put on the land through time. The word 'regional' also implies the incorporation of environmental considerations into theories of regional growth and decline.
>
> …The phrase 'political ecology' combines the concerns of ecology and a broadly defined political economy. Together this encompasses the constantly

shifting dialectic between society and land-based resources, and also within classes and groups within society itself.

We also derive from political economy a concern with the role of the state. The state commonly tends to lend its power to dominant groups and classes, and thus may reinforce the tendency for accumulation by these dominant groups and marginalization of the losers, through such actions as taxation, food policy, land tenure policy and the allocation of resources. (1987, 17.)

Blaikie and Brookfield's concern for political economy as an active part of political ecology certainly applies to the epic indigenous/latino struggles in Chiapas especially in relation to land tenure and as later examined here, allocation of administrative resources.

Finally, Robbins summarizes the historical mandates for political ecology:

…it is possible to argue that political ecology as a distinct mode of research emerged in the last 20 [now 25] years as a result of three convergent factors. First, cultural ecology and other related positivist human-environment social sciences had reached the limits of explanatory power for addressing some important questions about environmental change. Second, insights were emerging from critical theory of many kinds, including green materialism, peasant studies, postcolonial theory, and feminism.

Third, apparent contradictions and feedbacks in global ecology were accelerating in the late twentieth century as a result of globalization. Images of Sahelian droughts were broadcast to households around the world. Global conservation organizations were beginning to vie for attention against multinational corporate machines. American consumers, while calling for preservation of tropical biodiversity, were eating bananas harvested from plantations that displaced rainforests. These trends were joined by peasant uprisings, disasters at Chernobyl and Bhopal, and popular movements in the forests on the periphery of the global economy. Thus while "apolitical" human-environment science continued to thrive as the twentieth century drew to a close, anthropology, geography, sociology, political science, and a gamut of other research fields were swept up in a great transformation, signaling a change in methods of research and modes of explanation for social environmental science. (2004, 67-70.)

Central Place Theory

J. H. von Thünen's work, *The Isolated State*, written in three volumes between 1826 and 1863, provides one of the earliest geographic models of areal land use and

economic distribution. Thünen, a German, diagramed the layout of a settlement center with four rings representing land use: intensive farming, forest, field crops, and ranching all emanating from his hypothetical central town. This early modeling, as is much modeling today, is a homeostatic consideration of land use exhibiting the effects of distance on agricultural production. (Thünen 1966).

The City, published in 1925 by Park, Burgess, and McKenzie, is a keystone product of the Chicago School of sociology (1967, vii-x). Though a monograph of urban conditions (with the present study being primarily rural), *The City* is among the first to analyze the connection of socioeconomic factors and space while adapting the ecological metaphor to human settlements: "The young sciences of plant and animal ecology have become fairly well established. Their respective fields are apparently quite well defined, and a set of concept for analysis is becoming rather generally accepted. The subject of human ecology, however, is still practically an unsurveyed field, that is, so far as a systematic and scientific approach is concerned (1967, 63)."

Presenting a homeostatic model of areal land use is Walter Christaller's, Central Place Theory. A German, like Thünen, Christaller developed his work during the Nazi era but its importance was not recognized there until much later. Sweden and the United States popularized and applied his theories first with his *Central Places in Southern Germany* not being translated into English until 1966 (Hottes 1983). Central Place Theory looks at the regular spacing of population settlements and their wreathed expansion according to function on a heterogeneous plain – a valuable theory in this consideration of Chiapas yet having its limits tested because of its seldom homogeneous highland topography (Christaller 1966).

Mayan settlement patterns of antiquity have been gauged to have been quite regular in incidence. Driver and Garber (2004) plotted Mayan elite centers in the Belize River Valley and found them to be spaced at a predictive 9.9 kilometers apart, about the distance to reach another polity, conduct business, and return home in the same day when traveling by foot - a distance feature that could easily guide modern normative partitioning of *municipios* because of the pedestrian nature of transportation of much of the contemporary Chiapan population. Other Mayan regions, such as the Yucatan and the Petén, report varying spatial distances but at consistent intervals comprising a day's or half-day's travel distance dependent on topography and population density (2004, 289-90). Hammond calculated nearest neighbor distances of Mayan archaeological sites known at the time (1972) and finds first order modes of about ten kilometers from 83 sites with second and third order nearest neighbors occurring in modes of multiples of distances approximate to their ordinal orders (124-25).

Smaller centers have been found to occur in the Late Classic period (toward AD 900) and emerged at near equidistant points between the more established elite centers. Driver and Garber concluded that these centers were not satellites of the elite centers but were most likely prosperous farms emerging where swelling population filled in available territory (2004, 302-3).

Each state in Mexico, including Chiapas, has its own set of organic municipal laws that also set forth the political subdivisions of the states (State of Chiapas 2000). Nationwide, and in most of Latin America, this subdivision is called the *municipio* (municipality), which, as mentioned earlier, could be compared to the U.S. county in terms of geopolitical division (mostly in a metes and bounds fashion (McAlister 1984,

136). This device of geopolitical subdivision dates from the colonial days of Hernando Cortez and the Spanish Conquest (McAlister 1984, 135-152); however, in most of Mexico, there are no further formal geopolitical subdivisions such as cities, townships, boroughs, etc. There are, in Mexico, informal *barrios* (neighborhoods), *delegaciones* (political party subdivisions in large metropolitan areas), and *colonias* (postal districts in metropolitan areas), but these are not formal geopolitical boundaries recognized by state and federal entities for purposes of distribution of resources. *Ejidos*, large cadastral subdivisions of community land, play large as defining communities in Chiapas, but are not formal geopolitical subdivisions (Benjamin 1996, 13; Harvey 1998, 186-88; Rus et al. 2003, 6). There are, in Chiapas, also 19 *distritos judiciales* comprising subdivisions for legal actions (Supremo Tribunal de Justicia 2007) and nine *divisiones regionales* used primarily for economic statistical purposes (Chiapas 2005). The AGEB (Áreas Geoestadísticas Básica, or basic geo statistical area) is also used for statistical purposes similar to a US census tract.

This lack of further subdivision may be at the root of the problem of the Zapatista rebellion. A municipal seat, *cabecera,* artificially creates the central area and does not allow for other equivalent centers to emerge where they are needed in the hinter regions of large municipalities. Further, the topography of Chiapas is stressed by a lack of adherence to the laws of Walter Christaller's Central Place Theory (1966) and August Löch's, *The Economics of Location* (1954). Michael F. Dacey makes a valid point in his paper, *A County-Seat Model for the Areal Pattern of an Urban System,* when he states that theories like Christaller's and Löch's:

…have emphasized economic factors to the almost total exclusion of other variables. However, the system of cities and towns in any region is undoubtedly conditioned by the

> historical development and contemporary status of economic, social, political, and cultural institutions in that region and in the world at large. Because of the inherent complexity of an urban system, any theory that explains its areal pattern on the basis of only one behavioral system must be partial and incomplete. (1966, 527.)

Nor is Dacey's stochastic model for county seats (1966, 529, 532) and his one-dimensional study of central place (Dacey et al. 1974) that assumes homogeneity in the location of all cities and towns, complete.

Two main factors appear to dictate the phenomenon of central place in many Chiapan municipalities: religion/administration and transportation. Among the oldest functional structures in these municipalities are cathedrals dating approximately from the colonial period in the sixteenth century. As a center of colonial life, the cathedrals were, and are, about a day's walking distance to each other like the settlement patterns of Mayan antiquity allowing travel and return home in one day (Driver and Garber 2004, 289-90).

A cathedral is found approximately every ten kilometers on transportation corridors in historic colonial centers. A preliminary study by Samson in 2003 examined such a corridor containing four state recognized municipalities: Ocosingo, Chilón, Yajalón and Tila (see figure 6). Lying between the *municipios* of Ocosingo and Chilón, in Chiapas, is a community with a cathedral from antiquity called Bachajón. Bachajón is not an official *municipio* but is part of the *municipio of* Chilón. Bachajón is also the largest community in the Zapatista declared autonomous *municipio* of Olga Isabel. Another such center lies between Yajalón and Tila: Petalsingo. The four official municipal seats of Tila, Yajalón, Chilón and Ocosingo are all literally within a stone's throw of their respective cathedrals. Bachajón and Petalsingo have no municipal seats but their cathedrals have large administrative complexes that fill the void of a lack of government

services. The situation of colonial period cathedrals seems to have followed patterns of defense (to be able to flee to another cathedral complex in case of attack) and preexisting indigenous community centers, which may have kept early Mayan patterns of regular spacing (Graham 1998, 40, 50).

The other factor of central place is what passes for many as communication in rural Chiapas: transportation. Polling of telephone users, as in Christaller's work (1966, 139-52), would be difficult in determining a central place in Chiapas with the only practical distinction being *latinos* who have home telephones in the central places and indigenous people who generally do not have phones in the rural areas would skew the tessellations (the graphic containment of space). Transportation becomes the means of communication due to corridors that emerge from steep bifurcated mountain ranges that give way to an alluvial plain following directions of northwest to southeasterly of the municipal centers of Tila, Yajalón (one of the smallest *municipios legitimas* in Chiapas), Chilón and Ocosingo (the largest *municipio legitima* in Chiapas). These *municipios'* administrative centers follow a transportation corridor and are representative of highland Chiapas (see figure 5). This route continues to the northern plains of the Isthmus of Tehuantepec through to Villahermosa, Tabasco and on to the Gulf of Mexico. Christaller speaks to the issue of central place and mountains:

> In the high mountains, there are, of course, quite considerable physiographically conditioned deviations from the [central place] pattern. Here the natural circumstances are so dominant that, in many cases, it is hardly any longer possible to speak of an actual system of central places. Still, it should be noted that, as a general rule, the typical distances are nevertheless observed; in other words, economic principles determine the distribution of central places to the extent that natural circumstances permit. (1966, 196.)

Though Tila, Yajalón, Chión and Ocosingo vary widely in geographic area they have the commonality of having very small central places, their historically colonial centers with

cathedrals and contemporary seats of government - the *cabeceras*. So what exists with Tila, Petalsingo, Yajalón, Chilón, Bachajón and Ocosingo (figure 6) is a corridor of central places that adhere to central place theory only, "…to the extent that natural circumstances permit," (Christaller 1996, 196). The mountainous constraints of the region certainly facilitate the location of central market places in the transportation corridor of the alluvial plane, but the wreathing of smaller places from the principle central place is outpaced by the primacy of the municipal administrative centers. In these

Figure 5. The mountainous nature of Chiapas. *Source:* ESRI 2005.

selected Chiapan municipalities large numbers of people are dependent on the central administrative place that does not follow central place theory progression under the *K*=3 (market), *K*=4 (transportation) or *K*=7 (administrative) progressions of Christaller (1996). What Löch described as a, "punctiform agglomeration," is more descriptive of the

phenomena of the municipal seats requiring the central attention of the hinterlands (1954, 10).

It is punctiform agglomeration that stresses the areas outside the central place into the insurgency of declaring autonomous places. Administration consolidated in one place for a vast population exceeds a threshold of being able to serve the entire population of the municipality. Serving the population of the municipality by means of distribution and redistribution of resources in the form of federal, state and municipal wealth is indeed the job of the municipalities in Chiapas. These resources assume many forms such as roads, entitlements, education, water, electricity and law enforcement. With small administrative centers serving far and wide geographic areas and large populations, many of the expectations of the constituency are not being met.

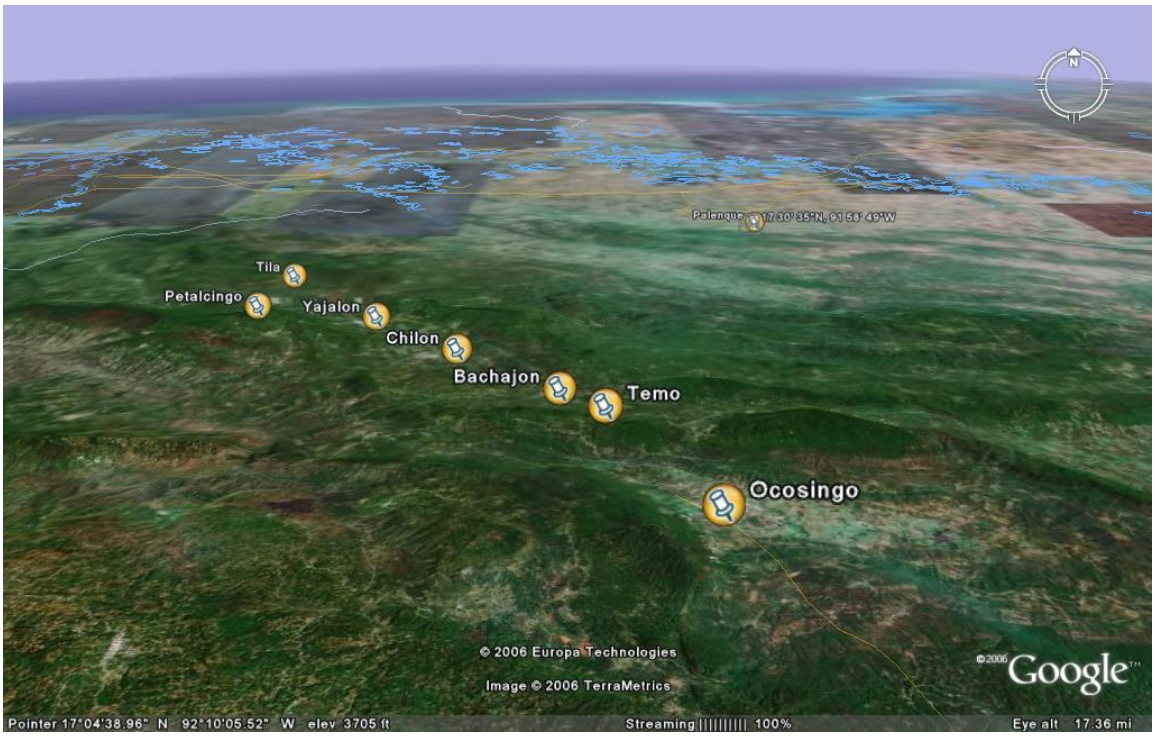

Figure 6. A flyover of the preliminary study area. *Source:* Google 2006.

Rural Theory

The idea of populations outside of central areas introduces rural theory, often read as rural sociology. Shifts from agriculture-based populations form centripetal force toward central places and make urban populations the dominant paradigm throughout much of the modern world. However, Chiapas remains very agricultural in spite of challenging topography – a challenge to transportation as well. But, "… rural sociology made a primordial decision in its formative period to become associated with *rural society* rather than with *agriculture* (Friedland 1982, 590)." Such a "primordial" description is offered from Mann's 1920 writing:

> The sociology of rural life is, roughly, then, the study of the associated or group activities of the people who live in the country viewed from the standpoint of the effect of those activities on the character of the farm people themselves. It recognizes as the final term in the whole country-life enterprise the farmer himself. It involves the consideration of the means, agencies, and methods, by which the farmer can realize in himself the best there is in human experience….
>
> The present widespread interest in rural conditions grew out of the discovery that certain conditions were not as satisfactory as they ought to be and that they were capable of being improved. And so we find ourselves following the normal procedure in the correction of social deficiencies, namely, by first calling attention to them, stimulating discussion, creating public interest, and crystallizing public sentiment into specific measures for amelioration. (612-13.)

A more modern conception of rural sociology and its theoretical place are spelled out by Gilbert:

> The concept "rural" implies its complement, "urban." Together they constitute the complex unity of society viewed from a spatial angle. This conceptual separation of rural and urban can be purely expedient. The splitting of society in two may be justified, for example, in that some researchers focus on cities while others look more to the countryside – the spatial totality being too much to grasp all at once….
>
> Most sociologists today agree that scientific empirical work requires a theoretical perspective from which to view the phenomenon under study. There is no direct, unmediated perception of the so-called facts. Empirical observation is inevitably, if often unwittingly, [theory-laden]. (1982, 609-10.)

Halfacree's (1993) parsings of the definition of "rural" take an apologetic post-modern view. His words expand the dichotomy of location vs. place and cautions the trappings of *similacra*:

> Just as there are 'urban areas', 'residential areas', 'suburban areas' and a host of other types of area, so too can we define 'rural areas' according to their socio-spatial characteristics. This way of defining the rural concentrates upon that which is observable and measurable and, hence, leads to descriptive definitions. Such empiricism accepts that the rural exists and concerns itself with the correct selection of parameters with which to define [it]…. (23.)
>
> Whilst neither simple rural-urban dichotomies nor more complex continua work well empirically, these approaches can also be criticized as being theoretically flawed. Studies reflected the penetration of geographical (environmental) determinism into social science, whereby human behavior and character is determined by the physical environment in which it exists. The specific development of such determinism in rural studies was aided by the combination of structural-functional anthropology and the romanticist defence of supposedly rural culture and [traditions]. Briefly, this isolated the rural as symbolizing a stable, harmonious community, everything 'positive' that urban life seemed to lack. This was a myth, since the determinists had a misconception of space (and time). Instead, we need an appreciation of rural space which neither prioritizes its empirical structure nor relies upon a false dichotomy between space and society. Defining the rural comes after this.
>
> [T]he principal theoretical criticism of both the descriptive and socio-cultural definitions of the rural is that they demonstrate an erroneous conceptualization of the relationship between space and society…. (25-26.)
>
> …[T]he problem in the literature stems from a failure to distinguish between the rural as a distinctive type of locality and the rural as a social representation – the rural as space and the rural as representing space – confounded by other difficulties, such as the inadequate conceptualization of space.
>
> In an era described by some as post-modern, where symbols appear increasingly to be 'freed' from their referential moorings, it is increasingly important to acknowledge explicitly this difference between space and its social representation. Indeed, we may have to recognize that whilst the referent – the rural locality – may be withering away in respect to its causal significance and distinctiveness (assuming such a salience ever really existed), its nominally associated social representation may well be flourishing and evolving…. Space becomes imbued with the characteristics of these representations, not only at an imaginative level but also physically, through the use of these representations in action. (34.)

The centrifugal force of agriculture on population creates the hinterland issue where people are isolated from administration, markets, transportation, and generally

access to goods and services enjoyed by more concentrated populations. Ribot and Peluso put rural isolation into context by theorizing access:

> Access analysis can be focused on the policy environments that enable and disable different actors to gain, maintain, or control resource access or the micro-dynamics of who benefits from resources and how. Access analysis puts property in place among the many other mechanisms that shape the distribution of benefits, the landscape of incentives, and the efficiency and equity of resource use. In doing so, it serves as a tool for identifying the larger range of policy mechanisms—beyond property and other forms of rights—that can affect changes in resource management and use efficiency, equity, and sustainability with consequences for well-being, justice, conflict, and cooperation. (2003, 173-74.)

One might want to take a social engineering/evolutionary view of Chiapan rural society but logistical factors might throw its state of existence against Friedland's consideration outside agriculture. Hopefully, many Chiapans will progress to the use of electricity, treated water/wastewater, paved roads, and other modern conveniences long denied them in the past and still *hoy en dia* (today) but agriculture in highland Chiapas is likely to remain unmechanized/unmodernized, if it remains at all. (I traveled in northeast Chiapas for ten years before I saw my first tractor and have not seen another since there.) Most agriculture (corn, beans, and squash) is conducted on very steep slopes on the order of 40 percent or more (figure 7). Agriculture is likely to remain a manual operation in these lands where slash and burn is often practiced. Seeds are planted from a shoulder bag after a stick makes a hole in the ground while crews go out daily with hoes to clean the fields of weeds and harvest means breaking corn stalks over and leaving them to dry since the inverted husk will protect the cob from the rain. Corporate agriculture is not likely to displace the majority of rural farm workers to the population concentrations of cities like many industrialized societies have seen (Bailey 1913, 5-50). This is to say that Chiapas' social character is likely to remain rural, if it remains agricultural (figure 8).

Location/Allocation Theory

Though location and allocation build upon Central Place Theory their place in spatial geography leads us toward the normative. Location will tell us where a resource

Figure 7. Steep corn fields in the Municipio Pantelhó, Chiapas, typical of agriculture and topography throughout northeastern, highland Chiapas that prohibits mechanized agriculture.

portal should be – allocation will tell us how often there should be a new location.

Bleddyn Davies gives his idea of the ideal of these concepts:

> Under certain conditions, it should be possible in principle to specify what seems to be the ideal distribution of the resources devoted to a social service in a way that is useful in an empirical study of variations in standards of provision. Among the most important of these conditions are that there is a high degree of consensus of community value judgments about the aims of the services and the relative importance of these aims and that there is broad agreement about the distribution of resources which would best achieve each of the aims; that the methods of

> achieving these aims are compatible with other ideals; that ideas about the aims of services, their relative importance, and the best way of achieving them are not changing so quickly and unpredictably that resources invested in highly specific capital are likely to be maldistributed quite early in their working life; and that the rate of growth of the services will be such that the amount of capital created annually will be large enough to keep the distribution of immobile capital appropriate. The degree to which these conditions apply varies between services and the usefulness of the specification of need will vary accordingly. One cannot fully ascertain the degree to which the conditions apply to any of the services at the moment because some of them will be determined in the future. (1968, 15.)

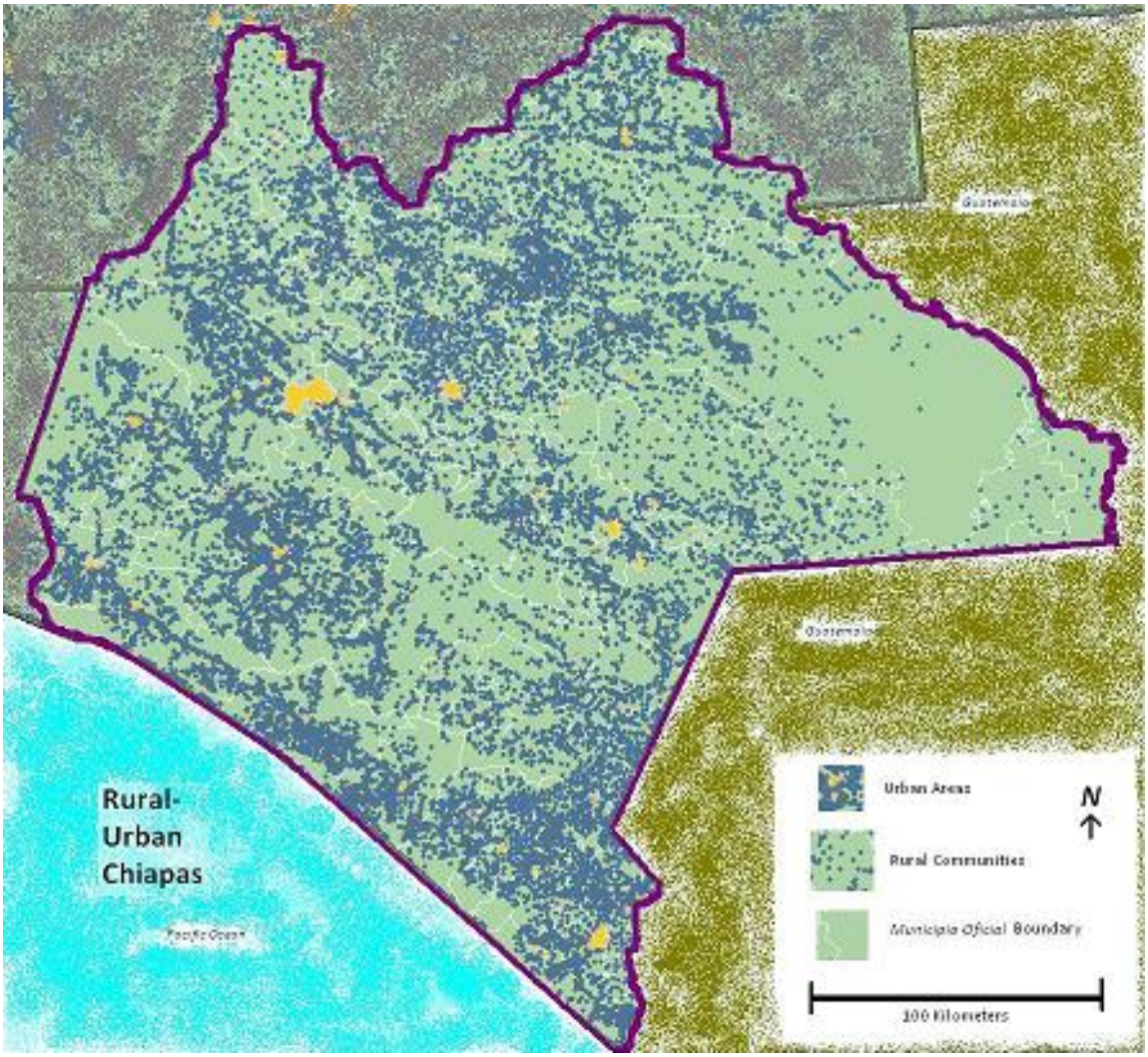

Figure 8. The rural character of Chiapas (INEGI/IRIS 2007).

Basing such distribution on consensus and self-sustaining capital seems to ignore the fact that many such allocation of services comes about by essential need and

governmental determination. Essential need implies a service is required but may not include consensus that the community wants to financially support it, such as a bond hearing for a school district or a neighborhood rejecting the idea of a half-way house for mentally incapacitated adults. Financially, while some special districts may be formed with special taxing powers, the general tax capital of a governmental entity is redistributing the common wealth in the form of the service regardless of profitability. Such seems the difference between an ideal and reality.

The economic philosophies and institutions of location and allocation would certainly seem to be a determining factor in application to the Chiapan study area. We are considering governmental districts in the cases of both the *municipios oficiales* and the *municipios autonomos* in Chiapas, and the kinds of services such districts provide such as general administration, police, recreation, education, water/waste water, and other public works. More specifically, we will consider the administration of environmental practices later in Chapter IV, "The Political Ecology of Selected *Municipios* in Northeast Chiapas."

But theories want to be general to their applications and have a wide appeal to different modes of application so in finding normative governmental service location/allocation in Chiapas. This research considers different approaches to location/allocation theory as metaphors to synthesize a normative prescription for Chiapas. Dunn considers location theory, in general, relating to agriculture:

> What form should [an "ideal" theory of location] take? Two things of importance stand out. First, the theory should comprehend and solve problems on all levels of aggregation. It is not possible to answer all questions by dealing with a location theory built entirely on such generalized concepts as population concentrations, just as it is not possible to answer all economic questions with the aggregative theories that have been developed around such concepts as savings, investment, and consumption….

> There is a second important point. A theory that is exclusively a theory of space will not provide final answers to the full range of questions – nor will a theory of agricultural location, exclusive of the location of other economic activities, provide all of the answers. The solution of land-use patterns in agriculture is an inextricable part of the solution of *the* economic principle. (1967, 3-4.)

Thus, one could interpolate from this that local administration could substitute for agriculture and understand "*the* economic principle" to be a throwback to Thunen's very early work and principles of land rent where the highest valued land will displace other use (Dunn, indeed, quotes von Thunen repeatedly (iii, 6)).

Massam specifically takes on *Location and Space in Social Administration*, the title of his 1975 monograph. While medical services are often credited with originating and organizing location/allocation theory to distribute a manageable ratio of medical professionals to the general population, documentation of such history is difficult to find with Massam citing some early United Nations normative figures (5-6). His approach to location/allocation theory is one of the most comprehensive in scope and perhaps his best caution related to forming normative models for the distribution of administrative resources is: "While we should recognize the merit of trying to construct macro-models of human spatial organization we should note that the technique is still in its very early stages. This point is clearly demonstrated in recent attempts to build models of cities. We need to have a clear understanding of the individual relationships between components before we can assemble these components into a large model. This principle applies equally well to administrative systems (29)."

The distinction between two potentially confusing concepts of administration is clarified by Massam. Size and spacing of administrative units, borrowing from Christaller's idea of range (distance) and threshold (population) to and for services,

provides that when the consideration is population we speak of size and any distance is spacing (29-34). In terms of distance we are considering how far apart administrative centers are, which is often a function of access. Administrative size is most functionally stated as a ratio of administrative functionaries to population served and acts as a basis for judgments of parity between *municipios oficiales* in this study.

Carrying Capacity

Carrying capacity is borrowed from Haeckel's classic 1866 work in German where he also coined the term ecology. Carrying capacity is defined as an area with the maximum number of organisms that can be supported over time without damage to the environment (Klein 1968). Sayre sets up the utility of carrying capacity:

> Carrying capacity may be the most versatile and widely popularized concept in environmental politics today. Like sustainability—which it predates and in many ways anticipates—carrying capacity can be applied to almost any human–environment interaction, at any scale, and it has the additional advantage of conveying a sense of calculability and precision—something that sustainability thus far lacks. Indeed, scientists of many kinds have calculated carrying capacities: in range and wildlife management, chemistry, medicine, economics, anthropology, engineering, and population biology, for example. In political debates, carrying capacity sometimes serves to help justify hunting, but more often it informs neo-Malthusian arguments regarding the finitude of the world's resources relative to growing human numbers... (2008, 120-21.)

And he quickly turns his back on the efficacy of carrying capacity in a critical dismissal of its use:

> In each new use, proponents of carrying capacity have capitalized on the familiarity and authority of its earlier uses while somehow foreclosing scrutiny of whether the new application was appropriate or coherent. Its durability and power, despite all the criticisms, have undoubtedly been reinforced through serial application by agencies of the state. Determining an ideal, fixed, and quantitative measure of how much *X* a given *Y* should convey, support, or produce is, it appears, an abiding ambition of government in areas as varied as taxation, resource management, planning, transportation, communications, and conservation. That it

> has worked in certain applications—in bounded, usually small systems where control could be exerted—has ratified its use in other areas where control was desired and asserted. Even when carrying capacities proved illusory, they provided an appearance of objectivity, rationality, and precision to policies that might otherwise have been revealed as politically or economically motivated. It is as though the continuity of the term itself, aided by its intuitive sensibleness—who cannot understand the idea that one's capacity to carry something has a measurable and stable limit?—has enabled its potency and persistence as it moved from one field to another. Moreover, by appearing to refer to actual relations in the world, rather than ideal constructions, carrying capacity has benefited from a kind of linguistic Pandora's box: once one has used the term, one has tacitly affirmed that its referent exists, even if determining its values in a given case turns out to be impossible. (132.)

The concept of a *carrying capacity* has expanded beyond biological function and is used here as a metaphor along the lines of political geography and political ecology to indicate a government entity's ability to service and/or control constituent populations. While Sayre's cautions are noted, they are dismissed as ammunition that could undo any theoretical construct by positivistic demands. Carrying capacity is useful, illustrative, and heuristically sound as a way to explore administrative abilities.

Conflict Theory and Davie's J-Curve

Conflict theory emanates from the works of Karl Marx (1818-1883) and more recently reconstituted in the latter half of the twentieth century by C. Wright Mills (1916-1962). Ross, more recently, gives us this definition of conflict:

> Conflict occurs when parties disagree about the distribution of material or symbolic resources and act because of the incompatibility of goals or a perceived divergence of interests. Both behavioral and perceptual elements of conflict are important. Considering behaviors alone ignores the motivations underlying an action, while asking only about perceptions fails to distinguish among situations in which similar perceptions lead to sharply divergent behaviors. [Not] all conflict is violent, but physical violence is one form political conflict takes. No society is without violence or threats of its use. (1993, 16.)

Ragunathan, a Tamil activist from Sri Lanka, gives a lucid break down of conflict theory:

> Social scientists usually follow many sociological paradigms and one of those is conflict paradigm. Conflict paradigm focuses on the ability of some groups to dominate others, or resistance to such domination. In conflict theory, competition plays a key part. The four primary assumptions of modern conflict theory are: 1) Competition. Competition over scarce resources. 2) Structural inequality. Inequalities in power and reward are built into all social structures. Individuals and groups that benefit from any particular structure strive to see it maintained. 3) Revolution. Change occurs as a result of conflict between competing interests rather than through adaptation. 4) War. Even war is a unifier of the societies involved, as well as war may set an end to whole societies. (2006.)

Hauge and Ellingsen report in a multivariate analysis study, "…that factors like deforestation, land degradation, and scarce supply of freshwater, alone and in combination with high population density, increase the risk of domestic armed conflict… (1998, 299)." All of these factors exist in northeast Chiapas. The rural setting does not preclude high population density.

Davie gives us a strong visual to consider in terms of the problems in northeast Chiapas (figure 9). When only the small urban areas around the administrative centers are being served, the expectation that resources will expand to rural areas belonging to the same municipal center fall short and expectations are not being met. Rural inhabitants travel to the administrative centers for transportation, market, or administrative needs and become privy to a quality of resources they are not receiving. Not receiving these resources brings a theoretical model known as "Davie's J-curve" into play. "The J-curve is this: revolution is most likely to take place when a prolonged period of rising

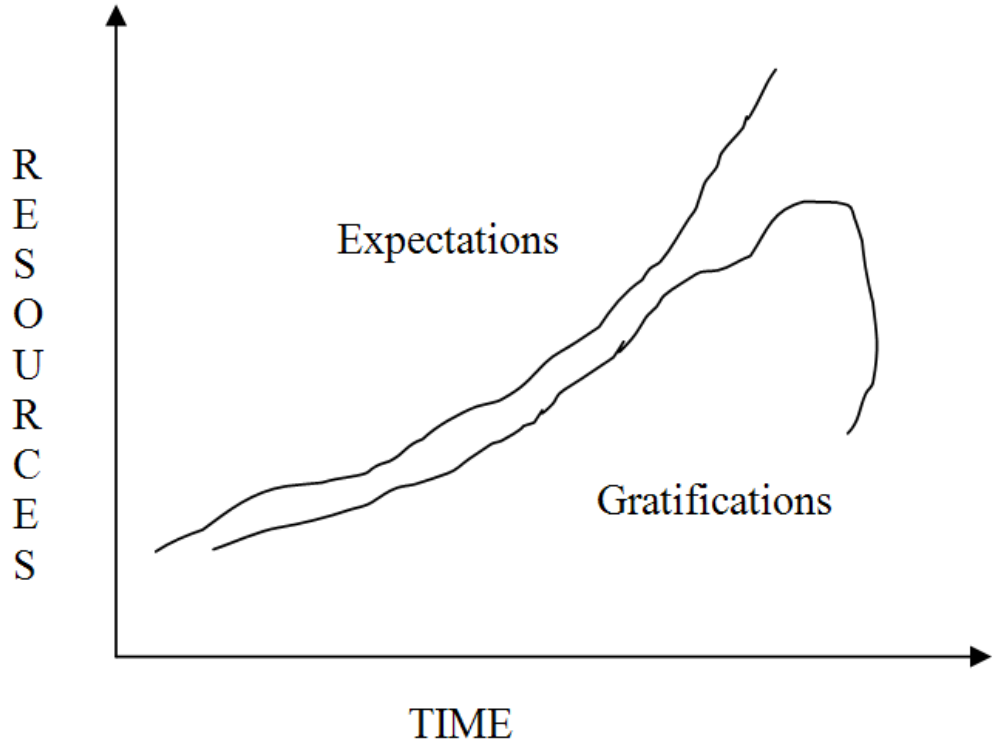

Figure 9. Representation of Davie's J-Curve. The plotting of resources against time presents the J-curve. When gratifications fall sharply from expectations, revolution is most likely to occur. *Source: Davies 1969.*

expectations and rising gratifications is followed by a short period of sharp reversal, during which the gap between expectations and gratifications quickly widens and becomes intolerable (1969, 690)." Expectations of more resources and the inability to distribute these resources provides fuel for the Zapatista rebellion.

Hazards/Risk Assessment Theory

An insurgency is a hazard - a *conflict* hazard (Tir 2005, 557; Werner 1999, 714). Why have new administrative central places emerged in Chiapas as a result of the 1994 Zapatista rebellion? What divergence in environmental quality is evident between *municipios oficiales* and *municipios autonomos?* Conflict hazards form the basis of the

myriad of hazards research studies beginning in the early 1950s (Quarantelli 1994, 19-26) while natural hazards research began with flood studies a couple decades earlier in the 1930s (White 1994, 5). "Terrorism and regional conflicts now have joined natural disasters and technological accidents as ubiquitous threats that can strike anywhere on earth and impact areas as large as a whole region or as small as a neighborhood, city block, or single building (Dobson 2003, 161)."

Whether military actions are seen as terrorism, revolt, insurgency, warfare or any number of labels used by one side or another to describe their opponents' or their own role in a conflict, the phenomenon involves varying degrees of necessity in defining the common hazard produced by these conflicts. The conflict in Chiapas resembles an insurrection – at one time hovering on the categorization of civil war (Herrera 2003). Etiological distinctions of hazards may ultimately play out as separate disciplines (Mileti 1999, 211-13) but in the present study, consideration of the question asks if overextended administrative central places are hazards to hinterland environmental quality, or do the breakaway *municipios* enhance the environment by providing a different form of administrative infrastructure? This study concerns itself with spatial, rather than military, interaction in the hope of mitigating further militaristic type hazards, whatever they might be called, by addressing its root causes (Mustafa 2005, 84-86).

Often not understood by many outsiders of Mexican and Latin American societies is the driving force of racism causing the inequity seen in supplying administration to rural/hinterland, read indigenous, areas. A. David Hill describes the indigenous condition in a study of the region some thirty years before the Zapatista uprising:

That much of the region's cultural landscape is still very 'Indian' reflects the fact that, despite the changes which the modern system and, as a corollary, he is at the most

only a marginal beneficiary. In a sense the Indian is a 'defensive participant' - he only moves here or there to defend himself. He never takes the initiative, the offensive, because he does not understand the new system. It is as though he were an actor who does not know his lines. He cannot compete with the *ladino* because he does not know 'the rules of the game.' He merely goes through the motions without knowing why the game is being played. The spirits of the Indian *Meiltatiles*, the most powerful men in the supernatural hierarchy, fly over the town to guard the Indian community, but they do not watch the new road - it is the *ladino*'s road and not a part of the Indian system. (1964, 106-07.)

Analysis of risk for conflict hazards has considered history (Tir 2005), the distribution of power and resources (Werner 1999), and population size and location (Elbadawi and Sambanis 2002; Raleigh and Hegre 2009). Many of these analyses consider civil conflicts differently than struggles between sovereignties but maintain a normative focus on prevention of armed conflict (Anin, 2003).

Planning Theory, Ekistics, and Personal Recognition Factor

Exploring normative models for geopolitical units that fairly allocate resources by means of adequate administration and constituent access implies a foundation of some kind of theoretical construct on which to base the model and ultimately the execution of theoretical *municipios* in northeast Chiapas. Scott, in his monograph on how schemes to improve human conditions have failed, spells out what seems like a primal form of settlement before “professional planners” and/or the state have made them legible:

> An aerial view of a town built during the Middle Ages or the oldest quarters (medina) of a Middle Eastern city that has not been greatly tampered with has a particular look. It is the look of disorder. Or, to put it more precisely, the town conforms to no overall abstract form. Streets, lanes, and passages intersect at varying angles with a density that resembles the intricate complexity of some organic processes. In the case of a medieval town, where defense needs required walls and perhaps moats, there may be traces of inner walls superseded by outer walls, much like the growth rings of a tree. …
>
> The fact that the layout of the city, having developed without any overall design, lacks a consistent geometric logic does not mean that it was at all

> confusing to its inhabitants. One imagines that many of its cobbled streets are nothing more than surfaced footpaths traced by repeated use. …
>
> States and city planners have striven, as one might expect, to overcome this spatial unintelligibility and to make urban geography transparently legible from without. Their attitude toward what they regarded as the higgledy-piggledy profusion of unplanned cities was not unlike the attitude of foresters to the natural profusion of the unplanned forest. The origin of grids or geometrically regular settlements may lie in a straightforward military logic. … Other things being equal, the city laid out according to a simple, repetitive logic will be easiest to administer and to police. (1998, 53-55.)

Scott's caution that planning can lessen humanity for the sake of administrative legibility is well taken. This study offers normative models (Chapter III) for the purpose of equity and access where they effect improvement of the human condition not facilitate social engineering for the sake of ease of administration. "To any planned, built, or legislated form of social life, one may apply a comparable test: to what degree does it promise to enhance the skills, knowledge, and responsibility of those who are a part of it (1998, 355)?" For example, the Department of Geography at Texas State University-San Marcos, until 1998 was formerly known as the Department of Geography and Planning. "This change mirrored the increasing integration of the department into national initiatives in geography. As well, the change implied recognition of the value and importance of geography education to the planning profession (Shelley, Bean, and Shaw 2001, 24-25)." If this rationale seems vague, it may be attributable to the baggage of vagueness that planning theory carries with it:

> It is not easy to define planning theory: the subject is slippery, and explanations are often frustratingly tautological or disappointingly pedestrian. There are four principal reasons for this difficulty. First, many of the fundamental questions concerning planning belong to a much broader inquiry concerning the role of the state in social and spatial transformation. Consequently, planning theory appears to overlap with theory in all the social science disciplines, and it becomes hard to limit its scope or to stake out a turf specific to planning.
>
> Second, the boundary between planners and related professionals (such as real estate developers, architects, city council members) in not mutually

exclusive: Planners don't just plan, and non-planners also plan. Failure to distinguish adequately the specific task of planning from the broader forces of urbanization makes it harder to recognize what can actually be done by planners. The most basic of questions too often remains unanswered: who exactly designs, builds, manages, and finally tears down cities: Ambitious, omnipotent planning theories often collide with the modest, constrained powers of actual planning practice.

Third, the field of planning is divided among those who define it according to its object (land use patterns of the built and natural environments) and those who do so by its method (the process of decision making). The result is two largely separate sets of theoretical questions and priorities that undermine a singular definition of planning.

Finally, many fields (such as economics) are defined by a specific set of methodologies. Yet planning commonly borrows diverse methodologies from many different fields, and so its theoretical base cannot be easily drawn from its tools of analysis. It is defined more by a shared interest in space and place, a commitment to civic community, and a pragmatic orientation toward professional practice. It is also a field defined by a series of both theoretical and practical questions, reflecting its somewhat ungainly straddling of both academic and professional causes.

Taken together, these considerable disagreements over the scope and function of planning and the problems of defining who is actually a planner obscure the delineation of an appropriate body of theory. Whereas most scholars can agree on what constitutes the economy and the polity – and thus what is economic or political theory – they differ as to the content of planning theory. (Campell and Fainstein 2003, 1-2.)

Towards an authoritative guide for the "planning" of settlements is the long emerging and struggling discipline of *ekistics*. There are five ekistic elements that compose human settlements: nature, man, society, shells (building enclosures), and networks (Perović 2005, 210). Constantinos A. Doxiadis was an architect/engineer working on the reconstruction efforts of post-World War II Greece even while a civil war raged on there until 1949. Until his death in 1975, Doxiadis built an almost cult-like following of his experience and ideas through the formation of a journal in 1955 first known as *Tropical Housing & Planning Monthly Bulletin* and in 1957 took on the ekistics moniker becoming, *Ekistics: Housing & Planning Abstracts*, with the name morphing a couple more times until 1965 when the journal became what it is called

today, *Ekistics: The Problems and Science of Human Settlements.* Other words popular during the formation of ekistics were the German, *Raumordnung* and *Landesplanung* and the Latin derivative, "chorotaxia," the Greek root of ecistics is *ekismos,* meaning settlement. (Perović 2005, 10, 15)

Unfortunately, shortly after a special issue to commemorate the thirtieth anniversary of Doxiadis' death and 50 years of publishing his journal, *Ekistics* has fallen four years behind in publication (Alkek 2010) and may be teetering on the extinguishment of a visionary approach to finding theory and law for human settlements as he proposed:

> "In the post-war period, especially since the fifties, attempts to solve the problems of human settlements by the creation of new cities and the amelioration of existing ones were made. … Although these efforts constitute important experiments in city building, they have not and cannot enrich our knowledge and our experience to the degree necessary to meet the present need. …
>
> In order to meet the confused situation in the field of human settlements we need a unified approach. Such an approach is necessary for the following practical reasons:
>
> · human settlements are unique biological individuals, they are entitled to a field of knowledge concerned only with them;
> · unless this comes about it is impossible for Man to achieve an understanding of, much less a solution to their problems. …
>
> The goal of Ekistics as the study of human settlements, in terms of dimensions, is to develop a system and a methodology:
>
> · to study all kinds of settlements, irrespective of size, location, etc., in order to draw general conclusions about them;
> · to study each as a whole, without excluding any of its elements in order to illuminate the knowledge of the field and to solve the specific problems of the settlement under study. (Perović 2005, 35- 36.)

Doxiadis' post-war perspective on planning from the clean slate of the devastation of war is not too far from the Chiapan situation of disrupted settlements with many internally displaced persons for many years after the beginning of the Zapatista rebellion.

His vision for the future promotes the *Ecumenopolis* where globalization and a world population estimated to be between twenty and fifty billion people will finally become a static world-wide city by the year 2100 with hierarchical centers ranging from neighborhoods to highest order centers of hundreds of millions (Perović 2005, 189-206).

On a more conceivable and manageable theory of a specific theoretical model for human settlements is Diana Kosse's personal recognition factor. "One universal on which anthropologists agree is that all cultures use classification to reduce and order the phenomenal world. … The constraints that limit group size have … general structural implications for the formation of hierarchies and thus social complexity (1990, 275). Groups form according to inherent structures based on memory and the ability to comfortably recognize a threshold number of people. The consequence of scalar stress imparts when this personal recognition factor exceeds its threshold changing from a maximized population environment to one where optimal systems begin to overshadow comfortable human existence. The thresholds of human recognition factor can mitigate the stress by cooperative endeavors such as water/wastewater, solid waste collection, agricultural production, defense, and other collective activities that will ameliorate the stress up to a point of no further benefit when the size of the population cannot be mitigated and quality of life is lessened by the stress of too many people to comfortably contain in the inherent human mental structure. "When settlement size grows beyond 150 individuals, organizational relationships tend to become more complex. With a population size of more than 150 individuals in constant daily interaction, some segmentation always occurs (1990, 279)." "[If the threshold] for the largest face-to-face unit in family and local groups is based on human information-processing limitations, the

same thresholds should also be important in more complex societies (1990, 284)." "The evidence is fragmentary and unsystematic, but it does show that similar scalar constraints seem to have been operating on the size of the elite [administrations] through time, across continents and cultures, and regardless of the size of the total polity (1990, 287)." "…there are as yet no universally valid principles for the social use of space, the spatial organization of settlements can provide some guidance in interpreting group organization (1990, 296)."

Kosse continued to investigate why larger more complex settlements usurped the smaller communities where recognition traditionally bound the population. "Appearing late in human history, large, complex groups have virtually replaced the earlier more numerous small groups in most areas of the world: in relative terms, small politically autonomous groups have decreased from 100% to almost 0%, and large, complex groups have increased from 0% to close to 100% during the past 10,000 years or so (1994, 35)." She hypothesizes why this change took hold:

> Specifically it is suggested that for large groups to become established, the presence of three factors was both necessary and sufficient:
>
> 1. There had to be some extrinsic selective agent(s) which conferred grater advantage(s) on membership in large as opposed to small groups. It is suggested that the specific selective agent was competition.
> 2. There had to be some measure of organizational efficiency: large groups had to be integrated to be effective in competition or in fact to function at all as single units. It is suggested that beyond certain thresholds, large groups had to be complex.
> 3. There had to be a favorable economic cost/benefit ratio to support the added energetic costs of complexity: the cost of large group maintenance had to be less or equal to the benefits generated by the system. More specifically, marginal returns had to be increasing or be at least constant over the long term. (1994, 39.)

Kosse's final examination of human group size involved theoretical complexity networks. She postulated that, "If there are indeed regularities in human group behavior,

a demonstrable link must exist between these regularities and the organization of human memory (2000, 64).” Thus, it is possible that the Zapatista movement falls somewhere on an evolutionary scale in terms of settlement formation.

Any normative or prescriptive model can be construed as reductionist or deterministic, however, the spirit of this study is to find options for problems that have presented as the many tragedies of warfare in northeast Chiapas. Much of the literature in this section cites a lack of method or theory for ideal settlement size. The intention of this research is to explore and ultimately theorize criteria of settlements that will serve constituent populations, preserve the population’s environment (or habitat, if you will), and keep conflict from manifesting as war.

Postcolonialism

Edward Said is often credited with the creation of postcolonial studies in his work studying “Orientalism,” published in 1978. *Postcolonialism,* “…is the study of the interactions between European nations and the societies they colonized in the modern period (Bahri 1996)”. While most Mexicans celebrate their independence from Spain, declared in 1810 and won in 1821, the hegemonic effect of Spanish colonialism is undeniably still in evidence as hegemony often with Mexican/latino nationalism serving as proxy for the colonial power over indigenous peoples in Chiapas and many parts of Mexico. Spanish, read *western,* paradigms have deprived indigenous people of their own history and until recently even the monumental architectures of, “The ancient Maya were imagined as a prehistoric, mysterious, ritualistic cult, ineluctably estranged from European historical and philosophical systems (Roberts 2000, 361).” “We cannot deny that in many cases it is a question of the violent imposition of one culture on another, as

is evident where Aztec, Toltec, or Maya pyramids are found beneath the churches, cathedrals, and grand structures of the colonial Spaniards (Torro 1995, 39).”

"The degree to which postcolonial studies is a new field that can bring the margins into sight and importance has been unnecessarily limited by a fixation on margins created directly by certain parts of the West (Sylvester 1999, 714)." Sylvester seems to be saying that the damaged (indigenous populations) are subject to the fixes of those who did the damage, in the present case, Mexican latinos administering to marginalized indigenous.

The relevance of postcolonial thought to the Zapatista rebellion appears obvious but the application of theory may prove problematic as described by Toro:

> The question persists. No doubt, whether we like it or not, it is impossible to situate ourselves outside the theory machine. Precisely, one of the most serious problems of Latin American indigenous and essentialist discourse is that it has rejected theory throughout the 1970s and 1980s, although without ever having a real understanding of what it was rejecting. This is because such nativism perceives itself as speaking from a position of absolute authenticity and authority, when in actual fact it spoke from a fossilized pseudoscientific Marxist discourse, where there is only one science, one History, one truth, and one theory. Not only is this discourse bankrupt, but it continues to believe in essentialism as an epistemological end. (1995, 39.)

The issues of land tenure and governmental control in northeastern Chiapas are imbued with postcolonial tensions and have played no small part in the Zapatistas declaring their autonomy from the latino hegemony. One of the slogans of Zapatismo often observed in graffiti and signs is, “500 *años de resistancia*!,” alluding to the 500 year anniversary of Columbus’ trip to the New World, very temporally proximate to the 1994 Zapatista uprising. **“**Perhaps one of the more dangerous mistakes has been the belief that it is possible to erase (and forget) history and contemporary thought, as if the so-called marginal ethnicities and cultures lived in a spatio-temporal and epistemological

vacuum (Torro 1995, 36).” Ostensibly, however, the Zapatistas will be living in the modern world no matter the outcome of their political efforts.

Governance

Following the idea that there has been a rebellion in Chiapas with reasons for declaration of autonomy from the regular government comes the idea of *governance:*

> Theoretical work on governance reflects the interest of the social science community in a shifting pattern in styles of governing. The traditional use of ‘governance’ and its dictionary entry define it as a synonym for government. Yet in the growing work on governance there is a redirection in its use and import…. Governance is ultimately concerned creating the conditions for ordered rule and collective action. The outputs of governance are not therefore different from those of government. It is rather a matter of a difference in processes…. There is, however, a baseline agreement that governance refers to the development of governing styles in which boundaries between and within public and private sectors have become blurred. The essence of governance is its focus on governing mechanisms which do not rest on recourse to the authority and sanctions of government…. The contribution of the governance perspective to theory is not at the level of causal analysis. Nor does it offer a new normative theory. Its value is as an organizing framework. The value of the governance perspective rests in its capacity to provide a framework for understanding changing processes of governing….. The discussion of governance … is structured around five propositions. The aim is to present a number of aspects of governance for consideration rather than make a series of statements that can be shown to be either true or false. The five propositions are:
> 1. Governance refers to a set of institutions and actors that are drawn from but also beyond government.
> 2. Governance identifies the blurring of boundaries and responsibilities for tackling social and economic issues.
> 3. Governance identifies the poor dependence involved in the relationships between institutions involved in collective action.
> 4. Governance is about autonomous self-governing networks of actors.
> 5. Governance recognizes the capacity to get things done which does not rest on the power of government to command or use its authority. It sees government as able to use new tools and techniques to steer and guide. (Stoker 1998, 17-18.)

The role of the Zapatista rebellion has augmented governmental policy for indigenous populations outside Chiapas by opening the debate of indigenous conditions

throughout Mexico. While prosecutions of Zapatista actors have generally been forestalled by widespread public support and changes in long-standing party domination in the usurpation of the PRI, it must be remembered that there are two sides to governance. One side advances the mandates and serves the people while the other side can include movements of governmental change such as the rise to power of drug cartels and other negative influences. (Alcántara 1998, 111-12.)

Environmental Health

"Over the past century a range of disciplines have provided diverse resources and a rich heritage of knowledge relevant to environmental health theory and practice (Parkes, Panelli, and Weinstein 2003, 669)." This study has assessed many environmental qualities that are explored and compared from the selected *municipios oficiales* and the *municipios en rebelde* in northeastern Chiapas. The differences between environmental practices of the official governments and the Zapatistas may hold the key to known and future human effects. "Environmental health addresses all the physical, chemical, and biological factors external to a person, and all the related factors impacting behaviours. It encompasses the assessment and control of those environmental factors that can potentially affect health. It is targeted towards preventing disease and creating health-supportive environments (WHO 2010)."

The marginalized aspect of the indigenous populations in Chiapas has special aspects in relation to environmental health:

> Although for historical and institutional reasons the theory and practice of environmental health have to some extent remained dichotomized between biophysical and social environments, the intersections between the two are highly relevant and still often overlooked. The importance of these links is perhaps most clearly illustrated by

concerns regarding environmental justice and environmental equity [.] Hazards in the physical environment remain disproportionately the burden of individuals, households, and societies that also face inequalities in terms of socioeconomic discrimination and/or psychosocial stress from their social environment[.] The roles of social and economic development, as both drivers and mediators of hazardous environmental exposures, and the need for an ecologically sustainable development are increasingly important challenges in environmental health. (Parkes, Panelli, and Weinstein 2003, 669.)

The banner of environmental health necessarily encompasses other disciplines and requires an integrated approach:

Theory, research, and practice in environmental health have always evolved in relation to topical challenges across the overlapping problem fields of health, environment, and development. Recent trends in environmental health, ecology and health, and human ecology all suggest that the interface between sustainability, ecosystems, social systems, and health is fertile ground for optimizing environmental health interventions and maximizing public health gain. Only with an integration of theory and a complementary methodology that incorporates scientific, institutional, and community players will interventions be devised to permit substantial gains in environmental health. (Parkes, Panelli, and Weinstein 2003, 674.)

CHAPTER III

GEOPOLITICS IN NORTHEASTERN HIGHLAND CHIAPAS

Land Occupation and Tenure

Geopolitical demarcation and sovereignty has a long history of humans simply occupying the land before settlements organized into territories, villages, tribes, cites, and predecessors and ultimate variations of the state. Anthropologists argue the point whether humans have a genetic territorial nature evolving through our hunting and gathering development or if territorial behavior is a cultural expression (Dyson-Hudson and Smith 1978). Land use monikers ranging from ecosystem to site cluster have been used depending on the aspects of study:

> [A]rchaeologists have devised numerous spatial frameworks for documenting variability in prehistoric economic, social, and political organization. It is generally accepted that the development of preindustrial societies is inextricably linked to the land and its resources and, thus, cannot be wholly understood outside the context of relationships between societies and the territory they occupied. However, the scale, content, and historical relevance of units of observation and analysis that best approximate a territory have changed repeatedly to accommodate contrasting theoretical perspectives and research interests.(Zedeño 1997, 67-68.)

In other words, as we understand the earliest land tenure we are looking at constructs of the researchers and not necessarily the territorial claims of the occupants.

Settlement patterns in Chiapas have a long history preceded by prehistoric human migration to North and South America. Indigenous Chiapan descendants are generally, but arguably, thought to have crossed the land bridge, *Berignia*, created by climatically

lowered ocean levels from Asia into North America some time prior to 11,000 years ago (Bonatto and Salzano 1997; Briggs and Collard 2007; Dixon 2001; Hoffecker 1988; Loy and Dixon 1998, 21; Mason, Bowers, and Hopkins 2001; Miotti, Laura L. 2003). A more southern isthmus that is formed by the narrowing of landmass at the furthest extent of North America, which dramatically compresses human habitat, from the Isthmus of Tehuantepec to the Isthmus of Panama, creates another land bridge to South America. Chiapas lies at the beginning of this landform/population funnel and is largely situated on uplifted mountains redoubling the barrier effect of reduced land mass with sharply undulating topography. *Amerindian* occupation of the region is estimated to have begun about 8000 B.C. with firm archaeological evidence from 3400 B.C. (Lohse, Awe, Griffith, et al. 2006, 216). Mayanists generally refer to highland and lowland Mayan cultures and settlement patterns in examination of early cultures inhabiting Mesoamerica (Fash 1994, 182) and both area types seem to have produced large scale population centers (Folan 1992). As Griffith points out, "Various conceptual illustrations suggest that analyses leading to an understanding of the spatial organization within a region are polluted by boundary shape effects (1982, 343)." However, both types of topographic habitat, "…experienced roughly the same pre-classical, classical and post-classical cultural sequences on Maya civilization; both suffered the same fate of conquest and socio-political marginality during the colonial period; and both remain, in recent times, among the least integrated and industrialized sectors of the contemporary Mexican national state (Konrad 1987, 163-64)."

Mayan civilization is considered to have become a distinct entity in what is known as the Formative or Preclassic period, which spans between 2000 BC and AD 250

(Fash 1994, 182). “The development of civilization in Greater Mesoamerica is a complex process poorly understood in spite of a considerable amount of time and energy dedicated to unraveling its complexities (Folan 1992, 158).” Mayan archaeological study was limited to elite structures in the beginnings of the discipline until the advent of household archaeology, which revealed the more realistic nature of Mayan settlement patterns (Robin 2003). Presently, agricultural advancements are considered to have driven great population densities and nucleation of population centers:

> They were primarily political and religious centers whose leaders ruled relatively small states. The general small size of the Mesoamerican state, along with constraints on transportation, communication, and production, limited the size of the associated centers. In a few cases macro-states emerged in areas where there was unusual potential for the production of certain goods, especially elite products, and a sufficiently productive agrarian economy to support numerous specialists. These macro-states were dominated by large elite classes and required large corps of service personnel for administrative purposes. (Sanders and Webster 1988, 544.)

Thus, population pressure is considered to be an important element in the partial collapse of Mayan civilization around 900 AD (Fash 1994, 187-89).

For reasons that are not completely understood Mayan elite settlements were abandoned in the southern regions of present day Guatemala, Honduras, Belize, El Salvador, and southern Chiapas where many settlement centers had reached near state status or were perhaps agglomerating state alliances warring with other such agglomerations (Lucero 2002, 820; Pringle 2009). Centers producing monumental architecture moved north into the Yucatan peninsula and remained active well into the Spanish conquest. This period, circa 900 to 1500 AD, is generally called the Postclassical. There is obscure comprehension of mythic proportions about the Maya collapse and it should be understood that while the continuity of ruling hierarchies seems

to have disappeared, dense population continued to exist throughout the Maya world. "Ultimately, it was the incursion of the Spanish and their introduced diseases that transformed a resurgent people into the pale shadow of their former selves. The pale shadow that came to be reflected in the ethnohistoric literature [of the postclassic] is not reflected in the archaeological [record] (Chase, Chase, and Morris 2008, 7)."

Geopolitics played an early role in the parsing of the New World with the Treaty of Tordisillas signed within two years of Christopher Columbus' discovery of the New World. The papal bull of Alexander VI divided rights to the newly discovered lands to Spain and Portugal based on distances from the well know Cape Verde Islands. A line of no particular distinction divided the new territories to possession of Portugal east of the line with lands west of the line (the vastness still unknown) to Spain (McAlister 1984, 74-76).

European incursion of the Mayan world began in 1517 when Diego de Velasquez, governor of Cuba, ordered Hernandez de Cordoba to explore the Yucatan peninsula where the Spaniards were attacked and suffered 20 casualties. Hernan Cortez, later the conquistador of central Mexico in 1521, was also soon ordered to the Yucatan by Valasquez. Cortez, too, had skirmishes with aboriginal people. Ultimately Cortez was ordered to conquer all of the land for the Vice Royalty of New Spain (Beck 2006). By 1520 Old World diseases began to infect the native people and ultimately it is estimated that the new world population of indigenous people was reduced to one-tenth of its original size by small pox, measles, and influenza (Beck 2006; Diamond 1997, 357). Those that lived were mostly branded and enslaved in *encomiendas,* partitioned areas to reap resources to be sent back to the Old World (Beck 2006; Benjamin 2000, 445).

The *encomienda* system represented the King of Spain directly and required tributes to be paid to the crown. The *hacienda* system of private land ownership was well established by the late 1520s and soon gave more rights and control to private colonial landowners. While the crown had instituted many protections of indigenous rights, the new *haciendas* were essentially free to exploit indigenous labor resources as they saw fit (Cuello 1988; Sherman 1971). The *hacienda* system survived Mexican independence from Spain in 1821 but was eventually dismantled as a result of the Mexican Revolution of 1910 with the implementation of the Constitution of 1917.

Independence from Spain was a protracted revolution (as would be the 1910 revolution) lasting from 1810 to 1821. Famously launched by the *grito de Dolores* by Father Miguel Hidalgo de Costillo in his call for, "Death to the bad government!" Mexico's war for independence from Spain led to the Constitution of 1824 and made local government a priority with a federal structure of national cohesion headed by a strong executive president. Chiapas had been annexed from the Vice Royalty of Guatemala in 1823 after these territories split from lands reaching to Panama that had been gained by newly independent Mexico and was granted statehood in spite of its new acquisition (Rodriguez 1997).

Land reform was one of the driving principles of the 1910 revolution. President Porfirio Diaz had favored large corporate land holders in the later part of the nineteenth centrury as part of the early modernization and globalization of the Mexican economy. Land redistribution was mandated by Article 27 of the Constitution of 1917 and was led by President Venustiano Carranza and later reinvigorated by President Lázaro Cárdenas from 1934-1940 who more than doubled the amount of land given to peasant farmers by

his predecessors with some 18 million hectacres. “Between 1924 and 1984, the government expropriated and redistributed more than 77 million hectares of large-estate land, amounting to more than one-third of the national territory (Merrill and Miró 1996, 70).”

The new dominant paradigm in post-revolutionary Mexico was the *ejido* or community property. This form of land tenure endures today in spite of neoliberal “reforms” put in place by President Carlos Salinas de Gortari in 1992 that gave members of *ejidos* individual title to their lands allowing for their rental or sale (Merrill and Miró 1996, 70). Many blame the neoliberal movement of the Salinas administration as the ultimate motivation for the Zapatista rebellion of 1994 (Cruz 2008).

The first paragraph of the First Declaration of the Lacandon Jungle, basically the Zapatista declaration of war, expounds on the geopolitical struggles of indigenous Chiapanecos:

> We are the product of 500 years of fights: first against the slavery in the war of Independence against Spain headed by the insurgents, after by avoiding absorption of the North American expansion, then by promoting our constitution and expelling the French Empire from our land, later the Porfiriato dictatorship denied us just application of the laws of reform and the people rebelled forming their own leaders arising Villa and Zapata, poor men like us that like us had been denied the most fundamental preparation and were used like cannon fodder and were robbed of the riches of the mother country without caring whether we are dying of hunger and curable diseases, without immortality we have nothing, absolutely nothing, not a worthy ceiling, nor land, nor work, nor health, nor food, nor education, without the right to freely and democratically select our authorities, without independence from foreigners, without peace nor justice for us and our children. (EZLN 1993.) (See Appendix II for original Spanish.)

Administrative Carrying Capacity

As discussed in the Introduction, carrying capacity is borrowed from Haeckel’s classic 1866 work in German where he also coined the term ecology. In Chapter II,

carrying capacity was defined as an area with the maximum number of organisms that can be supported over time without damage to the environment (Klein 1968). In addition, Chapter II also related the geographical economy of Central Place Theory as well as Davie's J-curve, which is a theoretical model of revolution given a collapse of resources with rising expectations. These tenets, in conjunction with the phenomenon of conflict hazards, all underlie *carrying capacity* and condense into an operative theory for the situation in Chiapas, defined as *administrative carrying capacity*. Translating this concept to the study at hand provides a definition of *administrative carrying capacity* where the number of people needed to distribute resources (administration) supporting the maximum number of people (the population of the municipalities) without damage to society and environmental quality (the hazard of rebellion). In other words, the human populace in rebellion in Chiapas has exceeded, or never had access to, the resources available to administration to distribute. Further, such rebellion has formed new central places in the form of the autonomous *municipios.*

Several writers after the pre-World War II works of Christaller (1966) and Lösch (1954) have examined administrative carrying capacity. There is some amount of instructive literature that considers what to do with areas that exceed administrative carrying capacity, but much more on how to plan before the capacity is exceeded.

Political scientist, James W. Fesler (1949) published a well-stated discussion of mostly American considerations for administrative carrying capacity in his *Area and Administration* without the use of a single geometric diagram or equation. Writing after Christaller's work, but before its widespread distribution in the U.S. after translation (Hottes 1983), Fesler promotes decentralization of governmental entities and refers to

"field service areas" as a function of the rapidly changing urban/rural landscape of the time. A mostly rural problem, he spells out, "The field service problem of administrative geography for any single function or cluster of functions, then, is affected by six considerations: the span of control; the natural physical, social, and economic area; the distribution of workload; relations with other governments, agencies, and private groups; administrative convenience; and political factors (58-59)." Fesler concludes that, " No unitary government is without criticism for its relations with local units. No nation's local governments and areas are without archaic features or immune from the trend toward centralization (153)."

Massam reinforces the use of municipal employees as a gauge for administrative size and offers thresholds of service (1975, 30-32). He explains the importance of a geographical perspective in studying administrative carrying capacity by saying that, "…the geographer can serve a very useful purpose in examining the spatial aspects of political units, and so add to the general understanding of political activities (168)."

In an earlier work, Massam (1972) speaks to the planning potential of administrative size but notes that, "….At the moment there is a lack of solid theoretical basis to help us determine the size or location of public facilities… (37)." Most pertinent to the situation of rebellion in Chiapas he states, "….It appears that *crisis* is the mechanism which generates appraisal of an administrative system and *ad hoc* reform is the result…. (37)."

Gilmer, Keil and Mack examine the relation of location quotients in terms of central place for markets but find that, "… the relationship between central place theory and the location quotient has not been explicitly and exactly developed (1989, 1)" and

conclude that, "…central place theory provides limited theoretical support for systematic shifts in the base of location quotients as a means of correcting for a hierarchy of places (1989, 16)." Perhaps most instructive is the, "…example of this enormous gap between central place theory and practice is the shift from nesting and threshold effects to the more intuitive, less well-defined concept of agglomeration (Gilmer, Keil and Mack 1989, 16)."

Planning considerations are not exactly prescriptive to the situation in Chiapas. Many new administrative areas have already been established either by autonomous declaration or state subdivision. This work is to explain the phenomenon of the rebellion as a function of normal administrative capacities. Normative values will be suggested as an index of vulnerability to rebellion where administrative carrying capacity is exceeded and calculated for Chiapan areas that may exceed such capacity.

A hypothesis may be stated, then, that *municipalities that are large in population and area, have exceeded their administrative carrying capacity in relation to the amount of autonomous municipalities in rebellion*. If administrative facilities distribute resources and if said distribution is beyond the capability of said administration then administration itself becomes a resource itself in short supply. The approximately thirty-eight manifestations of administrative autonomy in Chiapas (Cal y Mayor 2003, 192, 204; CIEPAC 2003; Saravia 1998) infer that if there is a device to distribute resources, there are resources to be distributed. By outstripping, or never supplying, their ability to support the population, these administrations in the insurgent areas of Chiapas have reached their carrying capacity (figure 10). Agglomerated areas of administration and resources in small central places, relative to the large area of the population, are

inadequate to serve the demands of the region, thus, the regions have partitioned to make new central places of administration in declaring the autonomous municipalities (figure 11).

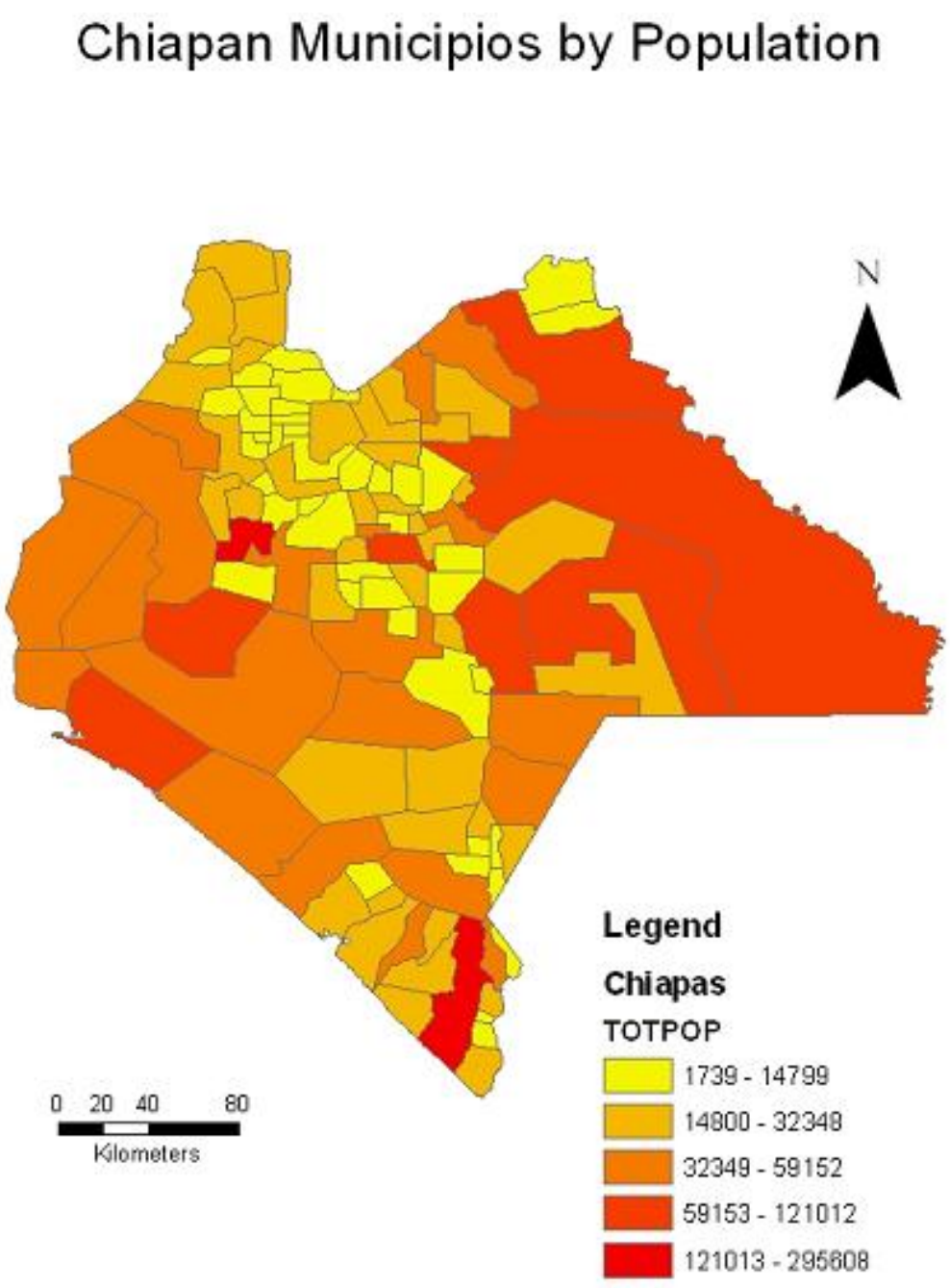

Figure 10. Large population municipios are likely candidates for exceeding administrative carrying capacity. *Source:* CIESIN 1990.

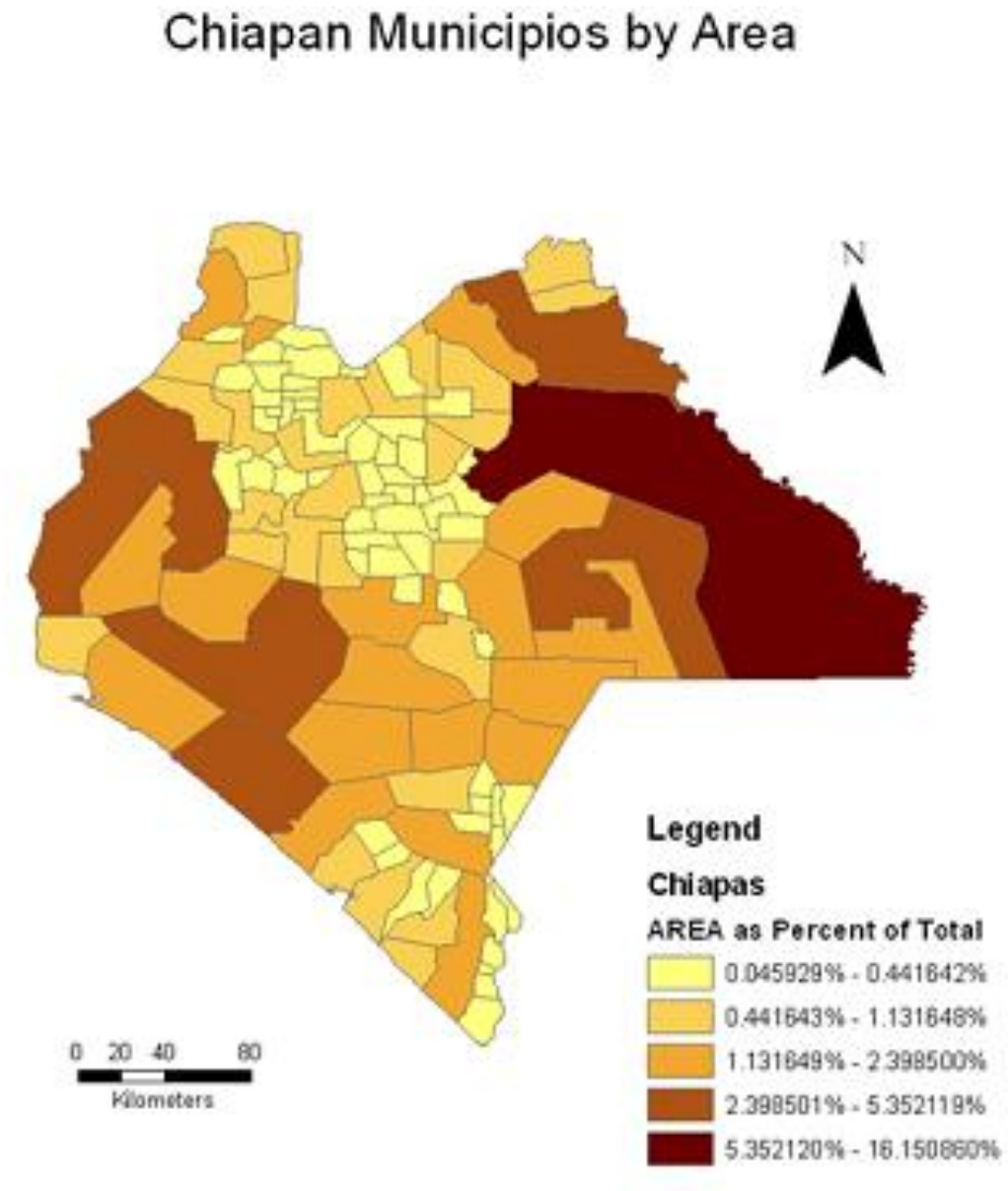

Figure 11. Municipios of large area are also candidates for exceeding administrative carrying capacity. Source: CIESIN 1990.

Thus, to answer to the first question posed in this research, "How many people can be adequately served by an administration of a given size?," the in-depth geopolitical exploration of threshold size for what conditions exceed administrative carrying capacity provides estimates and predicts adequate threshold size. In the following section,

resource distribution of the smaller municipalities will be compared with the larger ones in Chiapas to reveal a sense of what population exceeds administrative carrying capacity. Research on political entities that provide smaller geopolitical administrative devices than the current municipality size may provide models similar to central place theory that estimate population size for geographic area ratios that do not exceed administrative carrying capacity. Such a ratio may also be predicted by examining the size of administrative centers and the populations of other rebellious regions.

Geopolitical Analysis:

A Search for Discerning Normative Municipios to Avoid Risk of Rebellion

Point biserial correlation, ratios, and GIS analysis were used to begin assessing the risk of exceeding administrative carrying capacity and to find normative models seeking to mitigate the hazard of further rebellion in Chiapas. Finding characteristics of *municipios* in Chiapas that are vulnerable to exceeding administrative carrying capacity may also be translated to prevent conflict in other regions.

Point Biserial Analysis

A point biserial analysis of population density of state recognized *municipios* and occurrence of *municipios en rebelde* within these *municipios* was performed (see Appendix III) with the following hypotheses:

$H_{\emptyset}$: *no association between population density and rebellion,* $e_{pb = 0.}$

H_a: *association between population density and rebellion,* $e_{pb \neq 0.}$

Calculation of the r_{pb} for population density produced a 0.0 correlation coefficient *(p = 0.968)* mandating a failure to reject the null hypothesis. Calculations for population and area were run separately producing similar results with +0.05 r_{pb} and +0.17 r_{pb} respectively (p values not retained), also indicating failure to reject the null hypotheses of no relationship between population density and rebellion.

Limitations, Discussion, and Further Study

Significant relationship between population, area, or their quotient, population density, did not occur even when the data for Ocosingo, by far the largest *municipio* in area and also an outlier in population, was removed from the r_{pb} calculations. This may indeed indicate no correlation between rebellion and size of *municipios* among these demographic markers, but more sophisticated data like administrative size as outlined by Massam (1975, 1972) and building a stronger model of administrative carrying capacity with data on municipal employees might provide relationships between less aggregated data on the community level. At present such data is not accessible.

Data that were available and compiled for this study has a confused history. Though 2000 census data were available (INEGI 2000, Chiapas 2006) for population, all references to occurrence of rebellion are based on pre-2000/1999 municipal designations. The state of Chiapas sub-divided seven new *municipios* in 1999 as a stop-gap measure to the rebellion but these new *municipios* are not reflected in the data used here – populations and areas were added to the *municipios* that formerly contained them so the data reflected 2000 census population figures with pre-1999 areas (see Appendix III). Further, the rebellion under study occurred in 1994 so the ideal decadal census to use is

somewhat split. This examination assumes a clear stasis of areal size of *municipios* and assumes that population figures for four years (1990 INEGI census) before the rebellion would not reflect 1994 figures too much more accurately than six years later (2000 INEGI census used here) and in fact, government statistics bear out a near even split in the differences in Mexican population estimates for 1995 (Merrill and Miró 1996).

Administrative carrying capacity is essentially an optimization and a resource allocation problem. "The resource allocation problem … is an optimization problem with a single simple constraint. Given a fixed amount of the resource (this is the constraint), one is asked to determine its allocation to *n* activities in such a way that the objective function under consideration is optimized (Ibaraki and Katoh 1988, xiii)." The resource allocation problem in Chiapas is constrained by administration, which represents the services allocated. Essentially the practical problem in Chiapas is finding a way to gauge how much administration is needed and then cutting up areas with too little of it in an equitable way.

"For many reasons the [optimization] theory is imperfect, yet it must be used to predict the optimum operating conditions of a system such that some performance criterion is satisfied. At best such theory can predict only that the system is near to the desired optimum (Adby and Dempster 1974, 1)."

"Early applications of location-allocation models searched for location patterns that were optimum with respect to defined criteria. Later, researchers began to compare the results from such models with the existing system of locations, arguing that a comparison of the two was a test of the locational efficiency of the decision process with respect to the criteria optimized in the model (Rushton 1988, 100)." Rushton's sense of

history seems to apply to the problem in Chiapas. Rather than finding an empirical formula to impose on Chiapans reminiscent of the colonial conquests, it seems fitting to look at the autonomous areas that have been declared, historical settlement patterns and apply a modicum of algorithmic logic in determining new *municipios* and their *cabeceras.* This idea is supported in debate by Staddon, Hinson and Mazur: "….Optimality accounts are explanations in terms of final causes, not descriptions of a mechanism [such as a logarithm]. It is a fundamental error to identify optimization theory with any particular mechanism by which optimal results are achieved (1983, 976-77).

Rushton further sets out a how-to list of decision making for location-allocation optimization:

1) find a set of locations that are optimal with respect to predefined objectives;
2) compare the performance of real geographical systems with estimates made for their normative counterparts;
3) compute an optimal set of new locations to add to the existing set;
4) assess the benfits and the costs of any constraints on location decisions that are present in real-life decisions;
5) evaluate the quality of past (recent) location decisions;
6) investigate alternative decision making principles and to illustrate, by simulation, the alternative location systems that would develop if the principles are employed. (1983, 100.)

An immediate imperfection in considering population or area (or both) as the optimum criteria for finding ratios of administrative carrying capacity is the maximal covering location problem (MCLP) (ReVelle and Hogan 1989, 193) as applied by Church and Bell to ancient Egyptian settlement patterns:

It is not always possible to achieve total population coverage with a given number of facilities and a particular maximum covering distance. The next best thing would be to cover as much of the population as possible within a specified distance. That is, the problem would be to maximize the number of people controlled (i.e., "covered')

within a defined maximum service distance by locating a fixed number of administrative centers…. (1988, 704.)

Though ReVelle and Hogan's later maximum availability location problem (MALP) claims a stochastic solution to a presumably continuous population, distance and time, which would be admittedly useful in calculating the effects of mountains on travel in Chiapas, its complexity and randomness could easily leave many of the pedestrian travelers out of any proposed administrative service district (1989, 194-99). Using the MCLP would preclude second-guessing (stochastic prediction) and give a maximum solution to providing the often pedestrian travelers of Chiapas with access to the resource of a fixed administration by scheming *cabeceras* within a time/travel constraint, rather than considering the population element. More investigation may reveal that growing the administration to meet the demand may be cumbersome, but physical access to administration has priority over population coverage since the later can easily push a deprived economic class further away from service should a population dynamic decrease in density, or allocate to largely a small density.

Creating new administrative centers in Chiapas is a modifiable areal unit problem (MAUP) that cannot afford to err on the side of the convenience of allocating new *cabeceras* to new *municipios* by dividing up the aggregate data of current *municipio* populations by *n* units and creating the potential ecological fallacy of coverage (Ratcliffe and McCullagh 1999, 385-98). Location-allocation by distance is the option of optimal coverage to prevent continued vulnerability of Chiapans to the hazard of military action - rebellion.

With no finding in this calculation, this study has eliminated one of the most obvious avenues toward finding ways to detect and thereby mitigate the risk of the hazard of rebellion in Chiapas: correlation between rebellion and density.

A Snapshot of Administrative Size in *Municipios Oficiales*

Reiterating that Massam advocates the use of municipal employee populations as a gauge for administrative size and thresholds of service (1975, 30-32) leads to data solicited from *municipios oficiales* in the stated study area. Such data collection wants for more. Only the *cabeceras* of the studied *municipios* were asked to provide data on employee numbers and inherently these were also *municipios* where rebellion occurred. Field discovery of the data was really the only option to obtain employee totals and departmental breakdowns from the *municipios oficiales.* While total population of *municipios* is a figure readily available from online National Institute of Statistics and Geography (INEGI) resources, the number of employees and departmental affiliations is much less transparent and often required personal visits on the order of several days to glean what appears to be simple data. So what is presented is a snapshot of ratios of population of *municipios* in the study area in terms of employee/administrative size of six *municipios* and not any correlation or regression model of what can easily be envisioned (like the point biserial investigation) were data more easily obtainable such as correlating all states of Mexico, or just Chiapas, between areal size, population, administrative employees, occurrence of rebellion, perhaps ethnicity, wealth, and other demographics that could produce more quantitative associations.

Descriptive statistics can provide ratios of services to population (and extended to areal extent and perhaps density) and ranking these ratios gives some gauge of parity among *municipios.* Presented here (tables 1 and 2) are data garnered from the study area *municipios oficiales*. Each *presidencia* visited was asked to supply a breakdown by department of their employees. Only total employees, police, and publics works employees are reported as reliably similar categories.

Table 1. Population, Area, Density, and Employee Information of *Municipios Oficiales*

	Chilon*	**La Independencia**	**Palenque**	**Pantelhó***	**Tumbala***	**Las Margaritas**
Population	77686	32245	85464	16262	26866	87034
Area km²	2490	1704	1123	137	109	5308
Density	31	19	76	119	246	16
Tot. mun. employees	166	152	462	69	87	235
Police	74	31	183	12	35	96
Public works	43	29	42	4	7	7

*More than 98 percent indigenous population. *Sources:* INEGI 2005; Personal Interviews 2007.

Table 2. Table 2. Employee to Population Ratios for *Municipios Oficiales*

	Chilon*	**La Independencia**	**Palenque**	**Pantelhó***	**Tumbala***	**Las Margaritas**
Tot. mun. employees	1:468	1:212	1:185	1:236	1:309	1:370
Police	1:1,050	1:1,040	1:467	1:1,355	1:825	1:907
Public works	1:1,807	1:1,112	1:2,035	1:4066	1:3838	1:12,434

*More than 98 percent indigenous population. *Sources:* INEGI 2005; Personal Interviews 2007.

From the raw data in table 1 there is a trend distinguishing lower and higher densities that may be attributed to topography with higher densities being in lower elevations where land is more amenable to habitation (see figure 2). Physiographic trends are easier to follow since no such sense presents from a comparison of *municipio* population and total municipal employees other than a semblance of rank. The ratios in Table 2. present great disparities in total municipal employees to population. Palenque

and Las Margaritas, having near equal populations but widely divergent areas, exhibit a disparity with Palenque having exactly 100 percent more municipal employees and by department having about the same disparity with police and nearly 600 percent more employees per person with public works. The disparity between Palenque and Las Margaritas (remembering that we are considering *municipios oficiales* in this comparison), and indeed all of the other selected *municipios,* probably stems from the nucleated wealth in Palenque due to its world class archaeological park that is listed as a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site. The *cabecera* of Palenque is noticeably larger than the seats of power of the other selected *municipios* and exhibits other advantages such as first-class bus service, treated sewage infrastructure, tourism office, and four-star hotels among its exclusive magnet for greater wealth than the more rural settings of Chilón, Tumbala, Pantelhó, La Independencia, and Las Margaritas where the nucleated *cabeceras* are generally small populations of a few thousand people and often demarcated by mostly latinos living in the *cabeceras* and indigenous majorities living in rural areas. Chilón, Tumbala, and Pantelhó all have total *municipio* populations of over 98 percent indigenous with Las Margaritas at 56 percent and only La Independencia, six percent indigenous, markedly lower in indigenous population than Palenque's 53 percent (INEGI 2005). It may be notable that Palenque and La Independencia have the lowest ratios of total municipal employees per person. (Racial/ethnic identity is a complicated issue in Mexico (Nash 2001) and may account for the very wide disparity of non-indigenous identities in La Independencia.) These "poorer" *municipios* are also more highland in nature considering Palenque's proximity to the Yucatan's plains and the availability of

mechanized agriculture not available to most highland areas where *swidden* agriculture is practiced by hand on very steep slopes and mechanized vehicles dare not go. It seems relevant to point out that I was in Chiapas for ten years before I ever saw a tractor in this very agricultural area.

It is these indigenous disparities between the agglomerations of latino service in the *cabeceras de municipios oficiales* and the hinterland indigenous in rural settings that compelled the 1994 rebellion and drives disparity today. The ratios and raw numbers of Tables 1 and 2 begin to reflect the disparity of governmental service that are effectively available in colonial, latino centers of governmental administration. The rebellious reaction to such disparities drives the geopolitics of the autonomous stance of the Zapatistas today while they refuse any Potemkinistic aid that they have come to know as unsustainable and maintain their autonomy by developing their own infrastructures (EZLN 1994).

Were it that the Zapatistas would rejoin the status quo Mexican geopolitical structure, there are prescriptive ideas that might lead to normative *municipio* size, or here, speaking more theoretically, an administrative unit of equity and access for its populace.

One method of equalizing access is already practiced in Chiapas to a large extent but lacks implementation, particularly in the northeast. Situating administrative centers at the geographic centroid of administrative units certainly supplies a sense of equal access to all hinterlands (figure 12). However, such administrative distribution does not diminish problems of great distance to geographic centroids especially in the cases of very large administrative units. Transportation concerns are often of a pedestrian nature in developing regions so the determination of acceptable travel time by foot could

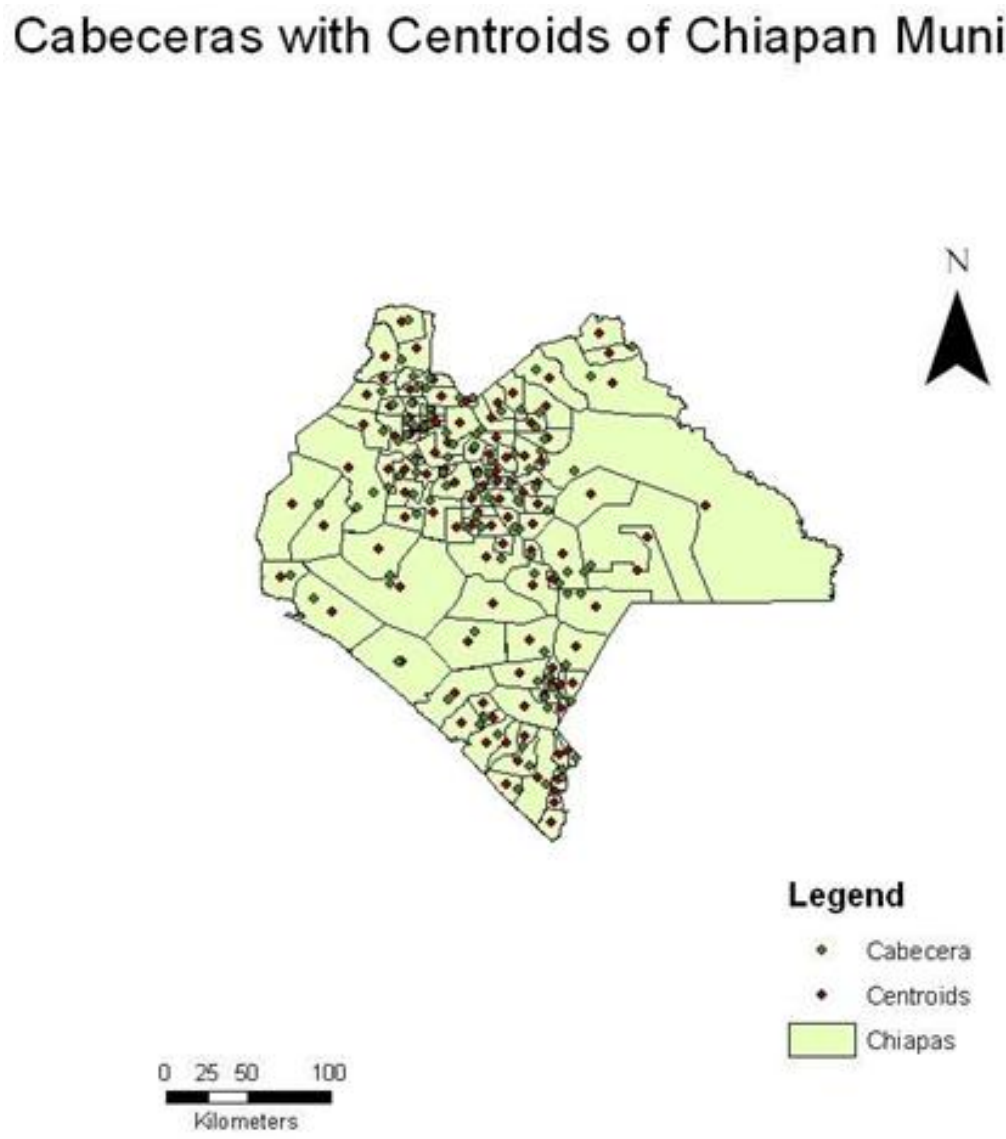

Figure 12. Administrative units in Chiapas with their actual administrative centers *(cabeceras)* and geographic centoids. Note the disparity between *cabacera* and centroid in the largest administrative unit, Ocosingo, to the far east. *Source:* CIESIN 1990.

determined as a normative distance of limit for an administrative center to its hinterland boundaries. Figure 13 exhibits the use of ArcGIS Spatial Analyst to configure space within approximately 30 kilometers to a quasi-geographic centroid when distance specific buffers fill the space of the arbitrarily selected 30 kilometers as a functional pedestrian

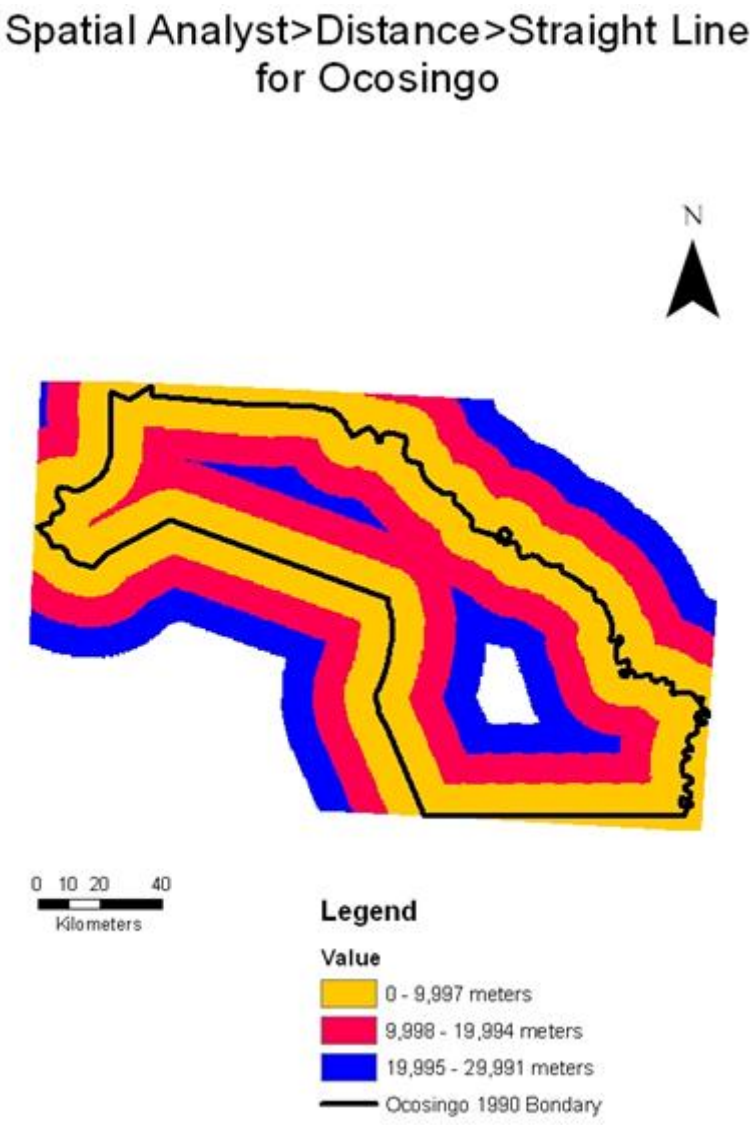

Figure 13. ArcGIS Spatial Analyst tool was used to create hypothetical boundaries for Ocosingo that would not exceed approximately 30 kilometers to an administrative center using buffer increments of approximately ten kilometers (each color band). Using this method and criteria, Ocosingo would be subdivided into two administrative units. *Source:* CIESIN 1990.

capability to reach an administrative center and return home in one day. Figure 14 parses the largest administrative unit in Chiapas, Ocosingo, into four near-equal, hypothetical units with geographically centroid administrative centers. Such spatial manipulation might provide parity and access for populations without service and provide administrative resources that can reach its populace with necessary services and allow its

populace reasonable access to market and administrative centers.

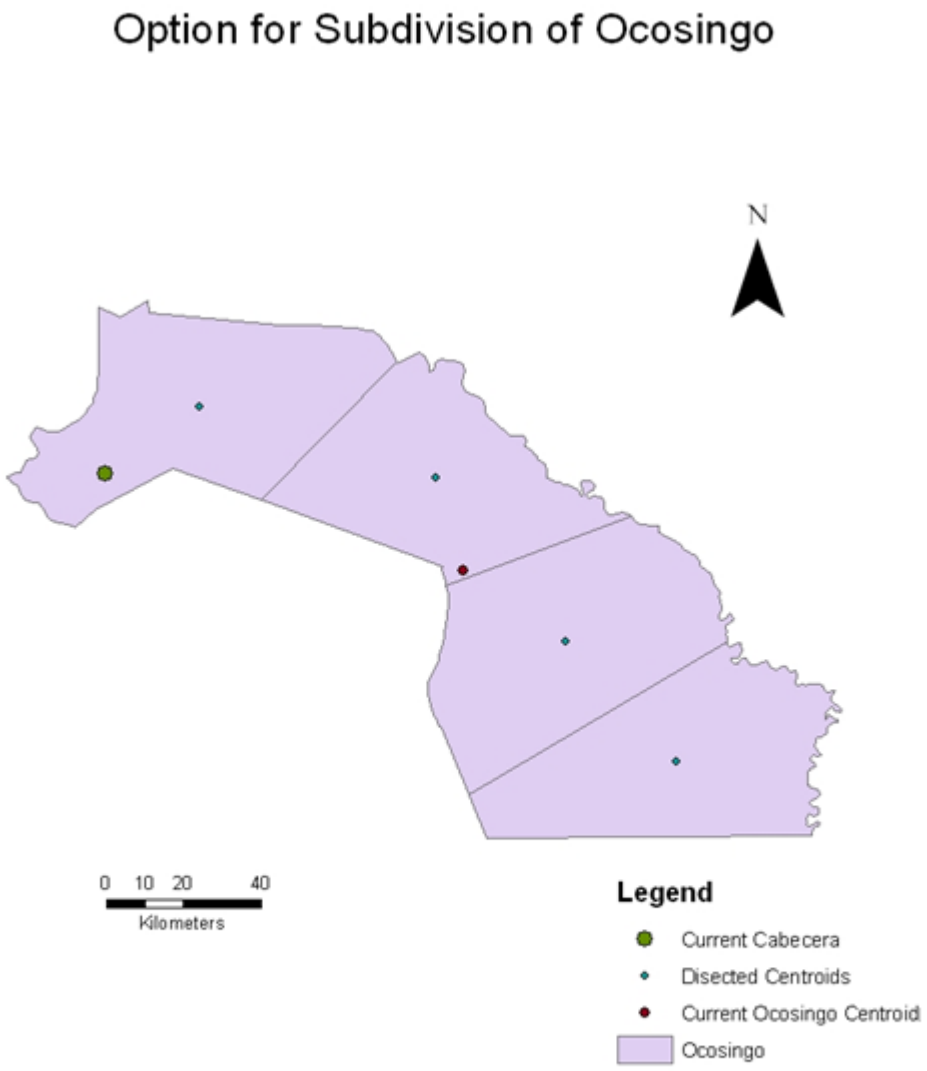

Figure 14. Dividing the largest administrative unit in Chiapas (Ocosingo) into four separate units to increase access to administrative centers. Note that this representation of Ocosingo predates its subdivision in 1999 into three new *municipios* still leaving Ocosingo as the largest *municipio* in the state. *Source:* CIESIN 1990.

CHAPTER IV

THE POLITICAL ECOLOGY OF SELECTED MUNICIPIOS IN NORTHEAST CHIAPAS

The view that, "…political ecology is something that people *do*, a research effort to expose the forces at work in ecological struggle and document livelihood alternatives in the face of change (Robbins 2004, 13)," implies several actors in the present study. First and/or second, if you will, is the status quo of the *municipios oficiales* headed by the State of Chiapas backed by the federal Mexican government and the ensuant rebellion of this hierarchy both ultimately claiming the good of the people and a resultant, reactionary political ecology of their respective stewardships over the man/land interaction. The Zapatistas have imposed their dictum over wherever their communities lie as part of their autonomous declaration (EZLN 2004) (figure 15) and part of this dictum is treatment of the land where they, "…expose the forces at work in ecological struggle and document livelihood alternatives in the face of change (Robbins 2004, 13)."

Method

The third, yet singular, actor is the researcher carrying out a formal study (the -logy element) of the former two actors. This, my own, role examined elements of the ambient environment itself but depended on the status quo and rebel actors to report their

Figure 15. The dictum of Zapatista control over their communities is prominently displayed at the entrance to most communities, here at Vicente Guerrero, in the *municipio official* of Palenque. Translation: "You are in Zapatista territory in rebellion. Here the people give orders and the government obeys. Northern Zone. The meeting of good government strictly prohibits trafficking of firearms, cultivation and consumption of drugs, alcoholic beverages, and the sale of lumber (otherwise considered legal). No to the destruction of the environment. E.Z.L.N." The graffiti figure at the bottom represents the ski-masked leaders and soldiers of the Zapatista movement.

practices through an institutional checklist that I used in interviews of the people thought or claiming to be in charge of public health infrastructure – often the public works director or city engineer in the cases of the *municipios oficiales* and the *Junta de Buen Gobierno* (counsel of good government) in most *municipios en rebeldes* (see table 3; Appendix IV) saw my role as collaborative or authoritative. Though the "Environmental Checklist" was somewhat open-ended to allow as much information to emerge as possible in the interviews for the sake of Grounded Theory (Glaser 1967), I never proposed or supposed that I would be tapped as a resource for environmental problems.

Table 3. Elements of the Environmental Checklist

Community Name:

Coordinates of Community:

Water:
treatment methods
testing
prevalence of indoor plumbing
alternate supplies
natural water use: HS2 tests and coordinates

Wastewater:
sewage treatment
collection points
septic tanks
pit or field latrines
filterability of terrain

Solid Waste:
centralized
collection
composting

Toxic Wastes:
batteries
chemicals

Public Health Offices:
credential of staff
testing regimens
medication programs
education

Agriculture:
swidden
organic
pesticides
fertilizer
irrigation
livestock
erosion

Forest:
firewood
lumber (plant)
monoculture

Settlement Patterns:
nucleated
land tenure
population

Air:
cooking
burning (trash, fields)
chlorine storage
insecticides
asthma

In one case (Babylonia 3ero, a *municipio en rebelde*) a two-day meeting was convened to discuss water problems and I was invited/mandated to participate in consideration of drought problems within the *municipio.* This, and several other case histories hereto with described, put me very much outside the unbiased researcher role and unintentionally put me squarely in active research camp. And I could not refuse communities in the midst of drought asking for help as well as offering knowledge on the dangers of the open burning of plastics (a common practice throughout the region) or the careless disposal of batteries with lead components.

So my research often became entangled with the politics of northeastern Chiapas in the selected communities (figure 16) that I visited and I found environmental similarities in the first two political ecology actors respectively, in common between the two, and at times in complete disparity of each other (table 4). I, and we, were “doing”

Figure 16. The municipios oficiales y rebeldes selected for study. *Source:* Google 2008.

political ecology in the presence of my study over the political ecology that had formerly emerged from the markets, rhetoric, and governance of the status quo and rebel movement. The political ecology from this research is reflexive, emergent, and participatory. The case histories of the studied areas are presented by *cabeceras oficiales y autonomos* paired by the containment of the later by the former. The study areas were selected by identifying *municipios oficiales* that contained *municipios rebeldes* through two published lists (CEIA 2007; Hidalgo and Castro 2003). The *municipios rebeldes*

Table 4. Complete Parities and Disparities between Studied *Municipios Oficiales and Municipios Autonomos* found in Environmental Qualities

	COMPLETE PARITY		**COMPLETE DISPARITY**	
Environmental Quality	**Occurrence of Quality**	**Quality Does Not Occur**	**Occurs in *Municipios Oficiales***	**Occurs in *Municpios Autonomos***
Treated Drinking Water	X	--	--	--
Indoor Plumbing	--	--	X	--
Hydrogen Sulfide Reaction	--	X	--	--
Central Wastewater	--	--	X	--
Doctor Staffed Health Office	--	--	X	--
Agricultural Pesticide Use	--	--	X	--
Chlorine Storage	--	--	X	--

were assigned numbers of representation. Four numbers were picked by a random number generator (Research Randomizer 2007) to select *municipios rebeldes* and one number was picked to represent a *caracol*. The *municipios oficiales* containing these *municipios rebeldes* were selected and visited by default. This study in no way intends to represent a stratified random sample in the selection of the subject communities. Random selection was used to prevent bias in community selection. An unintended positive consequence of the random selection of communities was a wide spatial distribution.These case accounts are snapshots of my visits to these nucleated areas of an often very rural landscape. I do not presume to paint all of these study areas with a generalist or reductionist brush of status quo or rebellious tendencies but where differences and similarities emerge they are noted as qualities that might warrant further study or provide insight to other political ecologies. Of course, there is a temporality to my snapshot. I made my field visits in the summer of 2007 so the picture is now a bit older but perhaps a bit more stable.

The Region: Mexico, Chiapas, and the Rebellious Northeast Highlands

Mexico

Mexico has a Día de Árbol (Day of the Tree), even a Month of the Tree but few Mexicans get excited about it other than children (Dominguez 2007, under "B2"). Expressing dismay at public and governmental apathy over forestation problems in Mexico, President Felipe Calderón promoted ProÁrbol, a reforestation effort spending six billion pesos (approximately 600 million USD), "…to generate economic development and share appreciation, restoration and sustainable exploitation of resources (Notimex 2007, under "A4") (see Appendix II for original Spanish)." The Mexican president also condemned the killing of an indigenous activist, Aldo Zamora, who was murdered in an ambush in May of 2007 for his efforts to stop illegal logging (Notimex 2007, under "A4"). The frequent assassinations of those connected to the business of stopping illegal lumbering, especially government officials, has prompted the strategy of licensing the transportation of lumber on the highways rather than confrontations in the forests to stop the estimated four billion peso (approximately 400 million USD) illegal lumber trade (Notimex 2007, under "A6").

The *Cámara de Diputados* (the lower house of the legislature) of Mexico reported in 2007 that the political ecology regarding forest policy (*la política forestal*) simply did not function. The report states that in Mexico about 600,000 hectares (about 2,300 square miles) of forest and jungle fall to legal and illegal lumber and firewood (a huge demand in this developing country) per year (El Universal 2007, under "A7") and during the administration of Vicente Fox approximately four million hectares of deforestation took place in Mexico (Notimex 2007, under "A7"). Greenpeace ranks Mexico as the fifth-most deforested country on the planet (Notimex 2007, under "A7") and the *Instituto*

Politécnico Nacional of Mexico reports sixty-five percent of Mexico's lands as experiencing desertification with about half of that caused by deforestation, a quarter from livestock pasture, and the remaining twenty-five percent from other anthropogenic causes such as bad water use, monoculture, and overuse of fertilizers (Notimex 2007, under "A6"). For some comparison of scale, "…forests cover 30 percent of the land area of the planet Earth – or just under 4 billion hectares (FAO 2005)."

Some movements of remediating ecological problems in Mexico have been instituted, financed, and/or proposed. The World Bank donated 7.3 million USD to improve conservation programs through Mexico's *Comisión Nacional de Áreas Naturales Protegidas* (CONANP - National Commission of Protected Natural Areas) (Notimex 2007, under "A7"). Mexico's Green Party (*Partido Verde Ecologista de México*) has proposed a special prosecutor to prosecute environmental criminals (Notimex 2007, under "A6") while CONANP has reorganized Mexico's 161 protected natural areas by ecosystem characteristics to allow for better decision making about the sites and national biodiversity (Notimex 2007, under "A8"). Debate is ongoing to constitutionalize the link of ecotourism and fast-track development for the former's promotion (Sanchez 2007, under "B17").

Chiapas

The autonomy of the Zapatistas cannot always evade considerations of public health and environment but surly exemplifies a need for geopolitical diplomacy with their juxtaposed neighbor state of Chiapas in terms of political ecology. Concerns over the spread of whooping cough have compelled Zapatista leaders to put aside their rhetoric of autonomy and cooperate with state health officials to report and treat incidence of the

disease after 11 deaths from whooping cough throughout the state. (Rincon 2007, under "B3").

Chiapas leads Mexico in infant mortality with the main cause being congenital birth defects of neurological and intestinal systems recently overtaking infectious diseases such as diarrhea and respiratory problems for highest mortality rank. A pediatric official is quick to blame malnutrition and premature births for these defects (Citalan 2011, under "19"). No mention of the highly promoted, used, and little regulated herbicide *paraquat,* having been used for over 50 years worldwide and in Mexico, that laboratory tests have linked to animal embryonic defects and human Parkinson's disease, yet it has been banned by the European Union (EFE 2007, under "A9;" Mussi and Calcaterra 2010; Perla and Greenlee 2008). *Paraqua*t is still listed as safe by the US Environmental Protection Agency (EPA 2011) but had its last "significant revision" in August of 1988 (EPA 2011) while any listing as safe appears to be imbued with politics (Fernandez 2006; Wright 1986, 32-3). Ingesting *paraquat* herbicides also seems to be the poison of choice for despondent young women attempting suicide in Chiapas (Villatoro 2007, under "R7"). In 2006 some 57 agricultural workers sought treatment for poisoning from the direct contact of agrochemicals including *paraquat* (Grajales 2007). Chiapas ranks at the top in Mexico for cases of intestinal cancer blamed mostly on indiscriminant use of agrochemicals like *paraquat* (Leyva 2007, under "B7").

Fifty-seven people died from diarrhea in Chiapas in the first six month of 2007 with 39,000 cases reported in the same period (Grajales 2007, under "B3"). Given that most communities do not treat their sewerage (see site specific interviews below), many water ways are profoundly polluted. Fecal lab testing of selected families living along the

Suchiate River in far southern Chiapas (at its mouth bordering Guatemala) found every member to be infected with *Giardia lamblia, Entamoeba histolytica, Entamoeba coli* (nonpathogenic but often indicative of other pathogenic species), *Trichuris trichiura, Trichomonas hominis* (also thought to be nonpathogenic but associated with diarrheic stools), and *Uncinaria stenocephala.* Also detected in the samples were *E. coli, Salmonella thipy, Salmonella enteric, Shigella* sp., *Enterobacter aerogenes, Enterobacter* sp., *Enterobacter aglomerans, Enterobacter cloacae, Proteus mirabilis, Proteus vulgaris, Proteus* sp., *Klebsiella* sp., *Klebsiella oxytoca, Serratia rubiadae, Serratia* sp., *Citrobacter enteric, Citrobacter freundii, and Providencia rettgeri.* Most of the above mentioned microorganisms were also found in direct water samples of the Suchiate River (Garcia 2007).

Another water-related disease (because it is carried by mosquitoes) found in Chiapas is caused by any of a group of four similar viruses. The disease generally manifests as hemorrhagic dengue (more severe and also known as "broken bone disease") and non-hemorrhagic dengue. The disease is human-mosquito-human vector without cure or vaccine. The best method is prevention of mosquito bites and eliminating their breeding grounds/habitats in water catchments like puddles and flower pots (CDC 2011; MdeR. 2007, under "B23").

In tending to the effects of environmental health deficiencies in Chiapas, a great shortage of healthcare professionals prompted the National Syndicate of Health Workers (SNTSA) to call for about 100 workers to help cover their rural healthcare mission. Chiapas reports one doctor for every 1,750 persons without insurance and one clinic bed for every two to three thousand persons. The insured in Chiapas receive medical attention

on the order of 1:35 medical professionals while the uninsured have about 1:292 to serve them (see Chapter III, Table 2 for other comparisons of parity) (Sanchez 2007, under "B3").

Chiapas is also a state following the national trend of deforestation. It is estimated that over the last 25 years that Chiapas has lost some 1.5 million hectares of forest mostly to agriculture with the problem growing with population and inviting desertification (Victorio 2007, under "B22"). But Chiapas in not without reflexivity on its environmental state. Trees blown over by tropical storm Barbara on the Pacific coast are being put into the lumber market producing 2,000 cubic meters of wood. The action came under the authority of new state sustainable development laws (Victorio 2007, under "B12"). Hundreds of government officials and volunteers gathered for a cleanup of Cañon del Sumertido, a large geomantic formation on the Grijalva River about 20 miles north of the Chiapan capital, Tuxtla Gutierrez. The effort was to put a better face on the popular tourist attraction (MdeR. 2007, under "B16-17"). At the Autonomous University of Chiapas (UNACH) a forum of agricultural products takes place extolling some 50,000 products produced with organic goods by 287 entities, primarily coffee products. Income from organic products often surpasses technological agriculture by five to one and brings benefits to the environment and the consumers following a worldwide movement to promote organic, sustainable agriculture for some 30 years (Garcia 2007, under "B12"). And there is growing solidarity among people working for the Earth. Teacher Jaime Gonzalez Gonzalez was detained and tortured by government officials for publicly opposing mining development that would destroy flora and fauna habitat in his native *municipio* of Motozintla in southwest Chiapas. The disposition of Gonzalez' case is

unknown at present but environmental groups from throughout Mexico, including Zapatista leaders, had joined the calls for his release and protection of the lands in question (Herrera 2007, under "A3"). People are coming together to preserve species habitat other than that of humans. September 7 has been designated the "Day of the Manatee in Mexico." Volunteers and government officials are uniting to stop black water discharges into manatee lagoon habitats and creating education campaigns upstream in tributaries that water pollution at those points will eventually affect manatee habitat when the rivers reach the oceans. Biologists estimate that if remediation efforts are not successful that pollution levels will destroy manatee habitat within ten years (Guizar 2007, under "A3").

The Rebellious Northeast Highlands

Palenque and Vicente Guerrero

Palenque, a *municipio oficial y cabecera,* is one of the wealthiest cities of Chiapas owing to its proximity to Mayan ruins also known as Palenque. Thousands of tourists each year are attracted to the UNESCO World Heritage Site creating a level of sophistication and service not known to much of Chiapas. Ethnic identity here is often a matter of ideology rather than blood given to the wide range of national and international visitors here and the identity most chosen is latino. Indigenous people selling wares at the archaeological park are mostly Lacandon Maya and come in their traditional white garb from many miles away to represent indigenous identity to the tourists. Palenque lies mostly in the limestone plains that reach across the Petén into Guatemala and north

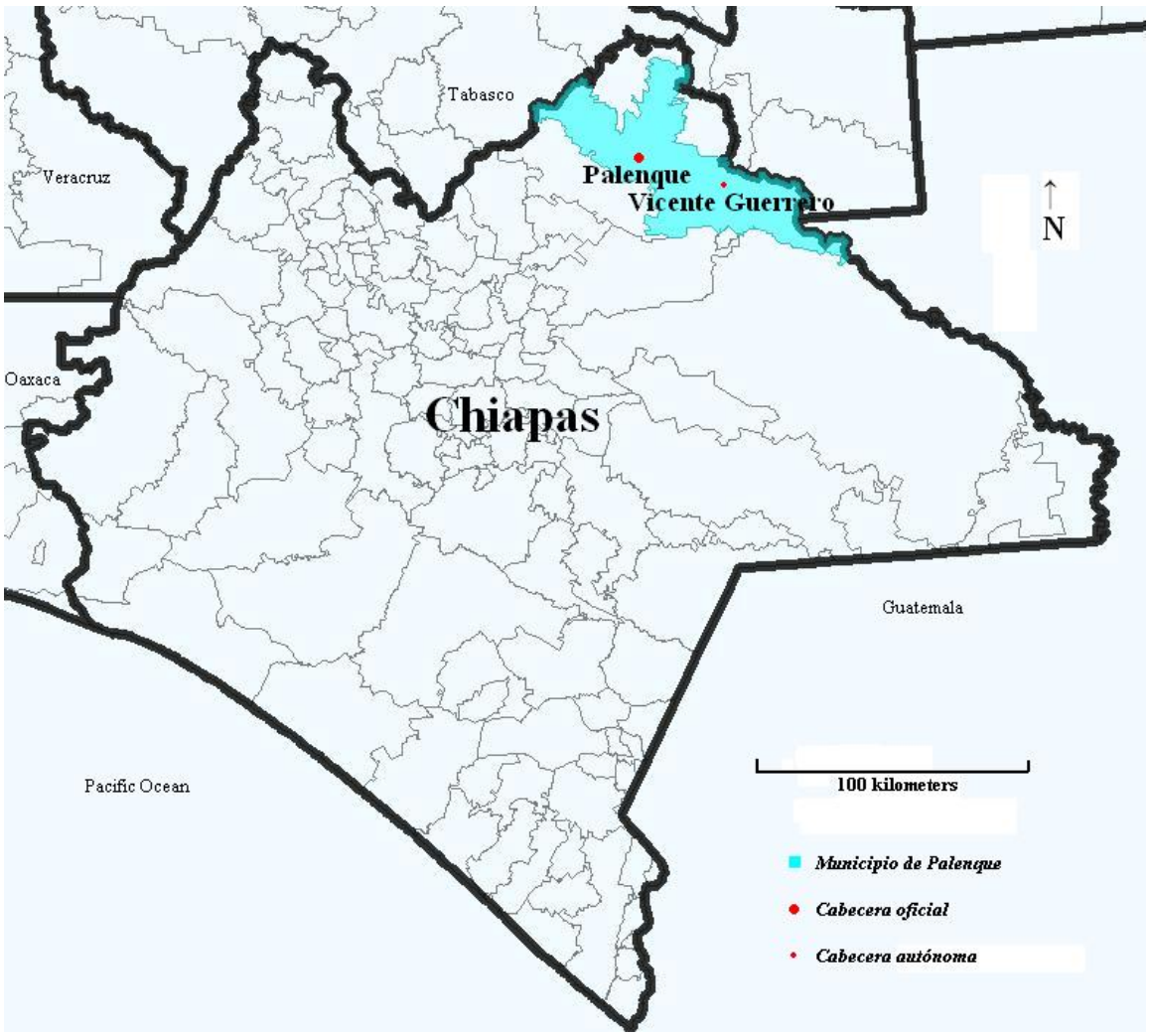

Figure 17. The municipio of Palenque within the state of Chiapas with official and autonomous county seats. *Source:* INEGI/IRIS 2007.

encompassing the Yucatan. It is hot and humid with a rainy season running from late May to late August.

In the *cabecera* the most singular characteristic that puts Palenque ahead of all other study sites is that sewage is treated by sedimentation and chlorine before it is released into local waterways while many other *municipios* are discharging raw sewage, few are doing sedimentation, and none, other than Palenque, chlorinated their

wastewater. Agrochemicals are sold here to surrounding farmers as a practice of modernity (see figure 18). Little organic agriculture in known here and most agriculture is monoculture with provisions for irrigation and intensive livestock grazing with little swidden agriculture. There is central solid waste collection and sewerage. The solid waste dump is not burned and there is some practice of composting garbage on the *cabacera* scale, however there is no special process for battery or chemical disposal. One

Figure 18. One of many outlets throughout northeast Chiapas where herbicides, insecticides, and chemical fertilizers are sold, this one in *cabecera oficial* Palenque.

of the environmental assets of Palenque is that little firewood is used for cooking and most kitchens have gas stoves. While trash burning in the city is supposedly prohibited, I was told on my interview with city officials that the dump accidentally catches fire occasionally from the sun magnifying through waste glass. The plausibility of this

phenomenon was not verified but I did find a store clerk burning a pile of trash outside a pharmacy (figure 19). When I asked if it was a normal function to burn trash the young clerk said it was to keep away mosquitoes (it was at the twilight hour). He soon brought a bucket of water and poured it on the fire and a large plume of smoke emitted from the trash pile presumably repelling mosquitoes. Unfortunately much of the trash pile contained plastic that burns and creates toxic fumes that are dangerous to anyone who breathes them into their lungs. "Air toxics are pollutants known or suspected of causing cancer or other serious health problems, such as birth defects (EPA 2002)." Household trash burning is known to produce volatile organic compounds (VOC), polycyclic aromatic hydrocarbon (PAH), non-PAH semi-volatile organic compound (SVOC), carbonyl and polychlorinated dibenzo-p-dioxins, and polychlorinated dibenzofuran (PCDD/F) air toxics. (Lemieuxa, Lutesb, and Santoiannib 2004). The municipality sprays insecticide regularly for mosquitoes on a city-wide basis. Palenque has the distinction of being the only study area to report not having any public education health programs.

Figure 19. Open burning of trash in the cabecera oficial of Palenque and dousing with water to produce smoke to repel mosquitoes.

Traveling some 40 kilometers east I was able to find the Zapatista *cabecera* of Vicente Guerrero after many days of searching, widespread inquiry, and lucky choices. Also known by its non-Zapatista name of Babiloinia Tercera (the third – having two other Babilonias on the map and knowledge of area natives definitely contributed to the difficulty in finding the place – the name is used herein to refer to issues of the entire community), this place was on the very end of the Chiapan highlands at the end of the Monte Azul range. Low-lying mountains obscured the view of the nearby Usumacinta River. At the entrance to the settlement is a marker signifying the installation of electricity for the community in the year 2000 (figure 20). This was at the end of the Ernesto Zedillo administration so the marker echoed one of last gasps of the PRI rule that I remember seeing in the news headlines quoting Zedillio, "Electricity for all!" Right next to the monument is the Zapatista indoctrination for strangers entering the community (see figure 20). The irony of the signage seems to extol the rebellion (originating in 1994) and cry, "too little, too late," to the reactionary measure of services like electricity, which are a big part of the reason of the Zapatista rebellion.

Since this was my first visit to one of the *municipios autonomos* in my study, it was here that I learned of the juxtaposed communities and that Vicente Guerrero housed about 20 Zapatista families and 20 PRI families (about 300 people). There was a Zapatista school and a state school. There was a Zapatista store and a community store. There was a Zapatista health office (see figure 21.) and I knew there was a municipal heath office just up the road. But I was surprised to find that the two communities had shared in the purchase, installation, and maintenance of a well. The summer of 2007 was

a drought for much of Chiapas. Rainy season norms of rain almost every day on the order of two to ten centimeters gave way to periods of two weeks and more without rain. Years

Figure 20. A monument marking the introduction of electricity in 2000 to *cabecera autónoma* Vicente Guerrero, also known as Babilonia *tercera* (third).

of dry season (November to April) water shortages brought the factions of the community to pool their resources to have a well dug with a pump to supply household water (see figure 22.) throughout Babilonia Tercero. Only one house that I observed, where I was hosted, had a toilet fixture and a septic tank. Other homes had a cordoned area behind the living/cooking complex where people urinated and defecated leaving feces and toilet paper exposed (In much more rural settings in northeast Chiapas I have seen these "bad" areas left to familial knowledge generally depending on dogs to eat the feces.). Hand

washing might or might not occur with or without soap using a bowl from the cistern to ladle water over the hands.

Figure 21. The casa de salud (health office) in Vicente Guerrero.

It was here in Vicente Guerrero that my presence spawned the most public debate about environmental issues. A meeting of all of the male leaders of Zapatista communities in the *municipio en rebelde* was called to discuss their environmental issues without my knowledge. There was a big effort to clean the area of all trash that was raked and swept into piles by the women that were summarily burned emitting toxic smoke resulting from a large composition of plastic wrappers, bags, and bottles. After the first day of meetings at the school I was invited to attend a meeting the following afternoon

to discuss environmental issues and get my questions answered. I said I would attend but that I had an immediate concern for all of the plastic that was being burned in the community clean up. Later that evening, after the meeting in the school had disbanded, I

Figure 22. The wet area of a household with detail of the cistern (right) where hand washing and water retrieval is facilitated by the floating bowl. The pump for the piped water running throughout Babilonia Tercero is only run a few hours per day so cisterns are filled at this opportunity. The walled off area in the photo (left) contains a toilet fixture (one of the few in town – this is a prosperous household) and area for showering. Green hoses trail to the kitchen house for cooking and dish water.

noticed my community hosts carrying many plastic soda and water bottles out and piling them up behind the school where they then ignited the pile (see figure 23) creating a plume of toxic smoke that wafted almost directly to my hammock. As I observed this I could not help but feel that my advice was being deliberately thwarted but made no mention of it at the moment.

The next day, a Sunday, I was called on to come to the community meeting, now in its second day but moved to the Casa de Salud (health house). I was asked to explain my presence, which I did, and then found myself being examined on what could be done for the water problems at a nearby community, Nuevo Usumacinta. Several

representatives reported the community of about 300 people had experienced problems of water shortages for some 30 years but now that drought had set in, it was a great

Figure 23. A pile of plastic left after burning behind the Zapatista school in *cabacera autónoma* Vicente Guerrero.

community stress to not receive the summer rains that usually filled the community cistern. It was described to me that the cistern would be filled by rain water that would serve the community through much of the normal dry season and that when it was empty it was necessary to carry water some three kilometers from the Usumacinta River for all household use. I suggested immediate relief to the problem by requesting water trucks from the state or federal governments to fill their cistern but was rebuked since Zapatista policy is to eschew outside resources and come up with their own solutions. I then

mentioned that the community trucks I knew the Zapatista's used for daily community transportation to various points of the region could be fitted with large tanks to transport water but that this might have limitations given that with only human passengers the truck had power deficiencies that barley allowed it to make it over steep inclines (on one of my trips in such a truck, several passengers had to disembark to allow it to make it up a particularly steep summit). So I then asked the obvious question: "How had this gone on for 30 years without finding a solution?" It was explained that the problem was considered minimal unless there was a time of drought that raised discontent when there was no relief to the water portage. Now that the rainy season had failed to commence there was no relief of the drudgery of transporting water in small containers on foot. I suggested three options: 1) increasing the size of the cistern to allow for more supply during dry and drought seasons, 2) a pipe and pump system with relay cisterns to accommodate the distance capacity of the pumps, and 3) follow the example of Vicente Guerrero and find the financial resources to dig a well and install a pump. My concern that a lack of water not only meant an increased workload from transporting water from the river but that a water shortage would inevitably have an effect on personal hygiene since hand and dish washing might be sacrificed because of shortage.I know that the drought eventually lifted that summer but do not know if Nuevo Usumacinta has implemented any plan to avoid water shortages in the future.

I closed my comments at this meeting by mentioning the toxic problem of burning plastic and suggested a depository area in anticipation of a time when recycling markets might give some value to plastic waste. Participating in the community affairs of Vicente Guerrero was not my intention or idea of an objective observation. I found, however, that

no objectivity was compromised by giving my opinions when asked and that I might be violating some standard of ethics by not warning against an apparent harm like the open burning of plastic.

Then it came time to get my questions answered and I went through the check list quickly. I noticed hesitation in answering my questions about agrochemicals. The day before I had mentioned some of the things I would ask questions about to two of the community leaders. When I mentioned agrochemicals, one of the men made an abrupt statement that they might use paraquat the first time on a new field while the other corrected him that they used to use the herbicide but that they no longer did. So when I asked the question, formally, in the group meeting there were some pausing stares and then a unified answer that, "no," agrochemicals were used. I really found no other blatant politicization of answers throughout my interviews at other locations but the experience here in Vicente Guerrero colored the possibility that answers to my questions might be representing the party line in *municipios oficiales* and *rebeldes.*

When I went to say goodbye to my hosts and community leaders, many of the men were returning from firewood gathering. They brought large lengths of dead wood to a central area and chopped it into burnable lengths. I was told of Zapatista policy not to cut living trees for wood or lumber. Some people had gas stoves since heavy gas tanks could be delivered on the paved road leading to Babilonia Tercero but I did not see them used. All cooking was done over a wood fire in a separate kitchen house. Boiling was the predominate method of water treatment.

Chilón and San Jose en Rebeldia

The *cabecera oficial* of Chilón is very familiar to me since it is the base of my archaeological studies and I had visited there extensively every year for the previous ten years. The small colonial center pipes its raw sewage directly into the river at its southern extent. Chlorinated water piped into homes is used for washing and toilets but it is not trusted to drink and virtually every home in the *cabecera* buys large bottles of filtered and ozonated water. There is solid waste collection but no special consideration for batteries or chemicals. Much swidden agriculture is practiced in Chilón's perimeter with a couple homes on the main road through the town having corn growing in their front yards. Most homes have indoor water with cisterns to insure against water and electric shortages (I have personally experience outages of both water and electric that lasted two weeks). State programs in the rural fringe of Chilón have financed toilets and septic tanks. There is a large state-owned nursery within the town where macadamia trees are being grown for transplant as an answer to deforestation and as an agriculturally diverse product. A federal health center and private practice supply medical care with Red Cross ambulance service to the neighboring *municipio* of Yajalón where there is a hospital.

Paraquat is sold in almost every kind of store, even the more remote family *bodega* type stores that only sell sodas and snacks and other essentials – and paraquat. Signs advertising several brands of paraquat can be seen on many utility and fence poles along the roads every 30 meters of so. Often someone will enter a "combi" (a Volkswagon van or economy sized pickup truck with benches and cover) with a pump sprayer filled with unknown chemicals going from one place to another. I have seen a

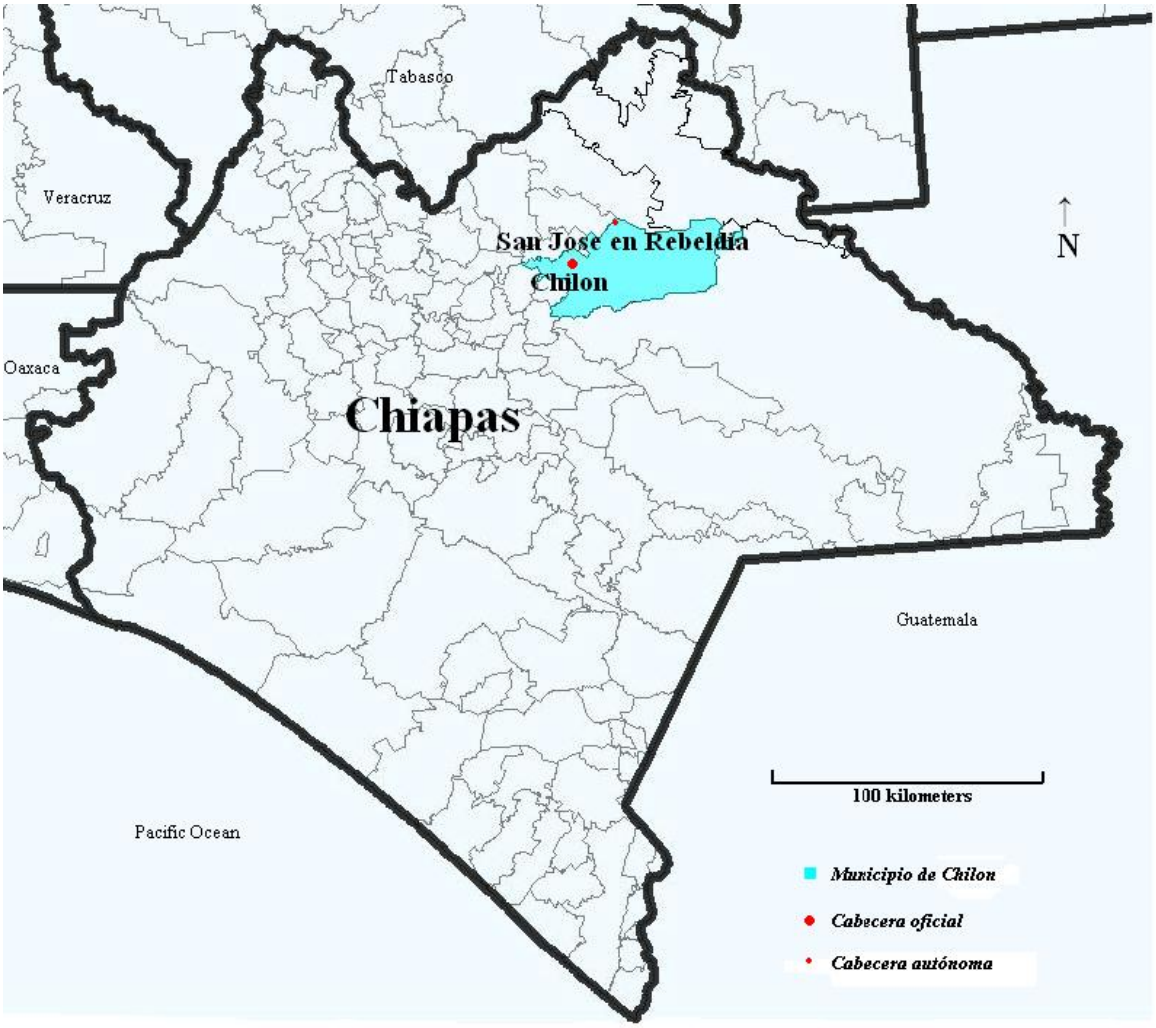

Figure 24. The municipio of Chilón within the state of Chiapas with official and autonomous county seats. *Source:* INEGI/IRIS 2007.

child running home from the store with two large bottles of paraquat, one in each hand.

Most latino families throughout Chiapas take some form of metronidazole (brand named Flagyl) or other strong antibiotics against amoebic dysentery twice a year as a matter of preventive action. Amoebic dysentery is quite pernicious since it can penetrate the intestinal wall and infect other organs like the brain, lungs, and liver producing cystic abscess conditions. It is spread mainly in tropical environments by poor sanitation and untreated water used in food production (MedlinePlus 2011).

At the new *cabecera rebelde*, San José en Rebeldía, at the northern extent of the *municipio oficial* of Chilón was an opportunity to witness the birth of a new *cabecera.* Named for a Zapatista soldier identified as *compañero* Jose who was assassinated as he returned home from a political summit (see figure 25). Part of the *municipio reblede* Olga Isabel, San José en Rebeldía sits at the meeting of three *municipios oficiales*: Tumbala, Salto de Agua, and actually is located in Chilón. They have declared and are building their own county seat to enhance the administration and services of the people too far from the current *cabecera* of Olga Isabel, about 90 minutes southwest by truck very near the *cabacera oficial* of Chilón.

Figure 25. A mural commemorating the namesake of San José en Rebeldía. The Spanish caption reads: "Compañero José responsable del pueblo fue asesinado por los paramilitares cuando se regresa una reunión." Translation: "Companion Jose, responsible for the community, was assassinated by paramilitaries when he returned from a meeting." The caption at right recounts the same story in Tzeltal, one of several indigenous languages in Chiapas and elaborates the year of 1995.

The most water tests of any study site were taken at San José en Rebeldía because of request by community leaders and the disperse nature of the area with about 130 individuals. Only a handful of families used a single *ojo de agua* (eye/source of water – see figure 26). All hydrogen sulfide tests were negative for E. coli at all study areas contrary to expectations with knowledge of a lack of sewage treatment in the area, livestock grazing, and a history of water contamination in Chiapas. The drought of the summer of 1997 might have contributed to the lack of E. coli findings or the simple fact that people chose isolated springs with underground, isolated sources for their water supply – all *municipios oficiales* reported chlorinating their water.

Figure 26. One of several sites testing for *E. coli* around San José en Rebeldía. All sites tested negative as indicated by the white test pad, the small white disc in the lower left center of the photo.

Construction of schools and a social service complex for the new *cabecera* of San José en Rebeldía was underway. Extensive excavation of the land provided no mitigation

for erosion from the exposed dirt. The excavation was directly across the road from drainage into a river less than 20 meters away (see figure 27).

Figure 27. Open excavation for the construction of a new *cabecera autónoma* complex at San Jose en Rebeldía

The ubiquitous open burning of trash was present at José en Rebeldía. The problem seemed to be exacerbated because of a thriving refreshment business from the Zapatista store located on the highway and just outside *Agua Azul*, an extensive waterfall tourist magnet. More trash, mostly plastic bottles, provided bigger toxic fires (see figure 28). Trash was reported to be centrally collected by the *cabacera* with composting but no provision for batteries or chemicals.

Figure 28. Open burning of trash at cabacera autónoma San José en Rebeldía.

Pantelhó and Emiliano Zapata

The *cabacera oficial* of Pantelhó abuts the western side of Chilón but is only easily accessed by skirting around nine other municipalities and is among the most rural and remote places that I visited in my research. I shared a taxi to this place with a latino business owner from Pantelhó who told me that an indigenous president (mayor) had been elected and that most of the administration there was now indigenous, which, he

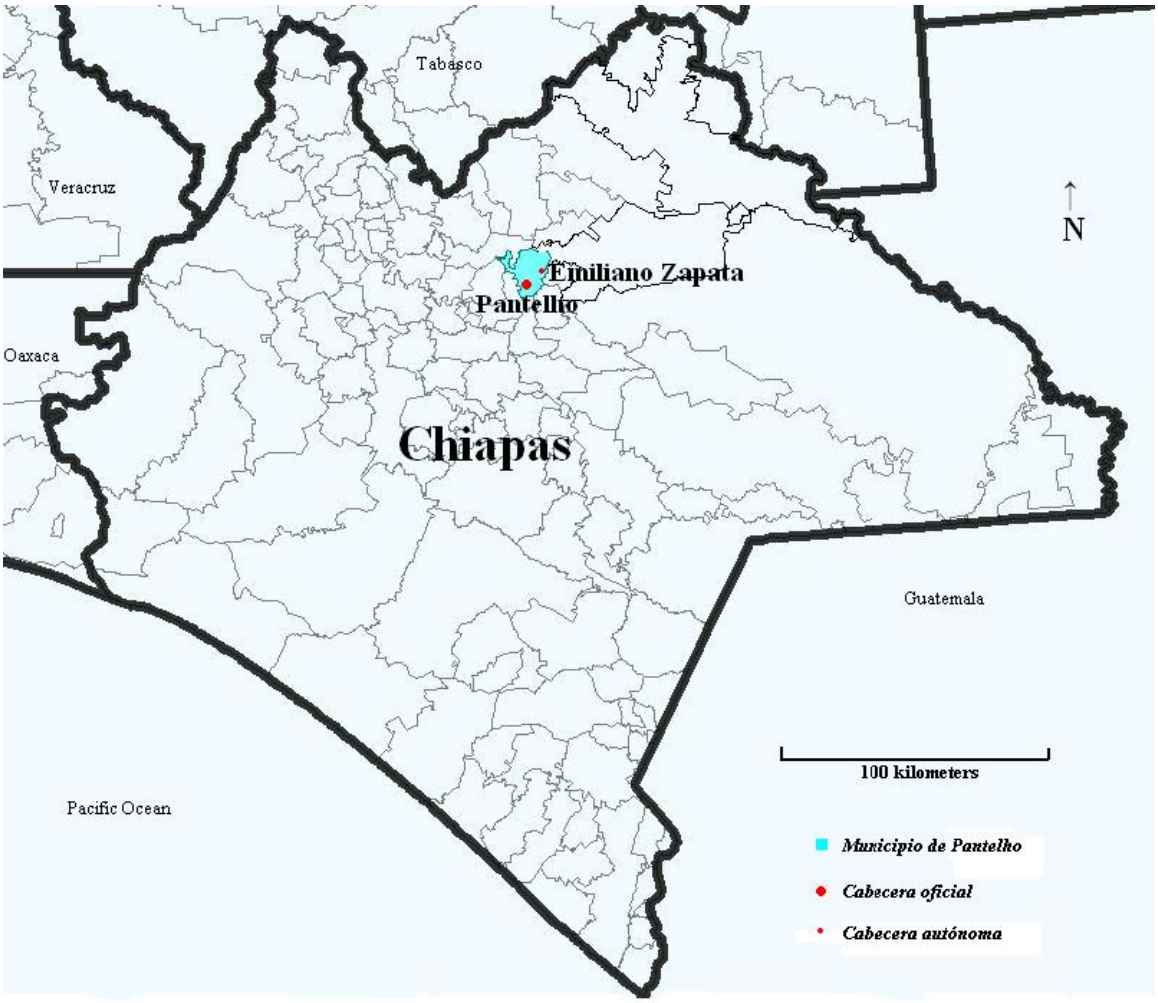

Figure 29. The municipio of Pantelhó within the state of Chiapas with official and autonomous county seats. *Source:* INEGI/IRIS 2007.

conceded, is right since, "they are the majority."

I found the *presidencia* (town hall) to be reflexive of ecological concerns in one way; the walls were hung with posters from the local preparatory school advising the care of nature (see figure 30) while this location began what appears to be a plague of

Figure 30. One of several posters reflexive of the environment in Pantehló's *presidencia* done by students from the local prep school. Translation: "Don't pollute the water because it is life. Be careful of it."

abandoned car batteries in Chiapas. Car batteries, known as lead-acid batteries, generally contain large amounts of lead while most batteries of any type usually contain heavy metals such as, "… mercury, … cadmium, and nickel, which can contaminate the environment when batteries are improperly disposed of. When incinerated, certain metals might be released into the air or can concentrate in the ash produced by the combustion

process (EPA 2010).” Chiapans seem to have a sense that at least car/truck batteries are dangerous since they seem to be stacking up in public places (not so for other types of batteries often seen in trash or thrown in the street to be crushed by traffic and unseal the elements inside). One battery was found just sitting on the main stair case of the *presidencia* in Pantehló and another much larger battery sat outside right next to the building (see figure 31). Neither the official or rebel county seats acknowledged any special battery disposal available.

Figure 31. Batteries inside and out at the presidencia in Pantehló

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The town dump could not have appeared to be more of a desecration of the Earth than if it was expressly designed to appear as such (see figure 32) Along a remote country road the *municipio oficial* of Pantehló’s trash is dumped off the side of the mountain and burned while eventually falling down into the watershed at the bottom of the elevation.

Reaching the selected *municipio en rebelde*, Emiliano Zapata, continued the remote theme of my visit to Pantehló. From the *cabecera oficial* it was more than two hours by truck on gravel roads and then another four hours on foot to reach the Zapatista *municipio.* On my journey I found that intense agriculture dotted the landscape in spite of the remote and rural density of the area (see figure 33). I found approximately 250

Figure 32. The burning waste of Pantehló oficial.

individuals living in the same juxtaposition here as I had in Vicente Guerrero.

Arrival at Emiliano Zapata brought an imperative to act quickly to get my interview since I had only been granted a one day pass by the *caracol* administration for my research visit. I found that there was no electricity in Emiliano Zapata with the exception of a large solar array used to power freezers in the Zapatista health clinic for

the purpose of preserving vaccines and medicines. The Zapatistas had built this clinic and supplied it by carrying blocks, bags of mortar, and supplies (including two large freezers) over the path that had taken me four hours to travel (see figure 34). The only toilet fixture

Figure 33. Remote agriculture in Pantehló on the way to Emiliano Zapata. Close examination of the photo reveals that field plots extend all the way to the summits of these mountains.

in town was in this clinic while the homes that I witnessed had the contained area of turned over dirt with open feces and paper as I had seen in Vicente Guerrero. I expected that maybe the children left their feces uncovered and that the parents would later cover the toilet yard – this made sense since there was a limited amount of open feces and the dirt was turned over. Both communities seemed to have the same architectural idea (I had not witnessed the practice at San José en Rebeldía) so I supposed that the chicken wire containment might be to keep dogs and other animals out, or the children in, or both but I did not ask as it seemed an intrusive, embarrassing question to put to my hosts. I was hosted by a family where meals were prepared and eaten in what I came to view as the

Figure 34. The clinic at Emiliano Zapata built with materials carried by hand over a mountainous trail of about 15 kilometers

traditional kitchen house (see figure 35). The parents with their three children and I existed in a very smoky environment while the mother cooked with a baby about one year old in a sling across her back. The wood fire filled the room with smoke and everybody coughed. Holes in the mud and wattle walls and thatched roof let out about as much smoke as was contained in the kitchen house. Boiling was reported as the method most used for water treatment though many were witnessed drinking water directly from the cistern, which was not chlorinated yet tested negative for *E. coli*. Water was boiled in my host's kitchen.

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Figure 35. The cooking arrangement and boiling water in the kitchen house at Emiliano Zapata.

Untreated water was piped to many houses (see figure 36) while some people came to the large plastic cistern outside the clinic to draw water that was collected up the mountain and piped to the reservoir cistern. Since my hosts lived next to the clinic I could sense that there was little activity there and the *promotores* (health practitioners – literally promoters, who promote healthy practices by education) seemed bored and were glad to show me the operation of the clinic. There was a dispensary room with many boxes of pills, tubes of ointment, and Pedialyte. The products had prices on the shelves below them but I knew it was Zapatista policy to only charge what someone was able to pay. I was shown the freezers and explained their intended purpose but they only contained water that the *promotores* wanted to chill for their own refreshment. There

Figure 36. The wet area of a home in Emiliano Zapata.

were several infirmary rooms with mattresses on the floor. But the covered porch and cement steps made the clinic a popular place for congregation during rain periods – the drought had broken here at least.

The *promotores* receive their training in two-week periods in workshops at the *caracol* administrative centers. Much emphasis is put on holistic and natural medicine. Health care is reportedly one thing that the Zapatistas will accept from the state in the event of a dire emergency. The *promotores* are trained in child birth, treating fever, ill symptoms, and physical injuries (machete cuts are common). The *promotores* have about six steps of rank depending on their level of training.

There were two remarkable qualities from the check list here: 1) the *junta de buen gobierno* stated that they no longer burned their trash, "not anymore." I was being told that news of my warning about burning plastics at Vicente Guerrero had proceeded me and it was now policy to not burn trash (this was, chronologically my last research visit). 2) This was the only Zapatista community that stated that they cut live wood. The practice was stipulated that they would do so only with permission but I was unable to exact a reliable definition to this caveat. I investigated a little more before I left and I asked what happened when people were found not complying with Zapatista policies – how were they policed in terms of something like cutting down live trees without permission? I was told that in the rare cases where people did not cooperate with Zapatista policies that someone would be expected to do something for the community good on the order of two times the damage they had caused. The example that I was given was that if someone cut down a stand of trees they would be expected to replant double the amount cut down. I did not witness any of these politics.

Las Margaritas and Caracol La Realidad

Las Margaritas lies in the rare flatlands in the southern extent of northeast Chiapas. Many lumber yards seen along the roads leading to the *cabecera oficial* might support a reason for the observation of much deforestation in the large alluvial area where tractor agriculture and wheeled carts are seen frequently. Las Margaritas is the only other entity than Palenque to treat their sewage with a new plant only a few months old in 2007 but only by sedimentation – no chlorinization. Las Margaritas was the exception to other

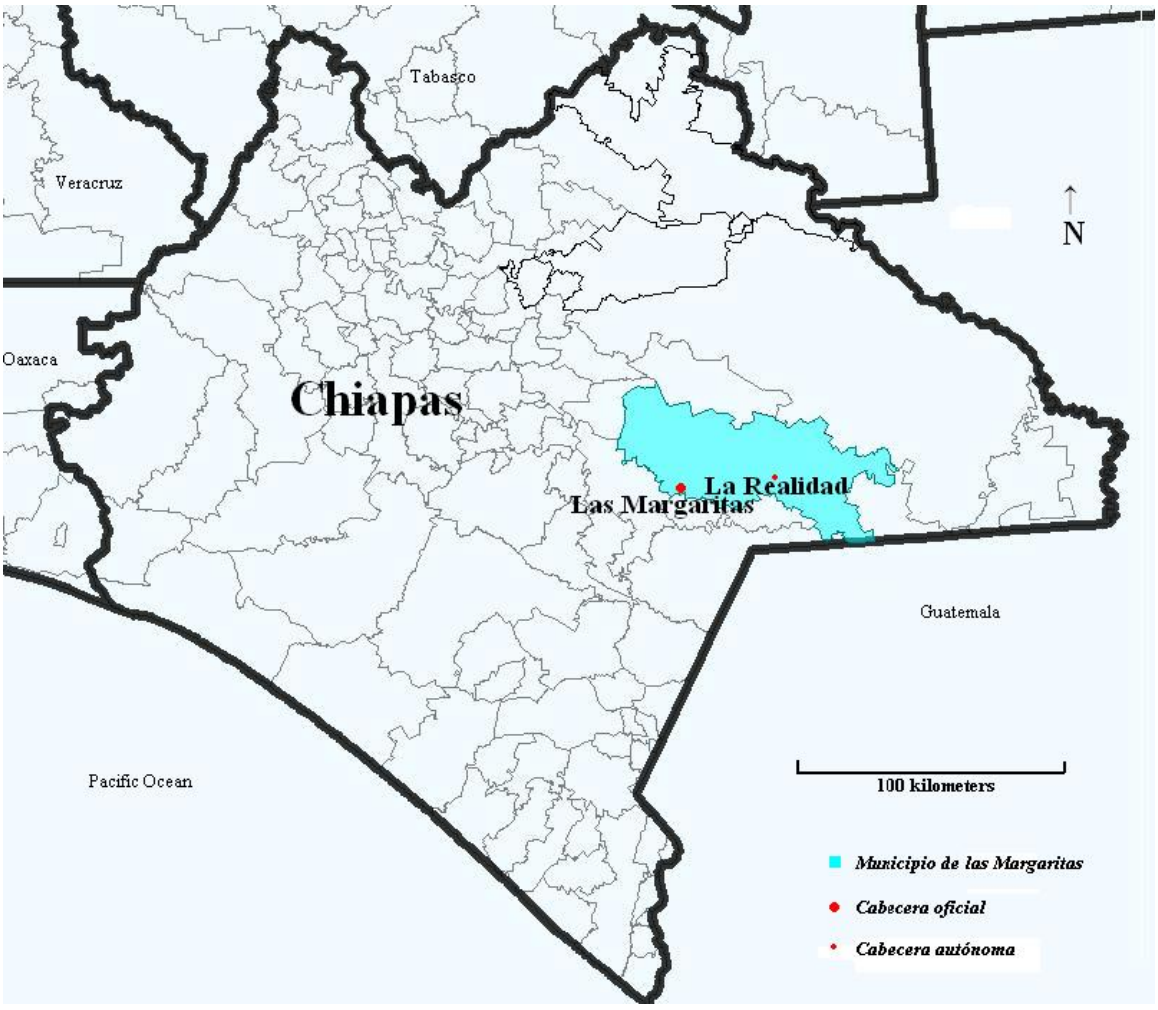

Figure 37. The *municipio* of Las Margaritas within the state of Chiapas with official and autonomous county seats. *Source:* INEGI/IRIS 2007.

cabaceras oficiales to report that they did not cut live firewood. Reporting that there were four major lumber plants in the area may have provided scrap firewood but Las Margaritas also reported kitchens as using mostly gas. It was also reported that there were no consolidated efforts in the local lumber industry for reforestation.

My trip to La Realidad was short lived. While the truck that transported me entered town I stood in the back of the truck and could easily be seen. One man spotted me and pointed yelling, "*Güero*!" This means fair or light skinned. All of my other *cabecera en rebelde* visits had required me to visit the administrative *caracol* to obtain permission to visit the *cabeceras en rebeldes.* Since this La Realidad was a *caracol*, deliberately chosen to represent the political ecology of the *caracoles,* it was a self-contained mission of permission and interview in one. As I approached the compound for permission and participation to my interview I was kept waiting in an ante area where the *caracol* guards asked me to make a donation to the Zapatistas. This had not happened before and I found it highly irregular (I had had an encounter with one individual in another community who attempted to extort money from me but this was one errant individual.). I asked for a receipt and found it to be status quo practice to ask visitors to make contributions so I made a twenty dollar contribution. When I was met by the ruling committee, the *junta de buen gobierno,* I was told immediately that I would have to leave the following day because community members had already complained of my presence. This community was another juxtaposed situation as I had seen before but none of the *caracoles* that I had visited to obtain permission to enter the Zapatista communities had been within a community – they had always been standalone compounds in remote areas. But this was a "two for" since I also could obtain permission here for my next visit to the

Zapatista community of Vergel in the neighboring *municipio oficial* of La Independencia since the area also fell under the jurisdiction of the *caracol* of La Realidad so I did not feel too shorted by the news that I would have to leave so quickly. The profile that emerged from my interview produced no remarkable variation from my previous visits. Not knowing what was ahead of me in choosing these sites, I wanted to make sure to visit at least one *caracol* to explore different dimensions of settlement and environmental practice. Little did I know when I made my random selections that I would end up visiting all but one of the five Zapatista caracoles as a required function of obtaining permission to visit my selected *municipios en rebeldes.*

As I was helped to where I would stay the night I was further confronted with strangeness: 1) that the *caracol* volunteer assigned to show me to my quarters asked me for money to buy food – another request for money (I gave him five dollars after disapproving questioning about why he wasn't getting fed) and 2) in the school where I was quartered were two Canadians who had been in La Realidad for weeks teaching school. Even though I was later given only one day at Emiliano Zapata for my interview, I had only been received in all of the communities with great hospitality and care for my well-being. I did not come to any conclusions about the singular hostility of La Realidad but it seemed to be embroiled in contentious politics.

La Independencia and Vergel

La Independencia is another flatland area only about 15 kilometers southwest of Las Margaritas. Tractor farming is much more extensive here in keeping with the planar terrain. The environmental qualities of La Independencia showed little variation from other *municipios oficiales* and exhibited no remarkable exceptions from other areas. As with Las Margaritas, the extensive deforestation for lumber and agriculture here in and

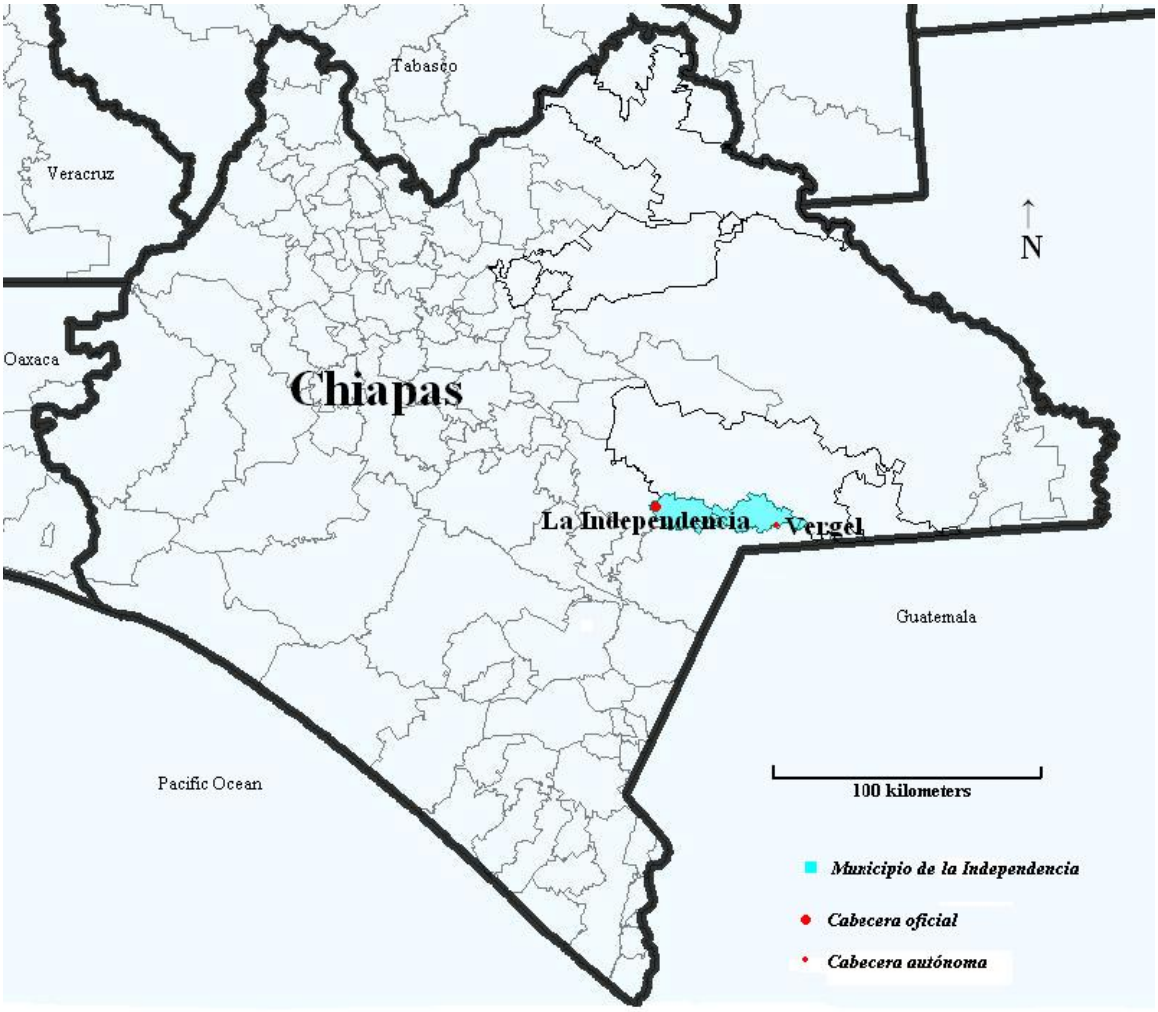

Figure 38. The municipio of La Independencia within the state of Chiapas with official and autonomous county seats. *Source;* INEGI/IRIS 2007.

around the *cabecera oficiales* must have an environmental dimension of degradation on water quality, soil loss, and quantity of agrochemicals in all ambient systems.

Traveling to La Independencia's paired *municipio en rebelde,* Vergel, brought only more political strangeness as if contaminated by the permission I was granted in La Realidad. My first hurdle was finding that the *cabecera* for the *municipio en rebelde* Tierra y Libertad had been changed from Agua Tinta as was noted in my published accounts. After much inquiry and disappointment I finally was enlightened about the change of location of the *cabecera* by a chance meeting in the town of Comitan, the largest colonial center in south northeast Chiapas. It was a woman who had sat on the *junta de buen gobierno* in La Realidad – the same person who had written my permission document giving the vague name of the entire *municipio,* not the name of the *cabecera.* Vergel, she explained to me, was now the administrative seat of the *municipio en rebelde,* Tierra y Libertad.

I set out for Vergel with much less uncertainty only to find three communities in the immediate region named Vergel. I had encountered this in Palenque with three Babilonias but was very lucky to follow the lead to the correct community first. I was only so lucky with Vergel in that the two wrong communities that I traveled to first were right across the road from each other (Vergel *pequeña* and Vergel *normal*) and a municipal employee of Las Margaritas lived in the one that I chanced to visit first and knew of the third and distant Vergel and was able to give me directions and a ride to Las Margaritas where I could get transportation to the Vergel, *cabacera de municipio en rebelde* Tierra y Libertad. When I finally arrived at Vergel the *cabecera* I was able to obtain an interview but only at the cost of more strangeness. This so-called political

capital was the territory of five brothers who comprised the community of some 40 persons. My theory of contentious politics seemed to be furthered by the shift of the location of the *cabecera* to a handful of brothers taking on the administration at the furthest reach of Chiapas and almost into Guatemala. Also, there was a conspicuous lack of iconography and signage to indicate that this was a Zapatista community.

Not lamenting these political irregularities any further, what I found in Vergel was in character with other Zapatista communities, however fraternal. Firewood was collected only as dead wood and collectively cut and distributed (see figure 39). Vergel consisted of a house for each brother and each had a cistern storing rain water (see figure 40). This was the home of Don Cesar and he was the leader of the

Figure 39. Unloading deadwood firewood in Vergel.

Zapatista clan, as it were, here in Vergel. I was received cordially and Don Cesar agreed to answer my questions. As I tested the murky water in his cistern, Don Cesar commented that he expected the test to be positive for *E. coli*, as did I from the appearance of the water clarity. But the test was negative. Don Cesar related that there were often periods when the cistern emptied and water needed to be carried from the nearby river. He said that he had witnessed in his lifetime (he was a man about in his mid-sixties) degradation of the river Santo Domingo and that he attributed the decline to the growth of Comitan and Las Margaritas many miles upstream.

To no surprise, three car/truck batteries sat in the front yard of Don Cesar (see figure 41) where there was also evidence of open trash burning (see figure 42).

Figure 40. A cistern in Vergel that catches rainwater from the gutter at left.

Figure 41. Three batteries with unknown destinies in Vergel.

Figure 42. Evidence of open burning at Vergel (Just left of center).

CHAPTER V

THE GEOPOLITICAL ECOLOGY OF NORTHEAST CHIAPAS, DISCUSSION, AND CONCLUSIONS

Marrying the subdisciplines and/or directions of this study brings the camps of geopolitics and political ecology together in an errant way. The idea that a rebellion had taken place with newly declared areas that I could demarcate and examine crumbled when my preconceptions of autonomous areas didn't include the possibility that these areas were juxtaposed with the areas and people they were rebelling against (see Chapter III). I had seen this juxtaposition on my first summer as an observer in 1995 deep in the Lacandon jungle of Ocosingo at a small community called Santa Elena but did not recognize it. There was not spatial separation of the communities, only alliances. There were Zapatistas and mostly Pristas (members of the then hegemonic PRI party) living in essentially the same space but separate ideologies - a virtual separation.

We have, in the last 150 years or so, been delivered from the time when communication was transportation. Electronic communication has given us the idea of virtual space and indeed the Zapatista rebellion is credited as being the first rebel struggle played out in cyberspace (Cleaver 1998). If we are to see the autonomous stance of the Zapatista movement as a separatist position, I argue that their geopolitical space is virtual since it is not physically separated from the status quo but remains in place and refuses the infrastructure and services offered by all forms of official government. The Zapatistas

remain in place and make their point rather *reductio ad abusurdum*: a separatist/rebel movement redefines space and demarcates new boundaries; the Zapatistas are a separatist/rebel movement but they remain in place and don't displace others.

At the coffee shop in the Chiapan town where I make my base, many hours are spent discussing the issue of the rebellion and the strategy of Zapatista autonomy. Whenever the subject is debated, one businessman invariably will repeat his perception of the matter: "Autonomy from what!?" As a latino businessman he says this to dismiss the indigenous struggle as if his sewage were not carried away by the municipal sewerage; as if his treated water supply did not run through municipal pipes; as if his garbage was not picked up by the *municipio;* as if his clients didn't come to him on the paved roads leading up to his storefront; as if his proximity to the municipal park does not bring him clients; as if his locality in the *cabecera* does not attract client traffic for him; as if there wouldn't be an ambulance only blocks away should his family have a medical emergency; as if his children don't attend the well-financed schools up to high school level. The Zapatistas make the same statement but with cause. The hinterlands do not receive the benefits of the *municipios oficiales* but those living there must travel to the mostly latino center for many of their services or do without. Thus, by implementing their own autonomous services, the Zapatistas are receiving many benefits they would not otherwise have provided to them by the government on any scale. By staying in place and implementing their own infrastructure they exemplify the fruits of their political efforts and do not take the roles of victims in want and need of government services. They also firmly control stewardship of the land by eschewing the status quo use of

agrochemicals, slash and burn cultivation, the cutting of live trees for firewood, central dumping, and intense grazing.

By virtue of geopolitical autonomy that is virtual the Zapatistas are able to quickly change the paradigm for agricultural practice, fuel collection, or any ecological improvement they would like to make. Certainly, the changes demanded by the Zapatistas are not limited to ecological concerns but their process of autonomy is a model for changing the status quo.

And the Zapatista process of autonomy is also an opportunity of influence (see figure 43). By remaining Mexicans and Chiapans while staying in close proximity to the hegemonic "opposition" the Zapatistas can hope their practices will be observed and adapted. This is the crux of geopolitics and political ecology – a position of sovereign identity with governance that exemplifies better practices for those directly under the sovereignty and a model for those mired in status quo hegemony. It is a noospere paradigm or noocracy (Barrett 2001).

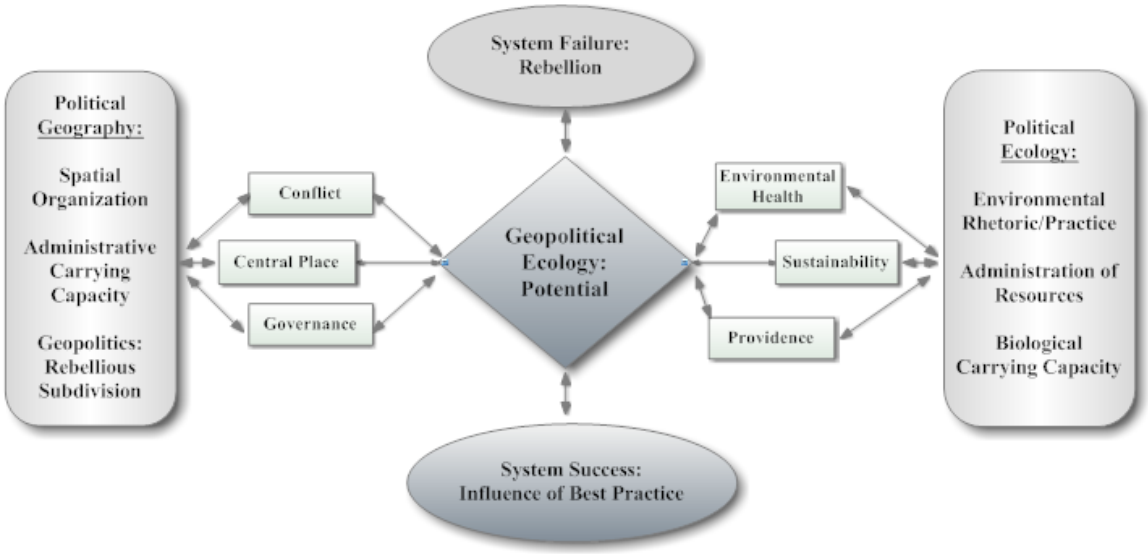

Figure 43. Visual representation of the synthetic theory of *geopolitical ecology*.

Robbins has much to say about political geography and political ecology concerning the Zapatista rebellion in northeastern Chiapas when he states:

> Indeed, the convergence of these two approaches suggests the possibility of an *everyday political ecology of the state*, and of an *ethnographic exploration of institutions in nature*, [author's italics] hinted at in current work of both political geographers and political ecologists. The analytical and practical benefits of such a convergence are too attractive for critical scholarship to ignore. (2003, 644.)

Emergent Profiles

Analyzing the responses to the Environmental Checklist allows us to have a picture of the hegemony/status quo, the Zapatistas, or both. This view gives us some assumptions to work with in consideration of groups in the region of northeast Chiapas. While such profiles may be seen as reductionist and non-representative, the human analytic instrument often works well with assumptions that can be reinforced or improved upon with more consideration. These generalities apply only to the observed groups of this study but such generalization for the entire area of northeastern Chiapas is neither indicated or excluded. Referring to the groups by various monikers (Zapatistas, hegemony, Chiapan, etc.) only discerns the inhabitants of *cabeceras oficiales* and *en rebeldias* in the entities selected for this study.

In terms of water/wastewater we see all communities treating water to make it potable. However, hegemonic communities are using chlorination for centrally distributed water (that is ultimately rarely trusted for consumption) while rebel groups may or may not centrally distribute water and certainly leave treatment to the end user. Such end treatment may include boiling, iodine, or rarely chlorine but individuals are left to care for their own water safety, which is essentially the net result of the hegemony who purchase bottled water. All hegemonic suppliers periodically test their water for

pathogens while the rebels do not and the *cabeceras oficiales* have alternative water reservoir sources while *cabeceras en rebeldes* do not, save for long portages with buckets.

Sewage goes largely untreated throughout the region whether it is centralized (*municipios oficiales)* or not (*municipios en rebeldes).* Few Zapatistas have the luxury of an indoor, sit down toilet fixture to carry away their bodily wastes but it is the norm for the latino hegemony.

Solid wastes are generally centralized in both the *cabeceras oficiales* and *en rebeldes* with some exception in rebel communities. No communities make provisions for hazardous wastes, including batteries, save one Zapatista community. Composting garbage is a concept beginning to take hold in both groups.

There is a disparity of the standard of healthcare between the two groups. *Cabaceras oficiales* have medically trained doctors and nurses at their disposal while the Zapatistas train practitioners in folk and first-aid medicine. Both groups have outreach health education programs to prevent the need for treatment. With two Zapatista exceptions most parties are treating for known, long-term effect parasites.

Agricultural practices take divergent stands on protecting public health. Zapatista policy prohibits agrochemicals while *laissez-faire* economics allow agrochemical use on most Chiapan fields often against recommended quantities and safe application. Zapatistas enforce sustainable livestock grazing compared to the highly impactful dense grazing of latino cattle ranchers in Chiapas. Slash and burn agriculture is practiced variably among both groups while the protection of live trees for lumber and firewood is

mostly excluded in Zapatista communities and strangely only in the lumber producing *cabeceras oficiales.*

Population density among the selected Zapatista *cabeceras* is variably nucleated and of low population with a maximum of approximately 300 people. *Cabeceras oficiales* are all nucleated and range from a couple thousand to tens of thousands of people, mostly the former.

In terms of air quality are several issues, the most primal being the consideration of dust needing to be controlled in Zapatista communities where most roads are unpaved as opposed to the latino centers that have paved roads. Most *cabeceras en rebeldes* do not have access to gas trucks or money to pay for gas and use firewood almost exclusively for cooking at with great indoor air contamination. Gas is widely available and used for cooking in *cabeceras oficiales.* Trash burning is done mostly in the Zapatista communities and is a problem whether done individually or collectively. Field burning, done mostly in all communities, is a local and far reaching hazard.

Emergent Problems

Batteries

A lack of street lights and the need for flash lights, increasing access to portable communication and media technology, and the replacement of auto ignition sources all produce batteries of varying amounts of toxic elements and size. In northeast Chiapas most small batteries are being put into the trash for landfill disposal or littered through the country side. People seem to have some wisdom of toxic danger about car/truck batteries as these are often left out of the waste disposal system and sit all over the place as if nobody knew what to do with them – which is probably the case. Batteries can often

be recycled and certainly, in most cases, need to be disposed of with care not to enter any ambient environmental systems.

Northeast Chiapas needs a campaign of education on the disposal of batteries. Also needed are easily accessible waste depositories that will be faithfully managed.

Burning

On a global scale the practice of swidden agriculture releases particulates, various constituents, and large amounts of carbon dioxide that has a near zero net effect if fields that are burned are allowed enough fallow time to produce secondary forest (Tinker, Ingram, and Struwe 1996). But increasing population density and varying economic status of land holders will often not allow land to be fallow for the threshold of zero net effect and add to the global carbon load and permanent land use change, i.e. deforestation (Tschakert, Coomes, and Potvin 2007).

Burning of household trash almost invariably means the burning of plastic and the release of toxic fumes. While warnings of the toxicity of plastic burning from this research may have permeated some of Zapatista settlements (and a summary of this work will be distributed to all study areas), there is a need for policies on all levels to prevent this phenomenon.

Water

Sewage treatment and standards needs to be applied throughout Chiapas. Some *municipios oficiales* stated that treatment plants were in long-range budget plans. Northeast Chiapas is walking a rail of public health disaster if sewage treatment is not implanted on all scales of communities. Cholera cases that are reported by the state each month could easily hit epidemic proportions like in 1995 at any time.

Give and Take

What was once an armed rebellion now gives way to peaceful juxtaposition. Perhaps the Zapatistas will one day want to reintegrate with the state. Until they do, their environmental practices have the potential to influence their status quo neighbors. Indeed, any critical mass level of success in reducing environmental degradation in northeast Chiapas may depend on the hegemony's participation given the fractional numbers of Zapatistas (estimated at 30,000 – 80,000 compared to about 1.5 million non-Zapatistas in the quadrant). Perhaps the smaller settlement sizes of Zapatistas convey more successful densities for environmental, political, and general well-being concerns.

Hoping for a cross-cultural exchange from what might have been considered a homogenic group before the rebellion might seem farfetched but what if there is an unknown threshold of population and/or hegemony that quells innovation and care of the environment? Many volumes and breaths have been devoted to the politics of change – what if bifurcation of social groups is a catalyst for such change? Will we one day organize such divisions without rebellion for the knowledge and action they could produce? Might the virtual noosphere be best facilitated by a juxtaposed division?

The observations of this dissertation scratch the surface of the possibilities of the integration of geopolitics and political geography as a force of influence and change for the better treatment of Earth and ultimately our escape from here and evolution into extraterrestrials either because we have depleted and destroyed our habitat or the Earth itself or the Universe has unleashed some hazard onto us that requires us to plan for escape before our technology is catastrophically wiped out. We will require knowledge of maximal group sizes, environmental practices, and models for effecting change and

eliciting new knowledge. Until we commence that escape we must apply these models to our present habitat.

Directions for Future Study

Geopolitical ecology has already become an important component of the intelligence and praxis that sovereign nations are experiencing in recovery from anthropogenic damage and increasingly scarce natural resources. The Rio de Janeiro Earth Summit of 1992 and the Kyoto Accords of 1997 have created precedents for political cooperation in healing the wounds of our common Earth. Legal disputes between the US and Canada over acid rain have given way to improved conditions (CBC 2006). A resounding logic comes from these international and cross administrative communications: when environmental degradation is reportedly produced by a neighboring entity, chances are that degradation affects both the complaining party and the offending party. The global stage of geopolitical ecology provides a reflexive venue for every side of a border to consider their environmental condition in a sort of "Golden Rule" context of care for the Earth. But to what extent and what are the most successful contexts?

More research is desired to find ways for political entities at all levels of hierarchy to share knowledge for improvement of environmental conditions. Finding group/settlement sizes that maximize the human condition and optimize the use of resources is not well understood and could hold many keys to administering environmental protection such as what level of population takes an anonymous, unaccountable approach to environmental care – what is the threshold for peer pressure when it comes to environmental degradation or economical practices?

Could implementation of ideal administrative size supplant the fossil fuel burning technologies that now and in the future can relieve the wants of those in the hinterlands? How many resources are wasted on outreach from administration to far flung boundaries and the inverse travel seeking out administrative benefits or markets? Conservation is often touted as a measure that is not exploited to its full potential for energy savings – would regrouping administrative units such as counties and *municipios* promote such conservation? And certainly the aspect of preempting resource disputes in the form or warfare is a valid justification for exploring the size of groups that can be adequately served by an administration.

What is the threshold for time spent traveling to an administrative center whether walking or using fossil fuels at varying levels of intensity from private vehicle to public transportation? What are the costs of exceeding administrative carrying capacity? More study is needed to identify tools, models, and methods that will approach the benefits that can be acquired from the perspective of geopolitical ecology and answer questions that can be formed from such a disciplinary viewpoint. The cases of divergent groups, nationalities, and states need examination to cull the environmental effects of their influence and education of each other.

Further study into critical thresholds of participation in environmental practices is needed to understand when a group can have influence. How many people had to begin to recycle before governmental entities took up the cause and not recycling ceased to be a macho badge of honor? How high will sea level rise before burning fossil fuels becomes passé? How low will human male sperm counts go (Carlson et al. 1992) and how high will cancer rates continue before environmental degradation is acted upon? The answers

to questions of critical human mass that will create human movements are valuable for answering problems before they become rebellion and finding motivation for preserving human and other biological habitat.

APPENDIX I

Institutional Review Board Exemption

Exemption Request

Northcut, Susan R

You forwarded this message on 3/27/2007 7:22 PM.

Sent: Tue 3/27/2007 5:41 PM

To: Samson, Eric L

Exemption Request

Based on the information in the exemption request you sent March 25, your project has been found exempt.

Your project is exempt from full or expedited review by the Texas State Institutional Review Board.

Becky Northcut, CIP
Compliance Specialist
Office of Sponsored Programs
Texas State University-San Marcos
sn10@txstate.edu
(ph) 512/245-2102 / (fax) 512/245-3847 or 1822
JCK 489 & 440 - 601 University Drive
San Marcos, TX 78666

APPENDIX II

Spanish Passages

1. *Los municipios tendrán el territorio comprendido dentro de los limites que hasta hoy se les han reconocido. El congreso del estado, tendrá la facultad de modificar su extensión territorial y la de suprimir los municipios existentes y crear otro en su lugar, cuando asi sea conveniente al interés público y se cumplan las formalidades que establece el artículo 63 segundo y tercer párrafo de la constitución política del estado.* (Chiapas 2008)

2. *En ningún caso podrán hacerse incorporaciones o segregaciones de un municipio a otro sin la aprobación de la mayoría de los ayuntamientos del estado, los que deberán emitir su aprobación dentro de los siguientes 60 días contados a partir de la fecha en que se les someta a su consideración el asunto, de conformidad con lo dispuesto por la ley reglamentaria. Su abstención significara aprobación. Dicho trámite deberá contar previamente con la aprobación del congreso del estado después de haber oído a los ayuntamientos interesados.* (Chiapas 2008a)

3. *Somos producto de 500 años de luchas: primero contra la esclavitud, en la guerra de Independencia contra España encabezada por los insurgentes, después por evitar ser absorbidos por el expansionismo norteamericano, luego por promulgar nuestra Constitución y expulsar al Imperio Francés de nuestro suelo, después la dictadura porfirista nos negó la aplicación justa de leyes de Reforma y el pueblo se rebeló*

formando sus propios líderes, surgieron Villa y Zapata, hombres pobres como nosotros a los que se nos ha negado la preparación más elemental para así poder utilizarnos como carne de cañón y saquear las riquezas de nuestra patria sin importarles que estemos muriendo de hambre y enfermedades curables, sin inmortales que no tengamos nada, absolutamente nada, ni un techo digno, ni tierra, ni trabajo, ni salud, ni alimentación, ni educación, sin tener derecho a elegir libre y democráticamente a nuestras autoridades, sin independencia de los extranjeros, sin paz ni justicia para nosotros y nuestros hijos. (EZLN 1993.)

4.. …*para generar desarrollo económico a partir de la valoración, restaruración y aprovechamiento sustentable de los recursos.* (Notimex 2007, under "A4".)

APPENDIX III

Point Biserial Correlation Data and Calculations

Municipio	Pop	Sq. Km.	Density	*Municipio en Rebelde:* 1=yes,0=no
001 Acacoyagua	14189	1913	7.417146	0
002 Acala	24754	355	69.72958	0
003 Acapetahua	25154	658.3	38.21054	0
004 Altamirano	21948	1120	19.59643	1
005 Amatán	18778	109.3	171.8024	0
006 Amatenango de la Frontera	26094	171	152.5965	0
007 Amatenango del Valle	6559	236	27.79237	1
008 Ángel Albino Corzo	26934	637.29	42.26333	0
009 Arriaga	37989	653.3	58.1494	0
010 Bejucal de Ocampo	6673	396	16.85101	0
011 Bella Vista	18205	114	159.693	0
012 Berriozábal	28719	396	72.52273	0

013 Bochil	22722	362.7	62.64682	1
014 Bosque, El	14993	241	62.21162	1
015 Cacahoatán	39033	173.9	224.4566	0
016 Catazajá	15709	621	25.2963	0
017 Cintalapa	64013	2404.4	26.62327	0
018 Coapilla	7217	106.8	67.57491	0
019 Comitán de Domínguez	105210	1043	100.8725	1
020 Concordia, La	39770	1112.9	35.73547	0
021 Copainalá	19298	330.4	58.40799	0
022 Chalchihuitán	12256	75	163.4133	0
023 Chamula	59005	393	150.1399	1
024 Chanal	7568	296	25.56757	1
025 Chapultenango	6965	191.5	36.37076	0
026 Chenalhó	30966	138.5	223.5812	1
027 Chiapa de Corzo	60620	907	66.83572	0
028 Chiapilla	5242	87	60.25287	0
029 Chicoasén	4345	82	52.9878	0
030 Chicomuselo	24994	959	26.06257	0
031 Chilón	77686	2490	31.1992	1
032 Escuintla	28064	206.2	136.1009	0
033 Francisco León	5236	114.3	45.80927	0
034 Frontera	52168	718	72.65738	0

Comalapa				
035 Frontera Hidalgo	10917	206.2	52.94374	0
036 Grandeza, La	5969	52.2	114.3487	0
037 Huehuetán	31464	313	100.524	0
038 Huixtán	18630	181	102.9282	1
039 Huitiupán	20041	360.2	55.63853	1
040 Huixtla	48476	395	122.7241	0
041 Independencia, La	32245	1704	18.92312	1
042 Ixhuatán	8877	72	123.2917	0
043 Ixtacomitán	9143	149	61.36242	0
044 Ixtapa	18533	313	59.21086	1
045 Ixtapangajoya	4707	201.2	23.39463	0
046 Jiquipilas	34937	1197	29.18713	0
047 Jitotol	13076	204	64.09804	1
048 Juárez	19956	161.5	123.5666	0
049 Larráinzar	18712	206.76	90.50106	1
050 Libertad, La	5288	530	9.977358	0
051 Mapastepec	39055	1086.5	35.9457	0
052 Margaritas, Las	97560	6129.32	15.91694	1
053 Mazapa de Madero	7180	116	61.89655	0
054 Mazatán	24079	382	63.03403	0

055 Metapa	4794	30	159.8	0
056 Mitontic	7602	82	92.70732	1
057 Motozintla	59875	782	76.5665	0
058 Nicolás Ruíz	3135	136.6	22.95022	1
059 Ocosingo	169712	8749.19	19.39745	1
060 Ocotepec	9271	60	154.5167	0
061 Ocozocoautla de Espinosa	65673	2176.6	30.17229	0
062 Ostuacán	17026	946.4	17.99028	0
063 Osumacinta	3132	221	14.17195	0
064 Oxchuc	37887	72	526.2083	1
065 Palenque	85464	3500	24.41829	1
066 Pantelhó	16262	137	118.7007	1
067 Pantepec	8566	47.2	181.4831	0
068 Pichucalco	29357	1079	27.2076	0
069 Pijijiapan	46949	2223.3	21.11681	0
070 Porvenir, El	11641	122	95.41803	0
071 Villa Comaltitlán	26706	606.1	44.06204	0
072 Pueblo Nuevo Solistahuacán	24405	420	58.10714	0
073 Rayón	6870	94.4	72.77542	0
074 Reforma	34809	399.9	87.04426	0
075 Rosas, Las	21100	234	90.17094	1

076 Sabanilla	21156	262	80.74809	1
077 Salto de Agua	49300	1284	38.39564	1
078 San Cristóbal de las Casas	132421	484	273.5971	1
079 San Fernando	26436	258.3	102.3461	0
080 Siltepec	32457	820	39.58171	0
081 Simojovel	35038	476.1	73.59378	1
082 Sitalá	7987	233.6	34.19092	1
083 Socoltenango	15171	772	19.65155	1
084 Solosuchiapa	7784	362.7	21.46126	0
085 Soyaló	7767	179	43.39106	0
086 Suchiapa	15890	355.2	44.73536	0
087 Suchiate	30251	230.75	131.0986	0
088 Sunuapa	1936	178.9	10.82169	0
089 Tapachula	271674	957	283.8809	0
090 Tapalapa	3639	66.4	54.80422	0
091 Tapilula	10349	70	147.8429	0
092 Tecpatán	38383	1352	28.38979	0
093 Tenejapa	33161	99	334.9596	0
094 Teopisca	26996	174	155.1494	1
096 Tila	58153	390	149.1103	1
097 Tonalá	78438	1766.2	44.4106	0
098 Totolapa	5513	183.3	30.07638	1

099 Trinitaria, La	59686	1841	32.42042	1
100 Tumbalá	26866	705.5	38.08079	1
101 Tuxtla Gutiérrez	434143	412.4	1052.723	0
102 Tuxtla Chico	33467	180	185.9278	0
103 Tuzantán	23180	268.3	86.39583	0
104 Tzimol	11925	419	28.46062	0
105 Unión Juárez	13934	72	193.5278	0
106 Venustiano Carranza	52833	1396	37.84599	1
107 Villa Corzo	68685	4026	17.06036	0
108 Villaflores	85957	1232	69.77029	0
109 Yajalón	26044	109.3	238.28	1
110 San Lucas	5673	154	36.83766	0
111 Zinacantán	29754	171	174	1
112 San Juan Cancuc	20688	162.3	127.4677	1
*113 Aldama added to Chenalho	3635	26.5	137.1698	
*114 Benemérito de las Américas added to Ocosingo	14436	979.2	14.74265	
*115 Maravilla Tenejapa added to Las Margaritas	10526	411.32	25.59078	

*116 Marqués de Comillas (aka Pico de Oro) added to Ocosingo	8580	932.61	9.199987
*117 Montecristo de Guerrero added to Angel Albino Corzo	5086	190.29	26.72763
*118 San Andrés Duraznal added to Simojel	3423	29.91	114.4433
*119 Santiago el Pinar added to San Andres Larranzar	2174	17.76	122.4099

*Post-1990 creation of new *municipio* added to the *municipio* from which it was subdivided (this table contains 2000 census data).

VassarStats Printable Report

Point Biserial Correlation Coefficient

Y Values Entered for Population Density

For X=0	For X=1
7.417145844	19.59642857
69.72957746	27.79237288
38.21054231	62.64681555

171.8023788	62.21161826
152.5964912	100.8724832
42.2633338	150.1399491
58.14939538	25.56756757
16.8510101	223.5812274
159.6929825	31.19919679
72.52272727	102.9281768
224.4565842	55.63853415
25.2962963	18.92312207
26.623274	59.21086262
67.57490637	64.09803922
35.7354659	90.50106404
58.40799031	15.91693695
163.4133333	92.70731707
36.37075718	22.95021962
66.83572216	526.2083333
60.25287356	24.41828571
52.98780488	118.7007299
26.06256517	90.17094017
136.1008729	80.7480916
45.80927384	38.39563863
72.65738162	273.5971074
52.94374394	73.59378282

114.348659	34.19092466
100.5239617	19.6515544
122.7240506	155.1494253
123.2916667	149.1102564
61.36241611	30.07637752
23.39463221	32.42042368
29.1871345	38.08079376
123.5665635	37.84598854
9.977358491	238.2799634
35.94569719	174
61.89655172	127.4676525
63.03403141	
159.8	
76.56649616	
154.5166667	
30.17228705	
17.99027895	
14.1719457	
181.4830508	
27.20759963	
21.11680835	
95.41803279	
44.06203597	

58.10714286	
72.77542373	
87.04426107	
102.3461092	
39.58170732	
21.46126275	
43.39106145	
44.73536036	
131.0985915	
10.82168809	
283.8808777	
54.80421687	
147.8428571	
28.3897929	
334.959596	
44.41059903	
1052.723084	
185.9277778	
86.39582557	
28.46062053	
193.5277778	
17.06035768	
69.77029221	

36.83766234	

Summary Data for Population Density (runs for population and area not retained)

	X=0	X=1	Total
n	73	37	110
$-\Sigma Y$	6808.876301385001	3488.5882015499987	10297.464502935
$-\Sigma Y^2$	1875043.8262419263	676489.7619117205	2551533.588153647
SS_Y	1239964.4223	347564.15	1587553.8137
$mean_Y$	93.2723	94.2862	93.6133

r_{pb}	t	df
+0	+0.04	108

P	one-tailed	0.4840835
	two-tailed	0.968167

APPENDIX IV

Environmental Checklist: Institutional Responses

Environmental Checklist

Comunidad Palenque oficial (hablado con XXXXX, Servicio Publico)_____

Coordinates of Cabacera_17d 30.511N/091d58.853W/Alt 256'_____

Water:

treatment methods **Cloro pastillas grandes**

testing **by the State**

prevalence of indoor plumbing **yes, tubo**

alternate supplies **4 electric pumps from the river**

natural water use: HS2 tests and coordinates

Coordinate	**Description**	**Test Result**
5 blocks west of presidencia	Tap at posada Las Vegas	0.0

Comunidad__Palenque official_____

Wastewater:

sewerage treatment **sedimentation/clorinization**

collection points **central**

septic tanks **no**

pit or field latrines **no**

filterability of terrain **4 meters of topsoil over heavy limestone, nonkarstic**

Solid Waste:

Centralized **yes, landfill, no burning**

Collection **yes**

Composting **Composta, si**

Toxic Waste:

Batteries **no**

Chemicals **no**

Comunidad__Palenque official_____

Public Health Office:

credential of staff **casa de salude del estado de Chis**

testing regimens **no**

medication programs **private 1-2X yearly**

education **no**

Agriculture:

Swidden **no, not allowed**

Organic **no**

Pesticides **yes**

Fertilizer **yes**

Irrigation **yes**

Livestock **yes**

Erosion **no**

Comunidad_Palenque official_____

Forest:

Firewood **very little**

lumber (plant) **no, bought from others**

monoculture **yes, viveria**

Settlement Pattern(s):

Nucleated **yes**

land tenure **private plots**

population **70,000**

Air: dust: paved roads throughout town

Cooking **gas**

burning (trash, fields) **supposedly not allowed (see photo).**

chlorine storage **barrels**

insecticides **Mosquito program (probably malathion)**

asthma **none known**

Environmental Checklist

Comunidad Vicente Guerrero, Babalonia 3reo_____

Coordinates of Cabacera_17d23m06sN 91d41m17sW_17d23.094N 91d41.286W Alt.522'

Water:

treatment methods **Boiled**

testing **no**

prevalence of indoor plumbing **yes, tubo**

alternate supplies **no**

natural water use: HS2 tests and coordinates

Coordinate	**Description**	**Test Result**
Across the street from listed	Pump water from faucet at house	0.0

Comunidad__Vicente Guerro_____

Wastewater:

sewerage treatment **None**

collection points **no**

septic tanks **only a few**

pit or field latrines **latrines, usually only surrounded by plastic. Often uncovered**

filterability of terrain **less than one meter of topsoil over heavy limestone, nonkarstic**

Solid Waste:

Centralized **Burned with neighbors – burn plastic**

Collection **no**

Composting **Composta, si**

Toxic Waste:

Batteries **Central collection, then buried in plastic bags**

Chemicals **none**

Comunidad__Vicente Guerro_____

Public Health Office:

credential of staff **Zapatista casa de salud (photo). No doctors. Training from Caracol. Private if serious – about 4km from Chancala casa de salud (mun. Palenque)**

testing regimens **Private if serious**

medication programs **no**

education **Caracol comes to community, reps sent to Caracol**

Agriculture:

Swidden **limited**

Organic **yes**

Pesticides **No, before used herbicide**

Fertilizer **No, organic**

Irrigation **no**

Livestock **limited, obvious out of Palenque when heavy grazing ends**

Erosion **very little when not burned**

Comunidad_Vicente Guerro_____

Forest:

Firewood **from milpa**

lumber (plant) **no, bought from others**

monoculture **just corn**

Settlement Pattern(s):

Nucleated **yes**

land tenure **mostly private plots**

population **300, 20 Zapatista, 20 pri families**

Air: much water sprinkling for dust (sweeping at school)

Cooking **puro wood**

burning (trash, fields) **Very limited burning of fields, castigation and future proposals required if done without permission.**

chlorine storage **no**

insecticides **no major programs, can at house**

asthma **none known**

Notes at Vicente Guerrero:

2 June 2007: Waiting for permission to enter Vicente Guerrero, Babalonia 3ero at Caracol Roberto Barrio

Roberto Barrio: Burned fields and gravel pit on way, compost piles, Flush toilets, trucks driven through river

Info: Junto said 9 municipios, others say 9-12. Subdivided into 3 regiones: Libertad, Trabajo, Oriente

Seperation of trash at RB:metal, organics, inorganics. Group trash pick up on road.

26 may still waiting to go back to VG. 3 car batteries by gate said to be waiting recycling

Sign at Caracol (photo, same at VG?): Esta usted en territorio Zapatista en rebeldía Aquí manda el pueblo y al gobierno obedece. Zona Norte – Junta de buen gobierno. Se prohíbe estrictamente el trafico de armas, siembra y consumo de drogas, ilegal de maderas. No a la destrucción de la naturaleza.

Environmental Checklist

Comunidad Chilòn

Coordinates of Cabacera_17d06.281N/092d16.291W/2907’

Water:

treatment methods **Cloro pastilles grandes**

testing **centro de salud**

prevalence of indoor plumbing **yes, tubo**

alternate supplies **rio**

natural water use: HS2 tests and coordinates

Coordinate	**Description**	**Test Result**
same	Posada	0.0

Comunidad__Chilòn_____

Wastewater:

sewerage treatment **crudo/ planeado sin $**

collection points **central**

septic tanks **no**

pit or field latrines **poco**

filterability of terrain **1-5m**

Solid Waste:

Centralized **yes**

Collection **yes**

Composting **no**

Toxic Waste:

Batteries **no**

Chemicals **no**

Comunidad__Chilòn

Public Health Office:

credential of staff **medico**

testing regimens **varios estudias**

medication programs **si**

education **si**

Agriculture:

Swidden **si**

Organic **no**

Pesticides **yes**

Fertilizer **yes**

Irrigation **yes**

Livestock **yes, not intensive**

Erosion **no**

Comunidad_Chilòn

Forest:

Firewood **yes**

lumber (plant) **no**

monoculture **vivero**

Settlement Pattern(s):

Nucleated **yes**

land tenure **private plots**

population **10000**

Air: dust: no

Cooking **gas/poco leña**

burning (trash, fields) **not trash, fields yes**

chlorine storage **Oficina de agua potable**

insecticides **2X yearly when wet**

asthma **none**

Environmental Checklist

Comunidad San Jose en Rebeldía

Coordinates of Cabacera 17d14.104N/092d05.679W/1607´

Water:

treatment methods **Boiled/none (don't know how to use cloro)**

testing **no**

prevalence of indoor plumbing **tubo/bucket**

alternate supplies **no- dry time problems, carry max 4-5 km when dry**

natural water use: HS2 tests and coordinates

Coordinate	**Description**	**Test Result**
17d14.105N/092d05.680/ 1640'	Agua de ojo 150 m. behind store (fotos)	0.0
17d15.644N/092d03.319W/445´	Agua Clara (north of cabacera, fotos)	0.0
17d15.348N/092d06.891W/ 704'	Agua Azul	0.0

Comunidad__San Jose en Rebeldìa

Wastewater:

sewerage treatment **None (Tourist center agua Azul**

collection points **no**

septic tanks **only a few**

pit or field latrines **latrines, hole with wood cover**

filterability of terrain **1-10m.**

Solid Waste:

Centralized **Burning– burn plastic (gave warning on burning plastic)**

Collection **no**

Composting **some**

Toxic Waste:

Batteries **just thrown (advised to collect)**

Chemicals **none**

Comunidad__San Jose en Rebeldia_____

Public Health Office:

credential of staff **Promortore de salud (secondaria ed, trained by caracol, 6 levels of competence him 6)**

testing regimens **no**

medication programs **2Xanual (priced by income)**

education **Yes, per promotore**

Agriculture:

Swidden **first clearing only**

Organic **yes**

Pesticides **No**

Fertilizer **No**

Irrigation **no**

Livestock **no cows little pigs**

Erosion **No, advised about construction erosion**

Comunidad_San Jose en rebeldia_____

Forest:

Firewood **dry/dead (castigation of 4X planting if cut green)**

lumber (plant) **chainsaw**

monoculture **no**

Settlement Pattern(s):

Nucleated **no, dispersed**

land tenure **comun**

population **16 communities/ 130 individuals**

Air: dust: just water

Cooking **puro wood**

burning (trash, fields) **yes.**

chlorine storage **no**

insecticides **no**

asthma **5-6 cases**

Notes at San Jose en Rebeldia:

Car change oil used in chainsaws.

Environmental Checklist

Comunidad Pantelhó

Coordinates of Cabacera_17d00.388N/092d28.163W/3895’

Water:

treatment methods **Cloro pastillas grandes**

testing **si 2X anual**

prevalence of indoor plumbing **yes, tubo**

alternate supplies **1 pump only**

natural water use: HS2 tests and coordinates

Coordinate	**Description**	**Test Result**
same	Posada ½ block from presidencia	0.0

Comunidad__Pantelhó

Wastewater:

sewerage treatment **no, crudo**

collection points **central**

septic tanks **no**

pit or field latrines **no**

filterability of terrain **1.5 – 2.5m**

Solid Waste:

Centralized **yes, dump**

Collection **yes**

Composting **no**

Toxic Waste:

Batteries **no**

Chemicals **no**

Comunidad__Pantelhó

Public Health Office:

credential of staff **2 Drs. 5 nurses**

testing regimens **si**

medication programs **si, gratis**

education **si, a grupos**

Agriculture:

Swidden **si**

Organic **some, 50/50**

Pesticides **yes**

Fertilizer **yes**

Irrigation **yes, a veces**

Livestock **yes**

Erosion **no/ poco terazas**

Comunidad Pantelhó

Forest:

Firewood **leña**

lumber (plant) **no**

monoculture **platanos/bananas/guineos**

Settlement Pattern(s):

Nucleated **yes**

land tenure **private plots**

population **3500**

Air: dust: no

Cooking **gas 20% leña**

burning (trash, fields) **si, si**

chlorine storage **si, bodega**

insecticides **por estado cada 3 meses**

asthma **poco**

Environmental Checklist

Comunidad Emiliano Zapata (cabacera de Santa Catarina)

Coordinates of Cabacera_17d04.330N/092d26.527W/2071'

Water:

treatment methods **hibierda/nada**

testing **no**

prevalence of indoor plumbing **yes, tubo**

alternate supplies **bucket from river**

natural water use: HS2 tests and coordinates

Coordinate	**Description**	**Test Result**
same	Tubo de tanque casa de Sr. Melardo	0.0

Comunidad__Emiliano Zapata

Wastewater:

sewerage treatment **no**

collection points **no**

septic tanks **no**

pit or field latrines **pit**

filterability of terrain **1-5m**

Solid Waste:

Centralized **no**

Collection **no**

Composting **no**

Toxic Waste:

Batteries **no**

Chemicals **no**

Comunidad__Emilian Zapata_____

Public Health Office:

credential of staff **Promotore**

testing regimens **no**

medication programs **no**

education **promotores**

Agriculture:

Swidden **yes, 1st time only, after no (Sr. XXXXXXX followed me to correct)**

Organic **yes [corrected from hard copy]**

Pesticides **no**

Fertilizer **no**

Irrigation **no**

Livestock **poco, no intensivo**

Erosion **no**

Comunidad_Emiliano Zapata_____

Forest:

Firewood **viviendo/dry dead**

lumber (plant) **no**

monoculture **no**

Settlement Pattern(s):

Nucleated **yes**

land tenure **private plots**

population **250**

Air: dust: water

Cooking **leña**

burning (trash, fields) **no quema basura, milpa 1st time only**

chlorine storage **no**

insecticides **no**

asthma **none known**

Environmental Checklist

Comunidad Las Margaritas (oficial)_____

Coordinates of Cabacera_16d18.947N/091d58.921W/5008' (check alt. against Comitan?)_____

Water:

treatment methods **Cloro pastillas grandes**

testing **yearly**

prevalence of indoor plumbing **95%**

alternate supplies **4 pumps pozo profundo, no alternatives**

natural water use: HS2 tests and coordinates

Coordinate	**Description**	**Test Result**
same	Check tap at hotel	0

Comunidad__Las Margaritas official_____

Wastewater:

sewerage treatment **sedimentation only, new 2-3 months, no cloro**

collection points **central**

septic tanks **no**

pit or field latrines **5%**

filterability of terrain **unknown, seems to be alluvial plain?**

Solid Waste:

Centralized **dump, burned monthly**

Collection **yes**

Composting **no**

Toxic Waste:

Batteries **no**

Chemicals **Biohazards at hospital (do their own disposal)**

Comunidad__Las Margaritas official_____

Public Health Office:

credential of staff **casa de salude del estado de Chis**

testing regimens **emidemiology**

medication programs **private 1-2X yearly**

education **by mun: familiar, in schools, sex, dengue**

Agriculture:

Swidden **yes**

Organic **no/very little**

Pesticides **yes**

Fertilizer **yes**

Irrigation **no**

Livestock **yes, intensive**

Erosion **no**

Comunidad_Las Margaritas official_____

Forest:

Firewood **leña cut, scrap from lumber plants**

lumber (plant) **4 in Las Margaritas! No reforestation**

monoculture **pina, Bananas-platinos**

Settlement Pattern(s):

Nucleated **yes**

land tenure **communal/private**

population **100000 in whole mun official/ 30-40000 in cabacera**

Air: dust: Revestimiento de camino (gravel that sort of cements) no oil or salt

Cooking **gas**

burning (trash, fields) **both**

chlorine storage **barrels**

insecticides **none**

asthma **no**

Environmental Checklist

Comunidad Caracol La Realidad cabacera (San Pedro de Michoacan, mun aut.)_____

Coordinates of Cabacera_16d20.612N/091d28.082W/ 1145'_____

Water:

treatment methods **hibierda, Microdyn 1 drop per liter**

testing **Done by rural hospital 6 months - yearly**

prevalence of indoor plumbing **currently installling**

alternate supplies **arroyo mantenar (not the same as English arroyo, always flowing)**

natural water use: HS2 tests and coordinates

Coordinate	**Description**	**Test Result**
Near JBG office	Tubo from arroyo	0.0

Comunidad__La Realidad_____

Wastewater:

sewerage treatment **no**

collection points **no**

septic tanks **yes**

pit or field latrines **yes**

filterability of terrain **greater than 10 m (in alluvial plain)**

Solid Waste:

Centralized **Yes in cabacera (plastic and all trash burned, gave advisory)**

Collection **yes**

Composting **Beginning separation program**

Toxic Waste:

Batteries **thrown in trash (gave advisory)**

Chemicals **no**

Comunidad__La Realidad_____

Public Health Office:

credential of staff **Clinica, promotores – 2 weeks initial trainging then every 2 months training**

testing regimens **only for sick: urine, throat culture, fecal , blood at teaching rural hospital**

medication programs **taught in classes, but no distribution**

education **only promotores**

Agriculture:

Swidden **implementing nonburning practices**

Organic **implementing**

Pesticides **no**

Fertilizer **no**

Irrigation **no**

Livestock **nonintensive**

Erosion **tree planting**

Comunidad_La Realidad_____

Forest:

Firewood **seco**

lumber (plant) **by motociera (chainsaw)**

monoculture **no**

Settlement Pattern(s):

Nucleated **yes**

land tenure **Comunal**

population **60 in Caracol**

Air: Water

Cooking **leña**

burning (trash, fields) **yes to both, but changing burning practices to gain organic coffee certification (their own)**

chlorine storage **no**

insecticides **only lorina**

asthma **no**

Notes: So far this is the only Zapatista community where I have been asked for money – when I checked in, the preinterviewer asked if I wanted to make a donation (which I did of 200 pesos). Also, the security guys asked me twice for 50 pesos for food. I gave it to them the second time, when I asked if they were fed by the Caracol (they are doing service) they said no. This is very different than the other two Caracols.

Also, I was denied permission to interview the general community, which is not what I wanted, anyway, since my intention was to profile the Caracol. But I was told that there was dissent in the community, but that the JBG could answer for the Caracol.

I got the idea from all this that they are struggling. Also, very far, a 4-5 hour truck ride from las Margaritas. To get to the Mun. Auto. Vergel is further still, on the order of large official cabaceras. And the Mun. Aut. I asked permission to visit has changed cabacera from Amparo Agua Tinta to Vergel (por Madero). Maybe too far flung?

Environmental Checklist

Comunidad La Independencia (oficial)

Coordinates of Cabacera_16d15.228N/092d01.439W/5140’_____

Water:

treatment methods **Cloro**

testing **si, monthly**

prevalence of indoor plumbing **si**

alternate supplies **1 bomba, 2 tanques (2-3 day supply)**

natural water use: HS2 tests and coordinates

Coordinate	**Description**	**Test Result**
Same as above	Bathroom at presidencia	0.0

Comunidad__La Independencia

Wastewater:

sewerage treatment **Crudo en Rio (planned, but not funded)**

collection points **central**

septic tanks **yes, most houses have tanks and then to central**

pit or field latrines **10%**

filterability of terrain **less than 1m**

Solid Waste:

Centralized **yes (no deliberate burning, but dump catches fire by accident 1-2 times a year)**

Collection **si**

Composting **No**

Toxic Waste:

Batteries **Dump**

Chemicals **none**

Comunidad__La Independencia

Public Health Office:

credential of staff **Casa de Salud mun. with Dr.**

testing regimens **No**

medication programs **yes, 2X yearly**

education **yes**

Agriculture:

Swidden **no**

Organic **no**

Pesticides **yes**

Fertilizer **Yes**

Irrigation **no**

Livestock **little intensive**

Erosion **no**

Comunidad_La Independencia

Forest:

Firewood **si**

lumber (plant) **si**

monoculture **no**

Settlement Pattern(s):

Nucleated **si**

land tenure **50/50 privado comunal**

population **3624 cabacera**

Air: No dust control

Cooking **gas/10% wood**

burning (trash, fields) **No, except accidents at dump**

chlorine storage **Bodega**

insecticides **no**

asthma **no se**

Environmental Checklist

Comunidad Vergel, Tierra y Libertad

Coordinates of Cabacera_16d09.950N/091d34.110W/2948'

Water:

treatment methods **Boiled**

testing **no**

prevalence of indoor plumbing **No, bucket from tank**

alternate supplies **River, 3km, pipe in plan from adjoining land with well, if it can be bought**

natural water use: HS2 tests and coordinates

Coordinate	**Description**	**Test Result**
Same as above	Rainwater tank (foto)	0.0

Comunidad__Vergel Tierra y Libertad_____

Wastewater: XXXXX XXXXXX volunteered that the local river, Rio Santo Domingo, was contaminated by Comitan and Las Margaritas.

sewerage treatment **None**

collection points **no**

septic tanks **septic tanks**

pit or field latrines **no**

filterability of terrain **1-5m**

Solid Waste:

Centralized **Burn everything (adviso)**

Collection **no**

Composting **Composta, si**

Toxic Waste:

Batteries **Thrown in hueco (adviso)**

Chemicals **none**

Comunidad__Vergel Tierra y Libertad_____

Public Health Office:

credential of staff **Promotore (trained en Realidad)**

testing regimens **No**

medication programs **Herbal, 2X yearly**

education **Caracol**

Agriculture:

Swidden **no**

Organic **yes**

Pesticides **No**

Fertilizer **Yes, for corn. (stated that since they don't burn, this is the only artificial practice used)**

Irrigation **no**

Livestock **5-8 per household, nonintensive**

Erosion **no, because no burning**

Comunidad_Vergel Tierra y Libertad

Forest:

Firewood **deadwood**

lumber (plant) **deadwood**

monoculture **platano, guineo (300 plants, or so)**

Settlement Pattern(s):

Nucleated **diverso**

land tenure **private plots (5 brothers)**

population **40**

Air: No dust control

Cooking **puro wood (emergency gas)**

burning (trash, fields) **Basura yes, milpa no**

chlorine storage **no**

insecticides **no**

asthma **none known**

Notes: I was cordially received here. This is the community in the Caracol where they asked for money, so I didn't know what to expect. They stated there are 4 municipios in the Caracol. There was a conspicuous lack of signage for a Zapatista community. The rain water tank showed no bacteria with my test, even Don XXXXXX said he expected there to be bacteria in the tank, but it came up 0.0.

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Eric Lee Samson was born on Christmas Day 1958 in Buchanan, Michigan, a small agricultural town not unlike Chilón, Chiapas, Mexico, where he spends his summers and bases his research. He comes from a family of farmers gone land developers and has announced at many environmental hearings that he is an adult child of a land developer.

Eric had a successful career in theatre, which lead him to study social science, obtaining a Bachelor of Arts in Anthropology in 1996 from the University of Texas at Austin followed by a Master of Science in Interdisciplinary Studies in 2002 from what was then Southwest Texas State University (now Texas State University-San Marcos). He founded the Mayan Esteem Project in 1998 to facilitate his studies in Chiapas and preserve cultural heritage there.

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