Within the Edge:

A revised approach to urban containment within the Chandigarh Periphery

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ABSTRACT

Within the Edge:
A revised approach to urban containment within the Chandigarh Periphery

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Le Corbusier's vision for an agricultural greenbelt surrounding Chandigarh may have been founded in overly romantic notions of rural India, but its original objective was not far from that of contemporary urban containment practice. While the goal of the greenbelt was to create a clear distinction between urban and rural uses, it has failed to contain growth and protect a functioning rural landscape. Today, the periphery of Chandigarh is characterized by unregulated construction and rapid urbanization. There is no restoring Le Corbusier's vision, nor should that be the objective of a revised urban containment approach. However, the rural landscape should be the result of active planning measures, rather than an unplanned remainder under threat of encroaching urban development.

This thesis produced policy recommendations for managing growth on the periphery of Chandigarh. The primary objective was to maximize the preservation of the rural landscape. The existing conditions were reviewed and solutions were devised from a

review of historical and contemporary urban containment practices in the United Kingdom and America. Each solution was evaluated based on how they respond to the unique challenges present throughout the periphery of Chandigarh. If successfully implemented, the preferred alternative will contain urban development, and protect agricultural activities and the rural way of life.

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1 | INTRODUCTION

What are policy recommendations for managing growth on the periphery of Chandigarh that maximize the preservation of the rural landscape?

Le Corbusier's vision for an agricultural greenbelt circumscribing Chandigarh may have been founded in overly romantic notions of rural India, but its original objective was not far from that of contemporary urban containment practice. At present, the periphery of Chandigarh is characterized by haphazard construction and extensive master planned developments; there is no restoring Le Corbusier's vision, nor should that be the objective of any future urban containment approach. However, the functioning rural landscape should be the result of active planning, not just an unplanned remainder under threat of encroaching urban development.

This thesis explores historical and contemporary urban containment practices to devise a recommended policy for managing growth on the periphery of Chandigarh. The historical planning challenges are discussed and the existing conditions of the periphery are reported on as they pertain to the goals at hand. Three potential growth scenarios are presented as a means to discuss potential solutions. The objective of the preferred alternative, or the recommended policy, is to better manage growth on the periphery of Chandigarh in manner that contains urban activities and maximizes the preservation of the rural landscape.

SIGNIFICANCE

Chandigarh is an aging Garden City whose greenbelt has failed to contain growth and protect a functioning rural landscape. Implementing policy - like designating a greenbelt - is just one step in a greater growth management strategy. The Chandigarh

region presently lacks strategies for implementing policy. By comparison, the American Pacific Northwest (PNW) has implemented, tested and revised various urban containment strategies, culminating in successful outcomes.[1] These strategies will be adapted for the periphery of Chandigarh.

HISTORICAL

Ebenezer Howard's Garden City concept is considered to be the root of twentieth-century thinking about urban containment (Nelson and Dawkins 2004, 5; Unwin 1912, 1). It employs agricultural greenbelts around cities as a form of urban containment. The concept itself was in response to urban overcrowding yet builds in few growth management controls to plan for future population growth (Howard 1902). The concept was widely studied and found its American expression in the form of Greenbelt Towns in the 1930s.

In the 1940s, the Garden City Movement arrived at point of divergence in its timeline. This thesis follows it in two directions. In one direction, urban containment policy continued to evolve in the United States into the contemporary growth management practices such as those seen today in the American Pacific Northwest PNW (Nelson and Dawkins 2004). Since the 1970s, the PNW has employed state-mandated growth management strategies to stem the consumption of agricultural lands and open space on the urban-rural fringe by sprawl. State-mandated growth management programs are, ultimately, the best and most legally sound way to promote an effective growth management program (Easley 1992, 16). In the other direction, Albert Mayer, an American architect associated with Greenbelt Town planning, created the Master Plan for

[1] This thesis uses the label "Pacific Northwest" to reference Oregon and Washington state.

Chandigarh. Plans for a true Garden City were drawn and the experiment that is the Chandigarh Periphery began. Chandigarh is chosen here as an international case because it provides the opportunity to explore the relevance of the American practice of urban containment in the context of a modern Garden City.

CONTEMPORARY

I am not interested in the city proper, but in the conditions of the urban-rural fringe. Le Corbusier's vision for the City of Chandigarh included a functioning rural buffer that sought to preserve agricultural activities and open space, but ever since the city's inception, various challenges to maintaining this vision have emerged. This thesis addresses this rapidly changing rural landscape within this urban-rural fringe. The Periphery is being consumed by unregulated construction as people are flooding from rural India for economic opportunity and the rural way of life is threatened (Kalia 1987, 120; Prakash 1988, 6). Only recently, regional planning efforts have started to plan for population growth within the Periphery, but this is counter to the Garden City concept and vision for Chandigarh.

The functioning rural landscape should be the result of active planning and preservation, not just an unplanned remainder under threat of encroaching urban development. The State of Punjab, of which Chandigarh serves as the capital, is responsible for roughly two-thirds of the countries food grains procured annually (Government of Punjab 2014). This speaks to the nature of the state's rural and urban communities, residents who stand to benefit from increased regulation and protection of the rural lifestyle. Successful implementation of rural landscape preservation goals and strategies

would protect the rural way of life, and support the people throughout the state that are dependent on the functions of these rural areas.

RESEARCH

BACKGROUND

The topic came about while participating in the 2014 Chandigarh Urban Lab (CUL) in Chandigarh, India through the University of Washington (UW). Topics of study included deruralization, Indian modernism, and Chandigarh architecture and planning history. The 2014 CUL studio focused on the northern periphery of Chandigarh and established a vision and development strategy for the area that responds to the significant development pressures that result from its close proximity to the Chandigarh Capitol Complex.

Over the course of the 2014 CUL I began to recognize common problems within the urban fringe, as it is perceived in Chandigarh and the PNW. The direct comparison of the two locations is unreasonable, as the two cases are incompatible in regards to their cultural, political and economic context. Nor do I intend to layout Garden City greenbelts and PNW growth management strategies to be evaluated side by side. I feel one has evolved from the other, so establishing that lineage will lead to a better understanding of the current conditions of the Chandigarh Periphery.

METHODOLOGY

This thesis utilizes an exploratory case study approach to examine planning on the periphery of Chandigarh through the lens of historical and contemporary urban containment theory and practice. Chandigarh is selected as the case because it is an example of the Garden City concept realized in the form of a modern city. My presence in

Chandigarh provided a unique opportunity to study the effectiveness of the Garden City concept as a tool for urban containment.

The goal of this literature review is to better understand Chandigarh as a Garden City and the function of urban containment as a growth management strategy, and identify successful policy measures and strategies that could be adapted and applied to the Chandigarh Periphery. From this survey, I intend to produce policy recommendations for managing growth on the periphery of Chandigarh. The goal of fieldwork was twofold. One, to gain a better understanding of land use conditions across the Periphery and the extent of change, and two, to better inform future recommendations for urban containment policy and growth management practices.

Literature Review

The literature review focused on three broad topics: historic perspectives on urban containment in the UK and US; the frame of contemporary urban containment practice in the US; and the case of Chandigarh. The historical perspectives category traces the history and theory of urban containment from the United Kingdom to the United States, introducing the greenbelt as both a tool for growth management and a key feature of the Garden City concept. Literature consists of materials sourced from the Chandigarh College of Architecture library, College of Built Environments library, and online databases. Literature on Oregon and Washington state growth management programs is sourced from government-produced planning guides and professional journals. Literature on Chandigarh and the Periphery consists of materials sourced from the Chandigarh College of Architecture library, College of Built Environments library, and online databases; and original letters and documents on display at the Chandigarh Architecture Museum. While

there exists a considerable amount of historical and critical literature on the urban core of Chandigarh (Jacobs 2007; Kalia 1987; V. Prakash 2002), there exists comparatively minimal literature on the periphery of Chandigarh (Chalana 2014).

Fieldwork

Fieldwork was conducted by mapping a route (see Figure 5) and driving throughout the Periphery over the course of ten-hours, the route was determined by reviewing historic and contemporary maps from 2002 to 2012 and focusing on sites of significant development and land use change.[2] Fieldwork relied on photo-documentation, note taking, and informal interviews. I focused on photo-documenting the pre-identified sites of significant change, but also on establishing a collection of images that accurately represented the variety of land uses and activities that exist throughout the Periphery. I took notes directly onto printed maps of various scales, documenting existing conditions, activities and their locations. Informal interviews consisted of conversations with people encountered throughout the Periphery regarding properties currently under development and the former land uses. Key information was noted post conversation, and the location was mapped.

CHAPTER ORGANIZATION

Following Chapter 1 this thesis proceeds as follows. Chapter 2 introduces the Garden City Movement as the root of twentieth-century thinking about urban containment. Its evolution is tracked through its American expressions and until it arrives at urban

[2] This thesis defines the Periphery as the area within the 16-kilometer radius established by the 1962 amendment of the Periphery Control Act.

containment as it is practiced today as a means to combat urban sprawl. The practice of growth management in Oregon and Washington is further elaborated on.

Chapter 3 introduces Chandigarh as a Garden City. Chandigarh provided the opportunity to observe how a contained city has grown beyond its intended capacity, how governing bodies have responded to the need for increased regulation on the Periphery, and how the vision of the functioning rural landscape has been maintained.

Chapter 4 presents the extent of observable change. The Periphery is developing in a manner directly counter to the PCA, a piece of legislation originally intended to preserve it as a permanent, functioning agricultural greenbelt.

Chapter 5 presents three potential growth scenarios, criteria by which to evaluate the alternatives, and ultimately, the preferred alternative. The chapter concludes with a policy recommendation for managing growth on the periphery of Chandigarh.

2 | LITERATURE REVIEW

INTRODUCTION

Through a literature review the case of Chandigarh and the Pacific Northwest (PNW) are situated within the broader context of existing literature on the history, theory and contemporary practice of urban containment. The Garden City Movement is introduced as the root of twentieth-century thinking about urban containment. Its evolution is tracked through its American expressions and until it arrives at urban containment as it is today practiced as a means to combat urban sprawl. The problems of sprawl, and its impact on the urban-rural fringe, are presented along with a discussion of policies in place to contain it. The chapter concludes by taking a closer look at urban containment policy in practice in the PNW.

HISTORICAL ORIGINS OF URBAN CONTAINMENT

The practice of urban containment can be traced to sixteenth-century Great Britain. In 1580, Queen Elizabeth I forbade any construction within three-miles of London city gates with the objective of creating a buffer against the plague while also preserving a supply of farmland (Easley 1992, 1; Nelson and Dawkins 2004, 5). This was over 300-years before Ebenezer Howard conceived of the Garden City.

THE GARDEN CITY MOVEMENT

Twentieth-century thinking about urban containment is rooted in Howard's Garden City concept (Nelson and Dawkins 2004, 5). The concept was conceived in 1898 as a response to urban overcrowding, cities were growing without giving a thought to health, aesthetics, or impacts on the natural environment (Howard 1902). Howard's solution proposed decentralization into compact new towns where proper planning and limitations

on growth would ensure its residents were always within "reasonable touch of open country". In his model Garden City, Howard sought to combine the best of both town and country.

The agricultural greenbelt was an essential element of the Garden City concept. Although Howard's discussion of the greenbelt as a tool for urban containment is limited, that was precisely its purpose. The greenbelt strategy prevented the Garden City from becoming just another suburb by limiting its growth, preventing sprawl, and keeping residents in close proximity to the countryside (Kalia 1987, 51). The Garden City concept thus became a movement that stood for the more harmonious balance of town and country, a principle at the foundation of contemporary urban containment practice (Nelson and Dawkins 2004, 5; Unwin 1912, 1).

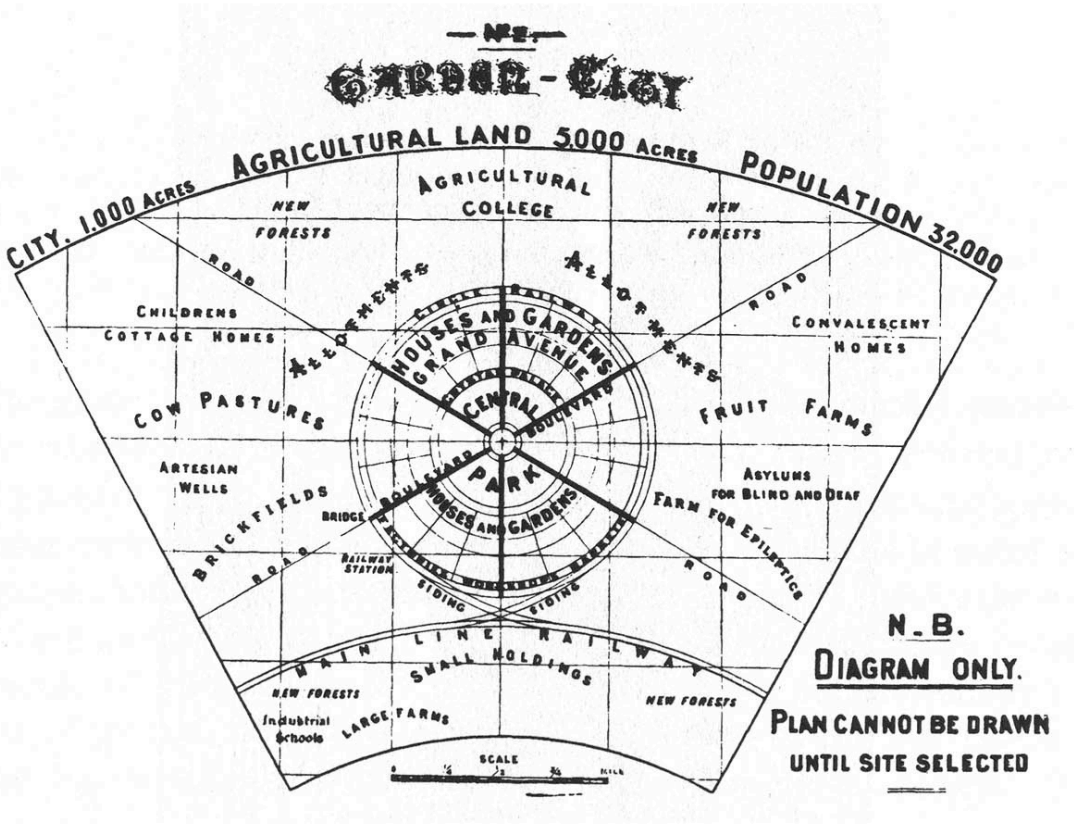

Figure 1: Garden City and Rural Belt (Howard 1902).

Raymond Unwin had recognized the significance of the Garden City concept and advocated the need for singular, freestanding cities as early as 1901 (Town and Country Planning Association 2012, 5). Unwin was responsible for the master plan of Letchworth. Founded in 1905, it was the first Garden City based on the principles set forth by Howard in *Garden Cities of To-morrow.* The plan of Letchworth sought to preserve natural features, present a clear sense of "economic functionality", and include large areas of green open space with a dedicated agricultural greenbelt for local food sourcing that would contribute to the town's self-sufficiency in agricultural production.

Howard's ideas may have resulted in the development of two new British towns, Letchworth and Welwyn, but they had little impact on the emerging issue of urban sprawl. Britain's first modern attempt to manage sprawl was in the form of the 1938 Green Belt Act, which proposed strong nationwide greenbelt policies (Nelson and Dawkins 2004, 5; Pendall, Martin and Fulton 2002, 18). The 1944 Greater Plan of London proposed a ten-mile radius greenbelt, and the 1947 Town and Country Planning Act made greenbelt plans possible throughout the country. Greenbelts were drawn tightly around existing communities to contain them within their present boundaries, and greenbelts thus became the accepted practice of British regional planning.

SATELLITE SOCIAL CITIES

Raymond Unwin suggested that the principles of the Garden City concept should also be applied to existing urban centers to limit their growth. Offering that if it is found desirable to limit the area and population of new towns with planned agricultural belts, as seen in Letchworth, it must be "desirable to make some effort to secure definite belts of open space around existing towns…" (Unwin 1912, 2). This does not restrict future

development, but rather is in accordance with Howard's principles for regional, social cities.

Beyond the buffer of the agricultural greenbelt, Howard envisioned satellite "social cities" developing around a central city (Figure 2). Garden cities will grow, but will leapfrog their greenbelts (Howard 1902, 110). New cities will form at the center of their own "zone of agriculture", eventually forming a regional network of garden cities around a central city. This concept of regional planning was later more fully developed by Peter Calthorpe who envisioned garden cities as "pedestrian pockets" linked to central cities (Calthorpe, The next American metropolis: Ecology, community, and the American dream 1993).

AMERICAN EXPRESSIONS

Seeing the 1920s as a time for change and believing America was entering "a new era for nationwide decentralization", Clarence Stein sought to carry out the principles set forth by Howard (Stein 1951, 5). Stein intended to create the first American Garden City and, through several new town planning experiments, he developed the theoretical basis that was to be applied to American

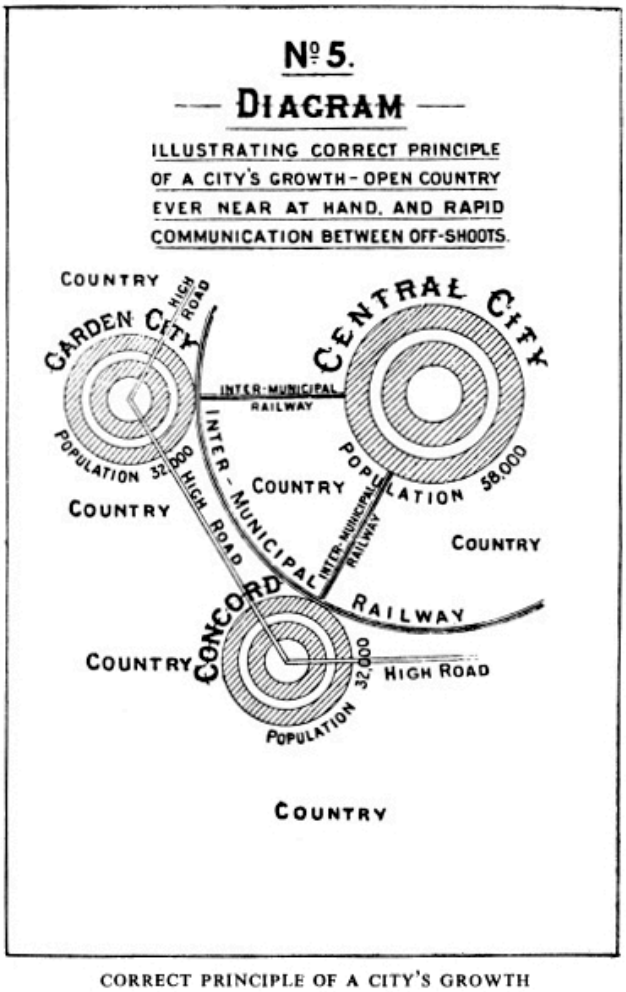

Figure 2: Correct Principles of a City's Growth (Howard 1902).

Greenbelt Towns and even Chandigarh (Stein 1951, 21).

While the objective of each new town experiment was to build the next Garden City, they ultimately failed. The greenbelt was an essential element of Howard's Garden City that was practically eliminated in plans for American garden cities. The greenbelt was reduced to a mere aesthetic and protective feature; a lush buffer that sought to protect the community from the evils of urban living (Unwin 1912, 1). These communities typically became suburbs, incorporated into metropolitan areas and dependent on the nearest urban center.

Enthusiasm about adhering to the principles of the Garden City concept appeared to be sincere. Rexford Tugwell, administrator of the federal Resettlement Association established in 1935, strongly believed that American Greenbelt Towns should demonstrate Garden City principles (Stein 1951, 102). Objectives promoting Garden City ideals were even included in the Resettlement Association's Statement of Function: communities should be "protected by encircling green belts" and there should exist "a system of rural economy…to integrate both the physical plans and the economies of the rural area and the suburban communities" (103). There was an obvious effort made to construct a true American Garden City, but Greenbelt Towns ultimately failed to account for the two essential features of the Garden City concept: the greenbelt and industry.

The greenbelt is incorporated into plans for Greenbelt Towns, but it is never fully realized as it was intended as a functioning agricultural periphery. Howard thought cooperative ownership of greenbelt land would prevent development within the periphery of the Garden City, but Stein frequently questioned the permanence of these greenbelts and the ability they had to remain undeveloped in perpetuity (Stein 1951, 116).

REGIONAL PLANNING AGENDA

The need for regional coordination is one of the largest hurdles to effective growth management programs (Easley 1992, 2). Along with several of his contemporaries – including Frank Lloyd Wright who had his own vision for suburban America, Broadacre City – Lewis Mumford founded the Regional Planning Association of America (RPAA) in 1921 (Daniels 1999, 28). Mumford was one of the first to promote the Garden City concept and urban containment practices as part of a regional planning agenda. Counter to Wright, whose solution appeared in the form of sprawling development, Mumford believed that growth should be contained to prevent expanding populations from overwhelming the countryside. Mumford saw regional planning as a tool used to strike a balance between urban growth and the natural landscape.

Eighty-years later, Peter Calthorpe and William Fulton developed the idea of the emerging "Regional City", a new metropolitan community made up of the aggregation of the central city and suburbs (Calthorpe and Fulton 2001, 6).[3] The "Regional City" stresses the importance of interregional coordination in the successful establishment of a new regional city form. They cite the greenbelt strategy as an example. However, as will be discussed later in the example of Boulder, CO, a city can try to construct a greenbelt to contain sprawl, but without a regional framework that would actually prohibit or regulate growth beyond the boundary, sprawl may actually be fueled or result in unaffordable urban land prices (203-204).

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[3] William Fulton is the founding president of the Solimar Research Group, a firm specializing in urban containment policy.

CONTEMPORARY PERSPECTIVES ON URBAN CONTAINMENT

Through its American expressions, the Garden City Movement evolved into the contemporary practice of urban containment. What had originated as a response to urban overcrowding, was now considered a solution to urban sprawl.

URBAN SPRAWL

The discussion of urban sprawl almost always begins with a disclaimer stating that the term is difficult to define or you only know it when you see it (Heimlich and Anderson 2001; Soule 2006). Throughout developed Western culture, it is generally described as low-density development at the urban edge (Easley 1992; Freilich and Kirts Davis 1981; Nelson and Dawkins 2004). It is typically characterized by single-family dwelling subdivisions and auto-oriented commercial activities built upon previously undeveloped greenfield sites. Urban sprawl is usually perceived as a problem that marginalizes the pedestrian and lessens the sense of community, and is even referred to as a "plague" by some planning advocates (Anthony 2004; Tam-Scott 2008).

In the United States, this trend of inefficient land consumption stemmed from the post World War II economic climate (Freilich and Kirts Davis 1981, 27-29). Inexpensive housing developments built up on previously undeveloped, cheap land fed the rise in home ownership. The federal government even encouraged greenfield development and suburban growth through housing, tax, and highway policies, and early zoning regulations made it difficult to construct anything but single-family developments (Tam-Scott 2008, 47).

This unsustainable, wasteful pattern of rapid growth has resulted in a devastating loss of agricultural land and natural resources on the urban-rural fringe (Freilich and Kirts

Davis 1981, 28). The fringe is defined as loosely settled land on the periphery of existing urban areas (Heimlich and Anderson 2001, 2). It is a precursor to the typical low-density suburb. Advancing sprawl infills the urban-rural fringe, creating a suburban setting. The type of resident who once found the fringe a desirable place to live is pushed further out onto previously undeveloped open space. This advancing pattern of development contributes to the conversion of rural land uses.

ANTI–SPRAWL STRATEGIES

The United States is quite concerned with how to grow, and how to grow responsibly (Tam-Scott 2008, 43). Anti-sprawl discussions typically involve an element of social responsibility and sustainability. Responses to sprawl have taken the form of New Urbanism, Transit-Oriented Development, and Traditional Neighborhood Development to name a few (Calthorpe 1993; Duany, Plater-Zyberk and Speck 2000). These concepts reduce sprawl through a variety of techniques centered on smart growth principles: dependence on the personal vehicle is decreased by increasing multi-modal transportation options; land is used more efficiently by developing at higher densities; and live-work environments are promoted to better integrate the two activities and reduce distances traveled.

The role of urban containment policies within these alternative urban development patterns is unclear (Tam-Scott 2008, 46). As urban theorists have promoted alternatives to sprawl, local governments have been employing various, often interdependent policies to control and contain development on the urban-rural fringe. Smart growth, growth management, and urban containment are three policy strategies that seek to combat sprawl and propose responsible models for development.

While the general goal of urban containment is to create a clear separation between urban and rural land uses, implementing policy is just one step in a greater growth management strategy (Dearborn and Gygi 1993, 1023). Since an established greenbelt or urban growth boundary does not steer the type of development within it, each must be supplemented with additional strategies that address growth patterns. It is easy to see how smart growth, growth management, and urban containment are interdependent.

Smart Growth

"Smart Growth" is one of the most popular of these policy strategies. Although its precise meaning is contested, planners agree that "smart growth" policies share several common principles: natural resource preservation, support for existing communities, and efficient infrastructure and land use planning (Nelson 2002, 86). In practice, smart growth principles should "promote compact, mixed-use, transit-oriented, and environmentally sound development and land use patterns" (Szold 2002, 3). Growth management and urban containment practices both aim to achieve smart growth principles;

> Growth management choreographs techniques to achieve a land-use pattern consistent with smart growth principles. Urban containment is a framework for guiding the preparation and implementation of growth management with the specific objective of creating a reasonably clear separation between urban and rural land uses. Not all growth management plans include urban containment, but many do. (Nelson and Dawkins 2004, 2)

Nor do all urban containment strategies effectively manage growth.

Growth Management

Growth management emerged as planning concept in the 1970s (DeGrove and Miness 1992, 2). Relative to smart growth and urban containment, growth management more specifically seeks to achieve a responsible balance between the protection of agricultural lands and open space, and the urban development required to support growth.

Growth management does not encourage a no-growth attitude, but promotes smart, responsible growth. State mandated growth management programs offer an advantage since they can require all communities to adopt growth management practices, which ensures all communities share the costs and benefits (Anthony 2004, 378). Two state growth management programs, Oregon and Washington, will be further discussed under the section Urban Containment Policy in Practice.

Urban Containment

In the United States, urban containment policies are categorized into three widely accepted strategies: the greenbelt, the urban growth boundary (UGB), and the urban service area (USA) (Pendall, Martin and Fulton 2002; Woo and Guldmann 2011). These are compared in various studies and classified as either weak or strong (Pendall, Martin and Fulton 2002, 18), or loose or tight (Woo and Guldmann 2011, 3512). By these terms, UGBs are strong and tight, particularly when mandated at the state level. No new development is allowed beyond the boundary. USAs, on the other hand, are weak and loose, with no policies or restrictions to prevent development outside the boundary. Although tight, the greenbelt strategy imagines that the contained urban area will inevitably become a central city with satellite cities developing beyond the greenbelt, a concept originating from Howard (Pendall, Martin and Fulton 2002, 18). Today, this pattern of urban growth is evident throughout the United Kingdom (Nelson and Dawkins 2004, 5).

Of the three urban containment policy strategies, the greenbelt is not widely implemented across the United States.[4] Even Greenbelt Towns are not widely acknowledged as examples of greenbelt policy. Boulder, Colorado, is considered the "longest experiment in 'greenbelt' planning" with a belt in place since the 1970s preventing the expansion of the city into the Rocky Mountain foothills (Pendall, Martin and Fulton 2002, 18-19).

Boulder is acknowledged as a prominent American example of greenbelt policy, if not the only American example of greenbelt policy. The city succeeded in preventing development within the greenbelt, but growth only shifted out into the rural countryside (Nelson 2002, 96). With an urban core built out by the 1990s, satellite communities began popping up beyond the greenbelt (Pendall, Martin and Fulton 2002, 19-20). Whereas Howard imagined satellite communities that were self-contained within their own greenbelts, the communities popping up around Boulder were not. The lack of employment opportunities resulted in the creation of bedroom suburbs with people commuting across the greenbelt for work. So Boulder succeeded in independently pursuing a growth strategy, but the absence of a regional containment plan simply resulted in the creation of a buffer around the city beyond which urban sprawl was permitted to occur.

URBAN CONTAINMENT POLICY IN PRACTICE

Since it was out of the Garden City concept that contemporary urban containment has evolved, the literature review has primarily focused on examples of greenbelt policy up to this point. Letchworth, UK and Boulder, Colorado were presented as two examples of

[4] In a study of the impacts of US urban containment policies, greenbelts were acknowledged as a policy category established by Pendall *et al.* (2002), but were excluded due to too few American cases (Woo and Guldmann 2011, 3531).

greenbelt policy. This section focuses on the urban growth boundary and presents the practice of state growth management in Oregon and Washington (PNW), where the greenbelt was done away with altogether to allow for a more comprehensive approach to containing urban growth and preserving resource lands. Each of these examples sheds light on the case of Chandigarh, as it will be discussed in Chapters 3 and 4, and informs later policy recommendations for the periphery of Chandigarh presented in Chapter 5.

PNW STATE GROWTH MANAGEMENT PROGRAMS

What the literature reveals is that there is no singular urban containment framework that is effective across the board. Success of a program is the result of the planners, politicians and lawmakers that have carefully tailored urban containment policy to meet local needs. However, state-enabling legislation is the most legally sound way to promote an effective growth management program (Easley 1992, 16). One advantage to state growth management programs is that they can require all communities within state lines to adopt growth management practices (Anthony 2004, 378). This ensures that all communities will share the costs and benefits associated with growth management.

Oregon is not the first state to enact a growth management program, but it is perhaps the best-known example with Washington taking its inspiration therefrom. Oregon focuses on balancing natural resource conservation and urban development, while Washington seeks to better manage and redistribute growth pressures (DeGrove and Miness 1992, 117). Both states utilize a variety of techniques to implement their goals, the focus here are on those related to urban containment, rural development, and agricultural preservation for I see these as the three primary issues plaguing the periphery of Chandigarh.

Oregon

The 1973 Land Conservation and Development Act (LCDA) created a mandatory policy framework for land use planning across the state of Oregon. The LCDA is nationally recognized as a pioneer of the development of practices that seek to balance resource conservation and development, and is considered successful in preventing sprawl outside the UGA (Howe 1993, 61). The state accomplished this task by establishing planning goals and guidelines that directed the designation of urban and resource lands at the local level (Nelson and Dawkins 2004, 10).

The Oregon growth management program consists of a "top-down structure of state-local involvement" (Nelson and Dawkins 2004, 10-11). The ability of the program to successfully diffuse state policy at the local level is considered one of their most significant accomplishments (Howe 1993, 66). All cities and counties were required to adopt comprehensive plans conforming to the state's 19 goals; and all incorporated cities were required to establish a UGB encompassing enough urban and urbanizable land to accommodate 20-year population growth projections (Easley 1992, 4; Howe 1993, 63).

The Land Conservation and Development Commission serves as a policy making body that sets the standards for the program and oversees the Department of Land Conservation and Development, the state agency that administers the growth management program (Howe 1993, 62). Initially, it took longer than anticipated for all local governments to comply with LCDA goals (Nelson and Dawkins 2004, 11). The state was even required to impose sanctions in the form of building permit moratoria on local governments that failed to designate UGBs that contained urban growth.

Washington

The 1990 Growth Management Act (GMA) was enacted in response to the uncontrolled, sprawling patterns of development that threatened both natural resources and quality of life standards (MRSC 2012). The GMA requires rapidly growing counties and the cities within them to plan in keeping with the state's 14 goals; the remaining counties are only required to plan for critical areas and natural resource lands. Similar to the LCDA, fast growing local governments are required to set UGBs based on 20-year population growth projections.

Washington State gives more latitude to local governments to prepare growth management plans. Fast growing cities and counties are required to prepare comprehensive plans in accordance with GMA goals. In order to resolve local disputes, the GMA established a Growth Management Hearings Board for each of the three major regions throughout Washington: eastern, western, and central Puget Sound (DeGrove and Miness 1992, 131). These hearings boards were created as a provision for enforcement. They hear challenges to all state agency, county or city plans alleged not to be in compliance.

GOALS

In the PNW, growth management is as much directed by the goal of urban containment, as it is by preserving rural lands, natural resources and open space. Although Oregon placed a greater emphasis on the preservation of the natural environment and Washington on the reduction of sprawl, their priorities are not mutually exclusive. Both growth management programs also have goals that address public facilities, transportation, housing, recreation, economic development, and citizen involvement. These statewide goals drive the local planning process. All local governments are required to comply or face

consequences, the objective being the creation of plans that reinforce each other at various scales.

Since the general objective of urban containment is to create a clear separation of urban and rural uses, this thesis focuses on goals related to urbanization and the treatment of exurban land. Table 1 compares LCDA and GMA goals pertaining to those two themes. Establishing a policy language that drives how land is treated beyond the UGB as well as within is essential. The treatment of rural land can greatly impact the success of the urban containment policy and the efficacy of a growth management program (Nelson and Dawkins 2004, 11).

OREGON LCDA GOALS	WASHINGTON GMA GOALS
GOAL 14: Urbanization. To provide for an orderly and efficient transition from rural to urban land use, to accommodate urban population and urban employment inside urban growth boundaries, to ensure efficient use of land, and to provide for livable communities.	**GOAL 1: Urban growth.** Encourage development in urban areas where adequate public facilities and services exist or can be provided in an efficient manner.
	GOAL 2: Reduce sprawl. Reduce the inappropriate conversion of undeveloped land into sprawling, low-density development.
GOAL 3: Agricultural lands. To preserve and maintain agricultural lands.	**GOAL 8: Natural resource industries.** Maintain and enhance natural resource-based industries, including productive timber, agricultural, and fisheries industries. Encourage the conservation of productive forest lands and productive agricultural lands, and discourage incompatible uses.
GOAL 4: Forestlands. To conserve forest lands by maintaining the forest land base and to protect the state's forest economy by making possible economically efficient forest practices that assure the continuous growing and harvesting of forest tree species as the leading use on forest land consistent with sound management of soil, air, water, and fish and wildlife resources and to provide for recreational opportunities and agriculture.	
GOAL 6: Air, water and land resources quality. To maintain and improve the quality of the air, water and land resources of the state.	**GOAL 10: Environment.** Protect the environment and enhance the state's high quality of life, including air and water quality, and the availability of water.

Table 1: Oregon and Washington goals related to urbanization and resource land preservation.

STRATEGIES FOR IMPLEMENTATION

Setting goals is just one step in a greater growth management strategy. To proceed to implementation, goals must be supplemented with additional strategies. Oregon and Washington utilize a variety of tools and techniques to meet their goals of urbanization, agricultural preservation, natural resource conservation, and rural development.

Oregon and Washington both require UGBs to be established based on the lands capacity to accommodate twenty-year population growth projections (Nelson and Dawkins 2004, 123). Land within the UGB is where urban services will be provided, urban form will be compact, and future developments will be sited (Easley 1992, 4). Land beyond the UGB is preserved as rural, agricultural or natural resource land. Under the GMA, the city plans within a UGB, while the county plans outside a UGB. This requires cooperation between local city and county jurisdictions.

Presented here are several strategies that contribute to the implementation of the previously highlighted goals. These strategies contribute to the protection of active agricultural lands in various ways. Several of these strategies will be discussed in greater detail in the following section as they could be employed throughout the periphery of Chandigarh.

- Urban Growth Boundaries (UGB)
- Performance-Based Agricultural Zoning
- Minimum Lot Sizes Outside UGBs
- Density Requirements
- Cluster or Planned Unit Developments
- Purchase Of Development Rights
- Transfer Of Development Rights

These strategies work best in a package. The establishment of a UGB alone does guarantee that land will be developed efficiently within it. The pattern of urban sprawl

could still emerge – just limited in its extent – unless coupled with development regulations directing lot size and density requirements. Neither does the establishment of a UGB direct growth beyond its boundaries. Beyond the UGB Oregon designates land as exclusively farm or forest, with a few exceptions for existing rural activities. When the state found that minimum lot size development regulations did not actually prohibit non-agricultural activities, their solution was to shift to performance-based zoning, a strategy that regulates the activity permitted rather than the shape of the land(Nelson 2007, 473). Not every strategy provides the right answer for every community.

CONCLUSION

This chapter established a thread of urban containment to create context for the later evaluation of the conditions of the periphery of Chandigarh through the lens contemporary urban containment practice. Chandigarh is one realization of the Garden City typology. The city was designed and a greenbelt imposed, yet there were limited regulatory tools to promote its effectiveness as an urban containment policy. State growth management programs of the PNW represent the evolution of urban containment practice. Out of this practice, land use planning strategies have been developed to support its successful implementation. Both the case and the lens evolved parallel to one another from a point of divergence on the urban containment timeline, all of which began with the Garden City concept.

It may still be unclear what the overall effects on land use and development are within contained urban areas (Brueckner 2000; Carlson and Dierwechter 2007). Given this uncertainly, urban containment policy is not presented as a “complete or perfect solution to sprawl”, but rather representative of one piece of the toolbox needed to achieve the

larger goals for growth management (Tam-Scott 2008). With planning horizons reaching twenty-years or longer, it may just be too soon to tell what the lasting impacts are, but in comparison to the greenbelt of Chandigarh, there are relative successes.

3 | CASE: CHANDIGARH PERIPHERY

INTRODUCTION

While the concept of urban containment continued to evolve in western countries into contemporary practice, Chandigarh represents one off shoot of this timeline. This chapter presents an overview of the historic origins of Chandigarh, and introduces Albert Mayer, who was previously associated with American Greenbelt Town planning, and his master plan for Chandigarh. Chandigarh is established as an international example of the Garden City typology, and critical events are presented that have impacted the development of the Periphery as it is seen today. The on-the-ground reality is that the periphery of Chandigarh is evolving in a manner directly counter to the intent of the greenbelt, which was originally planned to preserve it as a permanent, functioning agricultural landscape. Chapter 5 will present recommendations for policy and land use planning techniques that could renew this vision.

While subsequent planning efforts have attempted to expand the Periphery to 35- and 50-kilometers, this thesis defines the Periphery by the 16-kilometer radius as established by the 1952 Punjab New Capital (Periphery) Control Act (PCA). The 16-kilometer radius defines the scope of the case since it is the area originally reserved for an encircling greenbelt. As established in Chapter 2, the literature review, the greenbelt is both an essential feature of the Garden City concept and an urban containment tool. Since the case of Chandigarh is selected for its significance as an aging Garden City, it is important to define the scope in the terms of the Garden City concept.

ORIGINS OF A NEW CAPITAL OF PUNJAB

Modern Chandigarh was conceived out of necessity - a new capital of Punjab was required to serve as an administrative, cultural, commercial and industrial center, as well as accommodate displaced refugees from the newly formed Pakistan. India gained its independence on August 15, 1947 (Gupta 2010, 1). The former unified State of Punjab was divided in the partition of Pakistan and India, forming East Punjab and West Punjab. Lahore, the capital of pre-partition Punjab, was now located in the newly formed country of Pakistan. East Punjab required a new capital. Jawaharlal Nehru, first Prime Minister of India, is considered to be the primary impetus behind the new Capital Project. He envisioned Chandigarh as a " new town, symbolic of the freedom of India, unfettered by traditions of the past … an expression of the nation's faith in the future" (Evenson 1966, 6).

SITING

A Siting Committee led by P.L. Varma, Chief Engineer of the New Capital Project, was formed to locate a site for the new city, and by the spring of 1948 an undeveloped, rural site was chosen (Evenson 1966, 7). The site was selected by aerial reconnaissance; the Shivalik Hills to the northwest provided a striking backdrop, the gentle southern slope provided efficient drainage, and fertile soil held promise (Gupta 2010, 21). The present site of Chandigarh is often referred to as a blank slate, but there were twenty-four existing villages in which 9,000 villagers resided dotting the site of the future urban core (Evenson 1966, 7). The villages within the first phase of development were razed, but those located in the second phase were incorporated into the plan.

Originally, Chandigarh was to be constructed in two phases (Map 1). The first phase planned for 150,000 people in a low-rise development strategy, Phase I represents the

historic core of the city today (Chandigarh Administration n.d., 2). The second phase planned to increase the total population to 500,000 people. A third phase was later proposed to extend the existing grid of Chandigarh to meet with the new township to the south. Phase II, and the subsequent Phase III, were to be developed at increasing densities. The first two phases represented the historic urban core, beyond which an encircling agricultural greenbelt was intended to maintain a functioning rural periphery.

CHANDIGARH AS GARDEN CITY

A.L. Fletcher, an Indian Civil Servant, first proposed the garden city concept for Chandigarh circa 1948. Fletcher drew lessons from Frederic James Osborn, author of *Green Belt Cities* (1969), whom he found to be "one of the few persons living who has been actively associated with the building of two new towns". Fletcher believed that the magnitude of the Capital Project undertaking was similar to the planning of new towns as it had been conducted in the case of Letchworth and Welwyn. These two Garden Cities engaged the services of expert planners who were able to tackle the various interrelated matters that come into play in the planning of a new town. Fletcher felt strongly that there must be someone involved from the beginning that could envision the plan in its entirety (Fletcher 1948).

THE MAYER PLAN

Selection

At the recommendation of Prime Minister Nehru, the American architect Albert Mayer was selected to design the masterplan of Chandigarh (Evenson 1966, 12). Mayer served in India in World War II, and was already familiar with the country, and had already been involved in several planning projects across India (Kalia 1987, 31). By the time P.N.

Thapar, Chief Administrator of the Capital Project, approached Mayer with the offer, his experience included the Etawah rural development project, and the masterplan for Greater Bombay and for the New Delhi Region. Mayer's Indian career thus began out of his concern for improving Indian rural life and experience with American New Deal housing policies (32).

Mayer began his work in December of 1949 on what was to be the first masterplan of Chandigarh. He was to be assisted by a number of American specialists. Clarence Stein, a friend and colleague of Mayer's from his Greenbrook planning days, was engaged as a general consultant. Stein was responsible for the initial expressions of the Garden City seen in America. Matthew Nowicki, who was closely associated with Stein, was also invited to join the Capital Project. Nowicki's duties included developing an architectural vocabulary for the various pieces of the masterplan, and he became a key partner in the project (Evenson 1966, 12).

Philosophy

Mayer had been actively involved in FDR's New Deal program, and had worked on the designs for Greenbrook, an American expression of the Garden City concept and the unrealized fourth Greenbelt Town. Mayer's philosophy that urban areas should be contained rather than fragmented, coupled with his association with the Garden City Movement and its American expressions, formed the foundation of his planning approach (Kalia 1987, 57). The relatively blank slate provided the opportunity to validate the Garden City principles he had previously experimented with in plans for Greenbrook, the unrealized Greenbelt Town.

Form

Just as Howard proposed, Mayer's Plan offered the "beauty of nature", "social opportunity", "fields and parks of easy access", and "pure air and water" to name a few (Howard 1902, 10). Howard's Garden City provided natural benefits in the gardens, parks, and surrounding agricultural belt. It is in this vein that the planning of Chandigarh is most closely and obviously aligned to the Garden City concept. Mayer proposed the inclusion of a greenbelt encircling the city as a means to prevent sprawl and discourage outside elements from encroaching upon the city (Kalia 1987, 63). Mayer believed the greenbelt preserved rural life, but also improved the quality of life of the urban dweller by keeping them in close proximity to nature. Ultimately, Mayer's Plan took on a fan shape adhering to the contours of the site with a curvilinear road layout. However, after the death of his partner, architect Mathew Nowicki, a new planning and design team was sought to execute the plan

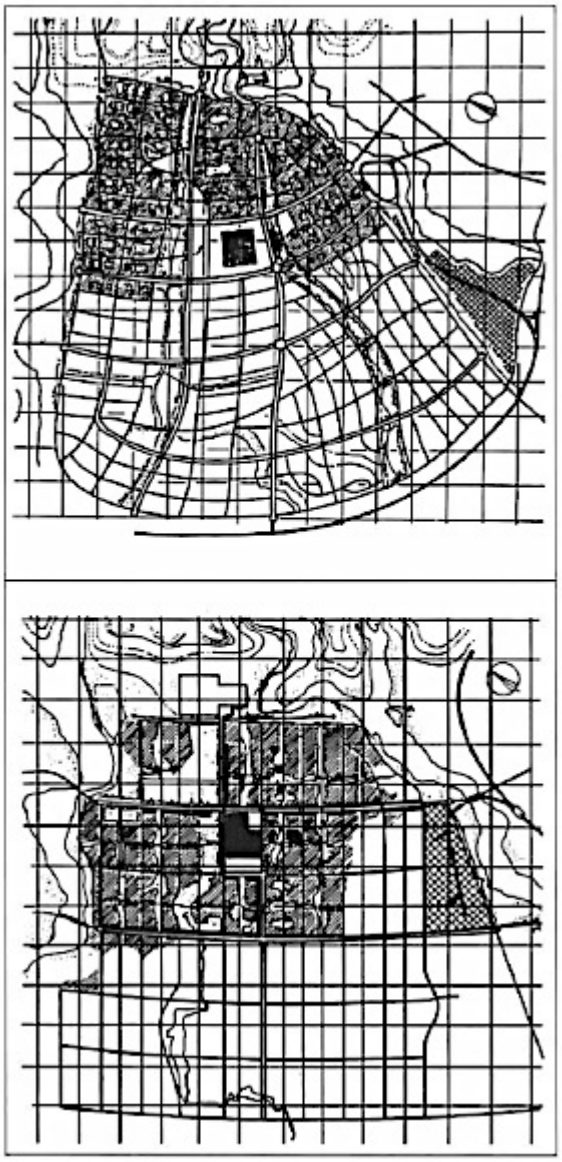


Figure 3: Comparison of Mayer's original plan (top) to Le Corbusier's Plan (bottom) for Chandigarh (Prakash 2002; originally sourced from Chandigarh Museum Archives).

THE LE CORBUSIER PLAN

Selection

Matthew Nowicki died in a plane crash on August 31, 1950. In search of a new architect, Thapar and Varma traveled to Europe with Mayer's completed Master Plan of Chandigarh searching for a "good modern architect". It was the French Minister of Reconstruction and Urbanization who suggested Le Corbusier for the project. Upon meeting, Le Corbusier sent the two Capital Project representatives to view his work in Marseilles. Thapar admired the architecture, but disliked the high-rise structure, leading to a clause in Le Corbusier's contract stating he was to avoid tall buildings in Chandigarh. The contract was signed in November of 1950 making Le Corbusier Architectural Advisor to the Punjab Government. Le Corbusier, together with the western architects Pierre Jeanneret, Maxwell Fry, Jane Drew, and a team of Indian architects and planners, produced the plan of Chandigarh as it is today (Evenson 1966, 25-26).

It was in February of 1951 that Le Corbusier first traveled to the site of the new capital (Gupta 2010, 35). While Mayer's plan was to serve as a basis for the Master Plan of Chandigarh, Le Corbusier asserted his own ideals as the new architectural advisor. Mayer was aware that significant changes were being made to his Garden City plan and was unaccepting, but he was unable to reach India to defend and justify his details (Evenson 1966, 26-27). While the new plan that emerged is said to represent the combined efforts of Mayer and the team led by Le Corbusier, Mayer felt it reflected few of his original principles (Fry and Drew 1955, 318). However, the side-by-side comparison yields obvious similarities between the original scheme and later designs (Figure 3).

Philosophy

Howard's Garden City concept is referred to as the horizontal garden city (Randhawa 1961, 49), but others believed that the solution to urban overcrowding could also be conceived in vertical form. Le Corbusier thought the solution was to build high-density towers surrounded by green space. This became known as the skyscraper in the park. His reasoning was, "The town of today can only increase in density at the expense of open spaces…Therefore the centre of the city must be constructed vertically" (Le Corbusier 1929, 322). However, Le Corbusier was expressly prohibited in his contract from constructing a vertical garden city.

Form

Both Mayer and Le Corbusier's plans included a proposed greenbelt. It should be noted that while Mayer employed the greenbelt due to its significance as an essential feature of the Garden City concept, it was Le Corbusier who implemented the greenbelt as a tool for urban containment. Mayer had questioned whether Chandigarh could even attain its Phase I projected size of 150,000 (Evenson 1966, 16). It was not until the passing of the Periphery Control Act that a radius defined an agricultural greenbelt.

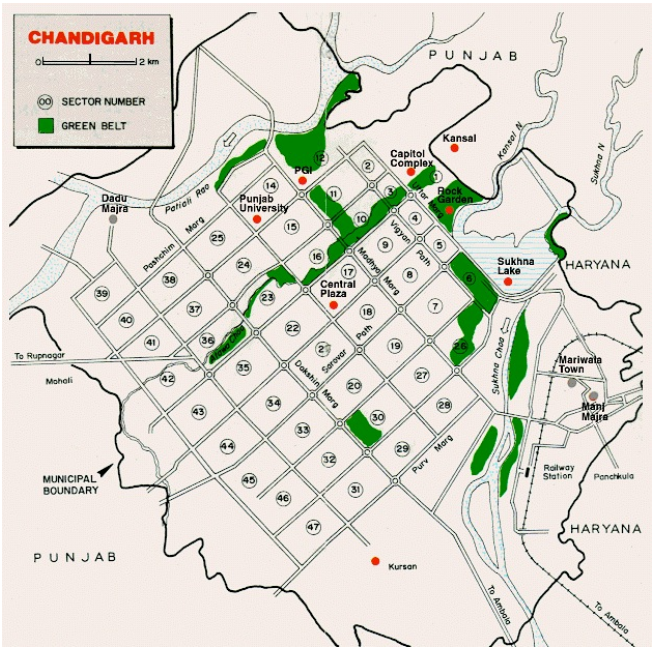


Figure 4: Historic map of Chandigarh (chandigarh.nic.in).

PERIPHERY CONTROL AREA

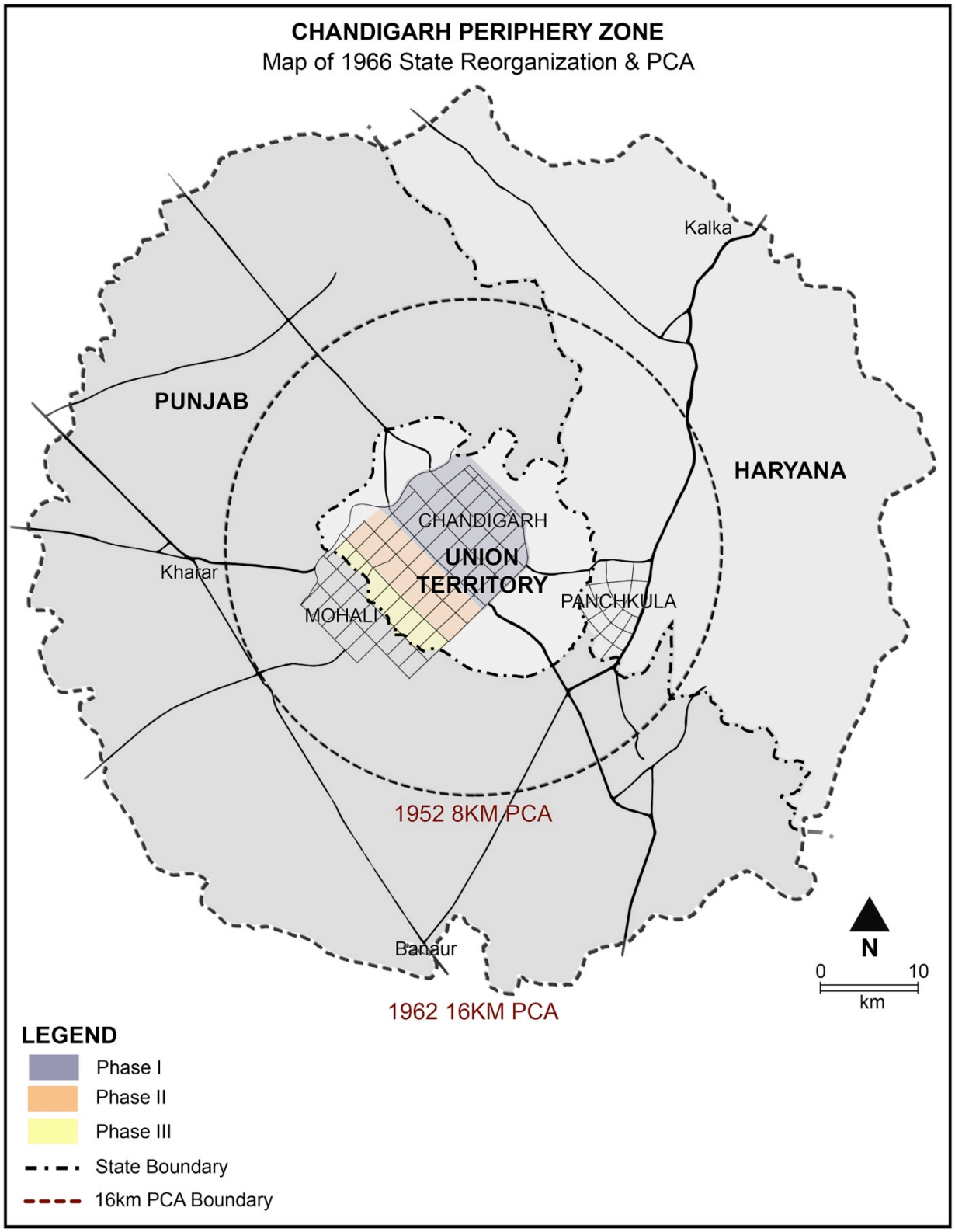
By 1953 the Punjab government passed two laws to direct and ensure the planned development of Chandigarh, one of which was 'The Punjab New Capital (Periphery) Control Act, 1952' (PCA) (Kalia 1987, 122-123). The act initially established an 8-kilometer (5-mile) radius Periphery Control Area, later expanded to 16-kilometers (10-miles) in 1962 (Map 1). As envisioned by Le Corbusier, a permanent greenbelt around the city of Chandigarh was created.

PURPOSE

The purpose of the PCA was to prevent unregulated and haphazard development along the Periphery and maintain a clear urban-rural dichotomy, while also protecting the surrounding rural communities from "degenerating contact with urban life" (Chandigarh Administration n.d., 16; Kalia 1987, 120). Four main goals were identified:

- Prevent the rise of suburbs;
- Discourage land speculation;
- Conserve traditional agricultural and rural ways of life; and
- Protect and enhance the aesthetics of Le Corbusier's Chandigarh (Chalana 2014, 6).

Le Corbusier viewed the PCA as a critical feature protecting the sacrosanctity of his plan and promoting his vision of the Periphery as a functioning rural landscape. No growth was to occur in the Periphery, and only rural activities were permitted.



Map 1: Map depicting 1966 state reorganization, development phases, and Periphery Control Areas (Map by author, features recreated from historical and contemporary maps).

Rural land within the Periphery was permitted to serve one of two uses intended to meet the day-to-day needs of the residents of the urban core: agriculture or the production of building materials (Chalana 2014, 13). These uses ensured that Chandigarh would be surrounded by a permanent greenbelt. The establishment of additional villages within the Periphery was prohibited, as was industrial or commercial development (Evenson 1966, 35). Le Corbusier urged city administrators to carry out the PCA at all costs.

The act places strict limitations on construction in the Periphery Control Area, though it does make allowances for any structure required for purposes considered "subservient to agriculture" (Kalia 1987, 123). This was intended to promote agricultural activities in the greenbelt and discourage urban land uses. While the intention was admirable, implementation of the act has been difficult.

CHALLENGES

Coordinated Administration

Since its inception, various stakeholders have liberally interpreted the PCA, pursuing urban development in their own self-interest. As will be discussed later in regards to the division of Punjab, the Chandigarh region has always been faulted with poor coordination between administrative bodies. The PCA initially established three municipal committees to represent the Periphery villages. Located in Kalka, Kharar, and Banaur, each committee was charged with the task of seeking approval from the Chandigarh estate officer for construction applications within their district. If the estate officer did not respond to the request within 30-days, approval was presumed. In an act of corruption, construction applications could easily be forgotten, resulting in approval by default.

Altogether, the administrative challenges, "substantially eroded the effectiveness of the acts" (Kalia 1987, 123).

State Reorganization

In 1966, the reorganization of Punjab and the creation of the Union Territory (UT) further complicated control of the Periphery by dividing governance of the area (Kalia 1987, 133). Punjab was to be divided into two states along linguistic lines, creating the new State of Haryana. Chandigarh found itself at the center, with each state demanding the capital as its own. The central government brought the city under its own administration, making it a union territory governed by the Union Ministry of Home Affairs under the Central Government (137). Punjab and Haryana shared the capital as tenant states of the Central Government, and Chandigarh proceeded to function as the seat of all three governments (Chalana 2014, 15).

The reorganization had negative implications for the Periphery that continues today. The UT is only in possession of 3.3% of land within the Control Area, while the State of Punjab is in possession of 76% and the State of Haryana is in possession of 21.7% (Chandigarh Administration n.d.). Due to a lack of inter-state coordination, competing interests and differing interpretations of the language of the law, the reorganization made it particularly difficult to enforce a unified vision of the rural landscape within the Periphery (Chalana 2014). The central government recognized that competing state interests would make it difficult to uphold the planned character of Chandigarh, and created a committee of representatives to control development and regulate growth throughout the zone (Kalia 1987, 138). However, the committee lacked statutory power and has remained ineffective since its inception.

Mixed Interpretations

The landscape of the Periphery as it is seen today evolved out of the various self-interested states' liberal interpretations of the PCA, each state justifying new development with national policy. The Indian Constitution permits the public acquisition of private property for projects in the public interest. Therefore new development is frequently constructed under the guise of being in the "public interest" (Chalana 2014, 6). This new development took the form of a military cantonment, several industrial factories, and satellite settlements, to name a few state authorized projects justified as within the "public interest" (16).

New development projects were fueled by the natural competition between Punjab and Haryana, both seeking to claim Chandigarh as their own capital while also benefitting from growth of the emerging region. Staking its claim for Chandigarh, Punjab developed Mohali directly to the south of the city as an extension of the grid of Chandigarh. Following suit, Haryana developed Panchkula to the northeast. The former planned for a population of 350,000; the latter planned for a population of 125,000. Both new towns, in addition to the previously mentioned authorized developments, were proposed and developed within Chandigarh's greenbelt. While the purpose of the act was to ensure growth occurred in a planned manner, this rapid urban development was counter to the vision of Le Corbusier and his team.

SUBSEQUENT REGIONAL PLANNING APPROACHES

In 1975, in response to the uncontained urban growth of the area, the central government formed a coordination committee "for the balanced development of the

Chandigarh region" (Kalia 1987, 140).[5] By 1984 the committee began preparing the 'Inter State Chandigarh Region regional plan for 2001' (ISCR 2001). ISCR 2001 was the first regional plan to acknowledge the failure of the PCA to contain urban growth and provide measures for the future coordinated development of the region (Chalana 2014, 20). Similarly, the 2000 'Chandigarh Inter State Metropolitan Regional Plan for 2021' (CISMeR 2021) called for heightened regulation across the Periphery and sought to concentrate urban development (21). Both regional plans failed to be implemented due to a lack of statutory power.

These past failed approaches applied a blanket plan to the region. Individually, Punjab, Haryana, and the UT experienced more successful planning efforts. However, these efforts were not found to be consistent with the PCA goals of agricultural and rural preservation, local governments are justifying their projects "ensuring planned development" in the public interest, and even guilty of land speculation (Chalana 2014).

Union Territory

With an area of 114 square kilometers, the UT represents only 3.3% of the Periphery (Chandigarh Administration n.d.). The UT considers itself to be the more responsible steward of the PCA, but the UT is far from innocent of upholding the vision of Le Corbusier. Technically, even the aforementioned Phase III expansion of the urban core was consuming the UT Periphery (Chalana 2014, 18). The existing Periphery village of Manimajra was granted urban status and more recently, in an act of speculation, the UT acquired land to the south of Sukhna Lake to be rezoned and sold to IT companies to

[5] The term "urban agglomeration" was introduced in the 1971 Indian census to describe areas of continuous urban spread on the periphery of a town (Kalia 1987, 140).

develop a technology park. This land had previously been maintained as agricultural up to this point, a decision detracting from their reputation for good stewardship.

In 2009, the Chandigarh Administration formed an Expert Committee to prepare the Chandigarh Master Plan 2031 (CMP 2031) (Chandigarh Administration n.d., 7). While the committee recognized the impossibility of restoring the original vision for the urban core and rural periphery, it prepared the plan for the remaining UT Periphery within the scope of the PCA. While the UT has long considered itself to be the "most serious steward" of the PCA, the facts state otherwise. The 2011 Census of India identified only 2.9% of the households within the UT as rural (Ministry of Home Affairs 2011), and in reality, CMP 2031 proposed to maintain only 0.9% of the UT Periphery for agriculture-related land uses (Chandigarh Administration n.d., 343). While the City has adopted the plan, it has yet to yield results.

Haryana

With an area of 295 square kilometers, the State of Haryana represents 21.7% of the Periphery. Second to the UT, Haryana is considered a relatively good steward of the law (Chalana 2014). While the PCA automatically applied to the UT and Punjab post partition, Haryana readopted the law in 1968, at the time reflecting a desire for stewardship (16). However, over time Haryana proceeded to permit residential and industrial expansion (20)

Haryana lacks a regional development authority, but has produced master plans under Haryana Urban Development Authority. The Haryana Periphery was 18% urbanized by 2008 and an additional 6% of the land contains defense-based "special projects" (Chalana 2014, 18). The majority of these activities are fairly removed from Chandigarh given the natural barriers of the Sukhna Choe riverbed (a makeshift greenbelt) and the

more significant Shivalik Hills. The Shivalik Hills substantially encumber the state's ability to pursue urban development within the Periphery, but has not entirely prevented it.

The Haryana Urban Development Authority (HUDA) was established in 1977 to manage development activities in urban areas in a systematic and planned way (Haryana Urban Development Authority n.d.). Haryana government has planned five settlements. Two, Panchkula and its planned extension, are built out with populations of over 200,000, while the remaining three are underdevelopment (Chandigarh Administration n.d.). Haryana lacks a regional development authority in the vicinity of Chandigarh.

Punjab

With an area of 1,021 square kilometers, the State of Punjab represents 76% of the Periphery. While Punjab has proportionately greater stake in the future of the Periphery, they stand little to benefit from maintaining the Periphery as agricultural lands in accordance with the PCA. The state takes the position that the purpose of the PCA is to ensure the planned expansion of Chandigarh. Along those lines, the Punjab Urban Development Authority (PUDA) recently created the Greater Mohali Area Development Authority (GMADA) to ensure that future development within the Punjab portion of the Periphery would be well-integrated (Greater Mohali Area Development Authority n.d., 2-2). The GMADA Regional Plan recognizes the need for planning in response to Chandigarh's rapid population growth and growing popularity as a regional center. While this is permitted in the legal language of the PCA, it is counter to Le Corbusier's vision of maintaining a rural Periphery (Chalana 2014, 17).

What is revealed in the regional plans of GMADA and HUDA, and is stated in the Chandigarh Master Plan 2031, is that there is an additional need for planning in the

Periphery to take development pressure off Chandigarh and the UT (Chandigarh Administration n.d., 5). While the PCA should have circumvented the need for additional regional planning strategies, fieldwork conducted throughout the 16-kilometer Periphery yielded results supporting the need.

CONCLUSION

This chapter told the story of the periphery of Chandigarh. The post-independence partition of Punjab created a need for a new capital, the site was chosen for its promise of fertile soil, and two plans are developed, the latter plan carrying over the concept of the greenbelt. Le Corbusier was able to ensure that this greenbelt, the Periphery, was not just a design element in a plan, but protected by law. The PCA has seen many challenges over time, it remains a piece a law, but the spirit is lost. The original goals are largely forgotten: prevent the rise of suburbs; discourage land speculation; conserve traditional agricultural and rural ways of life; and protect and enhance the aesthetics of Le Corbusier's Chandigarh (Chalana 2014, 6).

Chandigarh became a place of opportunity; "everything and everyone" began to find their way to the city (A. Prakash 1988, 6). This rapid population growth has placed significant pressure on the Periphery and has resulted in rapid urbanization. The need for planning is recognized in response to Chandigarh's growing popularity as a regional center, but all past blanket regional planning efforts have failed to be implemented and the states have undertaken their own planning efforts. The on-the-ground reality is that the Periphery is developing in a manner directly counter to the spirit of the PCA, and its original intent to preserve the land as a permanent, functioning agricultural greenbelt. The

PCA painted a picture of how the Periphery should appear, but provided limited strategies to ensure this form was maintained.

4 | FIELDWORK

INTRODUCTION

Chapter 4 presents current conditions of the Periphery as observed through fieldwork, the study of historical and contemporary maps, and the review of plans and literature related to the Periphery. Broad categories of observed land uses and activities are presented. The significance of each category is discussed, a map of the extent of land use is provided, the range of activities observed is presented, and a story that highlights the

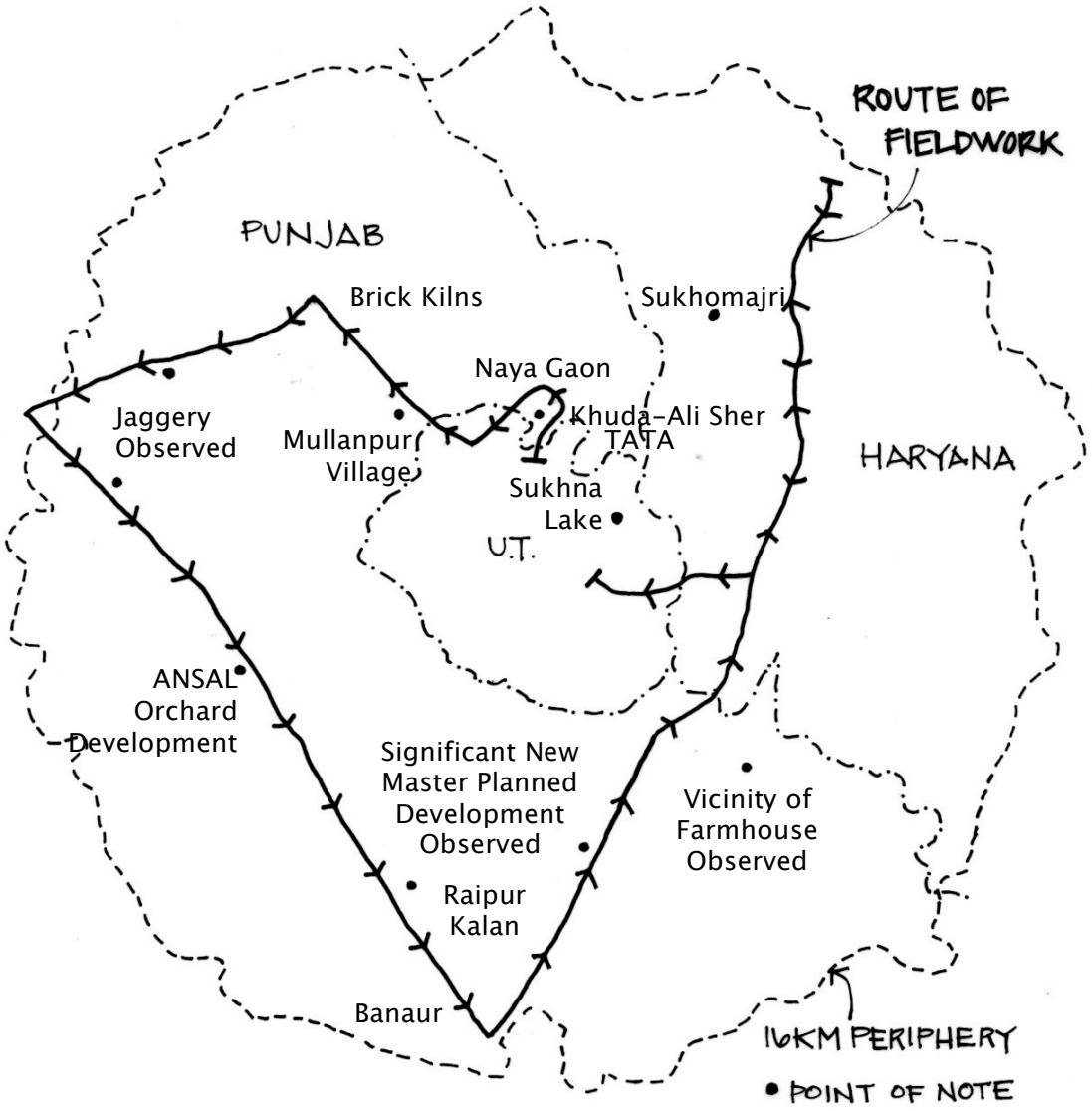


Figure 5: Sketch map depicting route driven throughout the Periphery with features of note indicated (Image by author).

changing landscape is featured.

The goal of fieldwork was twofold. One, to gain a better understanding of land use conditions across the Periphery and the extent of change, and two, to better inform future recommendations for urban containment policy and growth management practices. Fieldwork was conducted by mapping a route to be driven throughout the 1,315 square kilometer Periphery Control Area, also defined by the 16-kilometer radius. Historical and contemporary maps were used to identify zones and sites of significant development and land use change over the past decade.[6]

It is beyond the scope of this thesis and fieldwork to identify a full range of uses within the Periphery, nor was land use data available to contribute to my understanding of the landscape. My approach was limited by the fact that this chapter reports on the conditions and activities as they were observed along the chosen route at a particular time of year, but this limitation did not hinder the objective to discern broad categories of land use/activity. Additional sources were engaged to add depth to the story of the Periphery.

SIGNIFICANCE

Prior to the siting of Chandigarh, the Periphery was characterized by an agrarian landscape of rural villages, farmland and forested areas (Chalana 2014, 2). Le Corbusier sought to maintain this functioning rural landscape by creating an agricultural greenbelt circumscribing the urban core of Chandigarh. The PCA was later enacted to help implement this vision by restricting urban development, but despite its existence, the Periphery has seen rapid land use change.

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[6] The fieldwork methodology is presented in greater detail in Chapter 1, the Introduction.

The landscape of the Periphery as it is seen today has evolved out of the various self-interested parties' liberal interpretations of the Periphery Control Act. The aforementioned historical conditions, land use pressures and growth trends have resulted in significant pressure for development. While technically the development is permitted by the PCA as "planned expansion" in the "public interest", the reality is that the Periphery is developing in a manner directly counter to Le Corbusier's vision (Government of Punjab 1952). Even though active agricultural is retained, the rural ways of life are threatened to varying degrees.

Figure 6: Evidence of rural activity on the Periphery, located north of Naya Gaon and east of Khuda Lahora (Photo by author).

CATEGORIZATION

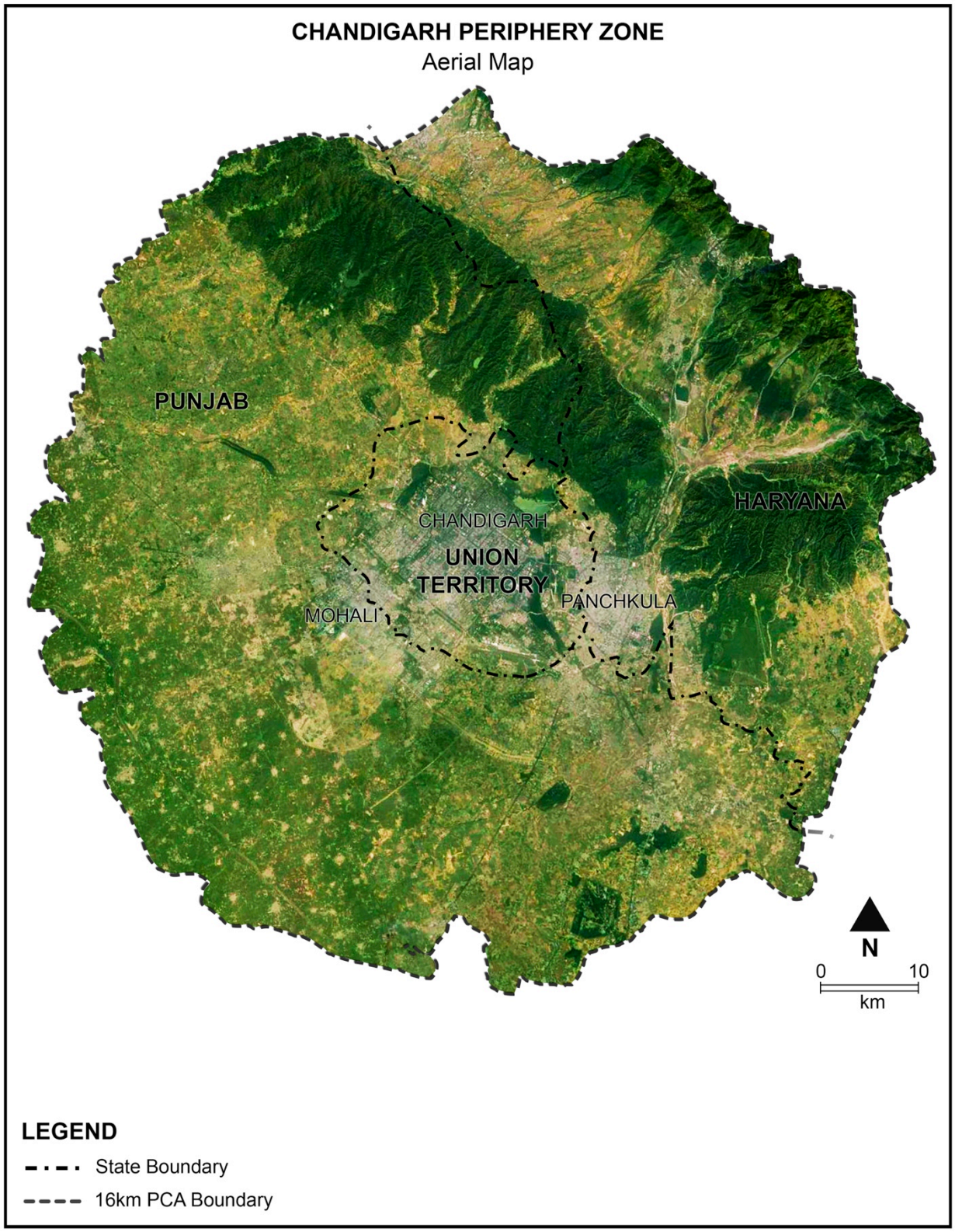
The observations have been broadly categorized to reflect the various conditions and activities that I perceived during fieldwork. These categories include:

1. Natural areas,
2. Agricultural and related rural uses, and
3. Master planned development and related urban uses.

Some uses are permitted outright by the PCA; others are the result of mixed interpretations of the PCA or a direct departure from it.

The three categories by no means present an exhaustive list of activities, but they do capture the bulk of land uses/activities that were predominant within the Periphery at the time of fieldwork. Within each category, the predominant land uses I observed through fieldwork and map analysis are discussed and located. Each category is structured into four

elements: first, the significance; second, a map is provided; third, the range of activities observed are discussed; and fourth, a significant feature of each category is highlighted. The *Feature* element at the end of each section elaborates on a particular condition within the category to tell the larger story of the changing rural landscape.

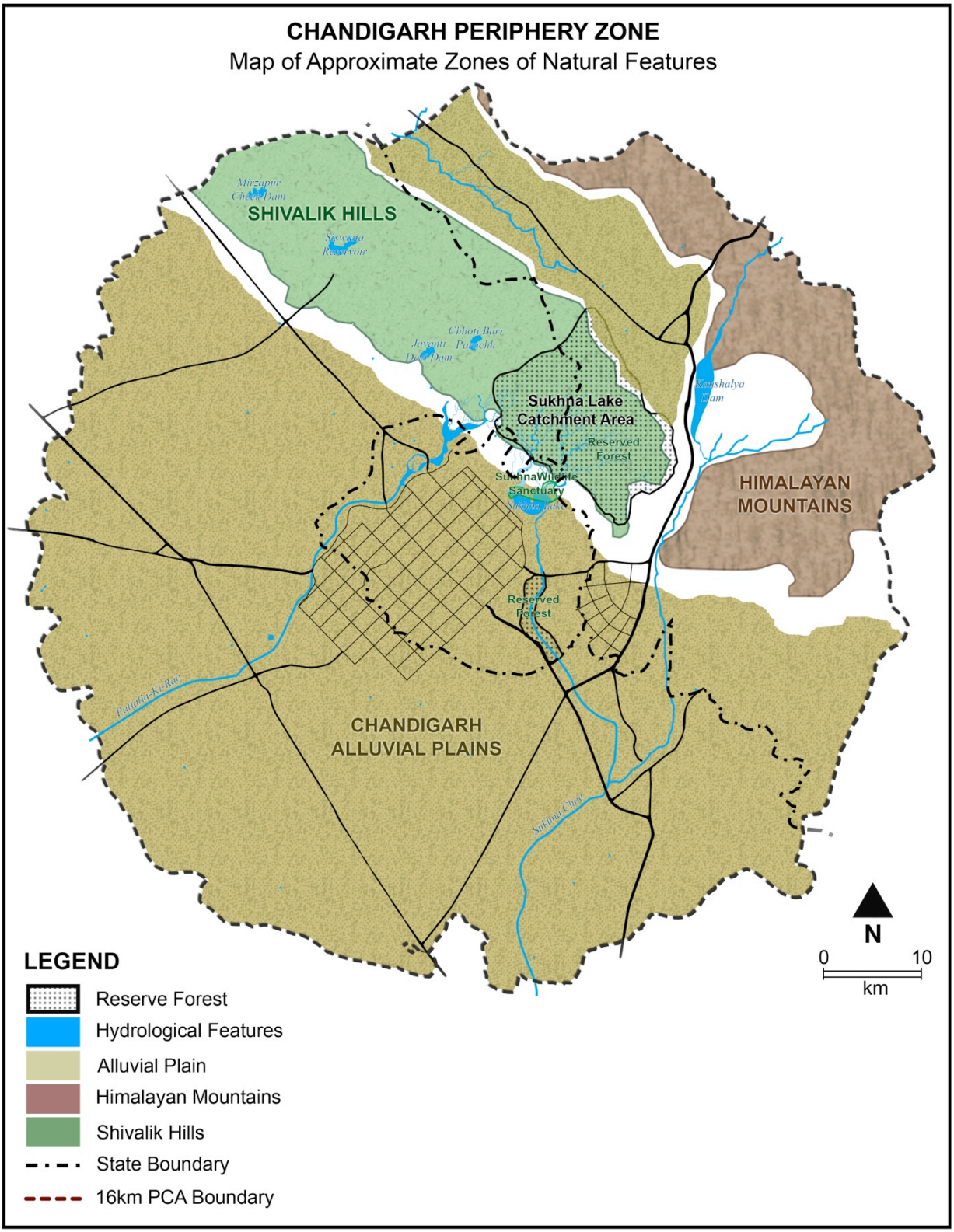


Map 2: Aerial map of the Periphery Control Area (Map by author, aerial image by Google Earth (2014)).

NATURAL AREAS

SIGNIFICANCE

It was the natural features of the site that first drew the siting committee to the site of Chandigarh. These natural features were also responsible for the landscape of agrarian villages that existed prior to the construction of Chandigarh. The landscape of the Periphery is made of four different geographical features; the Himalaya, the gravel upland (Dun), Shivalik Hills, the rolling plain at the base of the foothills (Ghar), and the Chandigarh alluvial plain (Mukerji 1976, 95). The Shivalik Hills to the northwest provided a striking backdrop, the gentle southern slope provided efficient drainage, and fertile soil held promise (Gupta 2010, 21). Each of these features of the natural environment contributes to the rural way of life. This interconnected ecosystem has been significantly impacted by the development on the Periphery. The natural areas are at risk of depletion under the threat of urbanization, therefore impacting the rural lifestyle by extension.



Map 3: Map of approximate zones of natural features (Map by author, informed by Mukerji (1976) and Chandigarh Administration (n.d.)).

RANGE OF ACTIVITY

The majority of the Periphery is made up of Chandigarh Alluvial Plain, located at the foot of the Shivalik Hills on a gentle southwestern slope. The plains are an important feature of the Periphery as they provide fertile soil for agriculture. The Shivalik Hills are located to the northeast of Chandigarh, running parallel to the Himalayan Mountains. Patialia-Ki-Rao and Suhkna Choe are the main seasonal streams flowing through the Periphery, previously referenced as defining elements of the Mayer plan (Gupta 2010, 74). Additional minor rivulets are located throughout the Periphery. Several of these rivers are dammed, providing year round reservoirs. The Sukhna Choe was dammed to create Sukhna Lake, while it does not serve as reservoir, it does provide a popular recreation and leisure destination in Chandigarh (Chandigarh Administration n.d., 34).

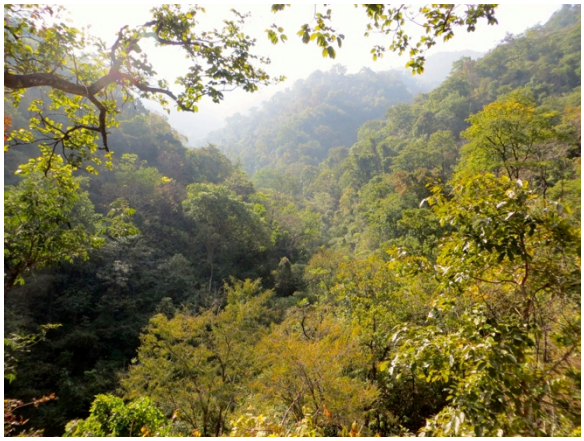


Figure 7: Reserve forest within Shivalik Hills (Photo by author).

There are two reserve forests functioning to protect the Sukhna Lake catchment area, which falls within portions of Punjab, Haryana and the UT (Figure 7) (Chandigarh Administration n.d., 461). The access to areas identified as the Sukhna Wildlife Sanctuary and the Reserve Forest is

Figure 8: Village of Khuda Ali-Sher and the inaccessible Shivalik Hills Reserve Forest beyond village limits (Photo by author).

restricted. Where a village borders the protected forest, a fence divides the two areas. Figure 8 shows the northern edge of the Village of Khuda Ali-Sher, access into the forest is restricted. The restricted area is treated as a garbage dump. With no access to the land, bags of trash are thrown over the fence. Agricultural activity occurs primarily throughout the alluvial plains and upland areas. These uses will be discussed in greater detail in the next section.

FEATURE

Sukhna Lake is an artificial lake located to the southwest of the Shivalik Hills. The lake was created in 1958 by damming the Sukhna and Kansal Choes, seasonal streams flowing from the Hills (Chandigarh Administration n.d., 34). This catchment area is located within portions of Punjab, Haryana and the UT. The lake was a design feature in Le Corbusier's Master Plan of Chandigarh and today is a beloved public amenity for its beauty and the recreation opportunities provided (Figure 9).

Since the 1960s, the lake has faced the problem of high siltation due to soil erosion of the degrading Shivalik Hills within the catchment area (Chandigarh Administration n.d., 461). In the 1970s, a study revealed that the highest rate of siltation was taking place in the village of Sukhomajri, located on the northeastern side of the Hills (465). Sukhomajri, originally a pastoral community, allowed their cattle to graze in the Shivalik Hills (Sarin 2014). This contributed to unstable soils and increased siltation.

Figure 9: Sukhna Lake pedestrian paths (Photo by author).

Various measures were taken to decrease siltation and stabilize soil conditions. The Central Government acquired 2,600-hectares of land within the catchment area and established the Sukhna Wildlife Sanctuary (Chandigarh Administration n.d., 461). The Sanctuary was designated a reserve or protected forest under the Indian Forest Act, closing off public access to the Hills. The rate of siltation has dropped, but the lake's storage capacity has already been reduced by 63%. The issue of siltation would not be significant if it were not for the urban public's value of a manmade lake, the lake does not serve as a reservoir nor does it serve any function other than recreation and leisure opportunities.[7]

This story highlights the complex ecosystem that exists within the Periphery and the rural villagers dependence on such systems for their livelihood. In this instance, an intervention has been made for the benefit of the urban core, which has negatively impacted the rural way of life of villagers who were dependent on forest resources. The villagers have lost access to their land and are treated as trespassers (Sarin 2014). The story questions whether or not this is a responsible intervention to preserve an artificial ecosystem, or is it more "natural" to allow the villagers to continue to use the land.

[7] For more information regarding the lake and its ecology see the Chandigarh Urban Lab 2014 Report, section "Ecology of the Northern Periphery" by Lynn Fredenburg.

AGRICULTURE & RELATED RURAL USES

SIGNIFICANCE

Le Corbusier romanticized the existing agrarian villages of the Periphery. As such, they were to remain as features of the functioning rural landscape. Rural land within the Periphery Control Area was permitted to serve one of two uses intended to meet the day-to-day needs of the residents of the urban core; agriculture or the production of building materials (Chalana 2014, 13). Land was designated as "agricultural and afforestation zone", or a "brick field zone" which included brick and lime kilns (Figure 10). Additionally, the PCA states that no proposed building shall be refused "if such a building is required for purposes subservient to agriculture" (Government of Punjab 1952). However, the interpretation of "subservient" has been liberal over the years.

Figure 10: Typical brick kiln (Photo by author).

Active agriculture and the rural village remain, but as urban development encroaches they are pushed further out into the Periphery. Villages in close proximity to Chandigarh have changed significantly, becoming visibly more urban in density and commercial activities (Figure 11). The edges of these villages are characterized by sprawling, unplanned growth beyond the

Figure 11: Banaur, located south of Chandigarh, visibly urban in density and commercial activities (Photo by author).

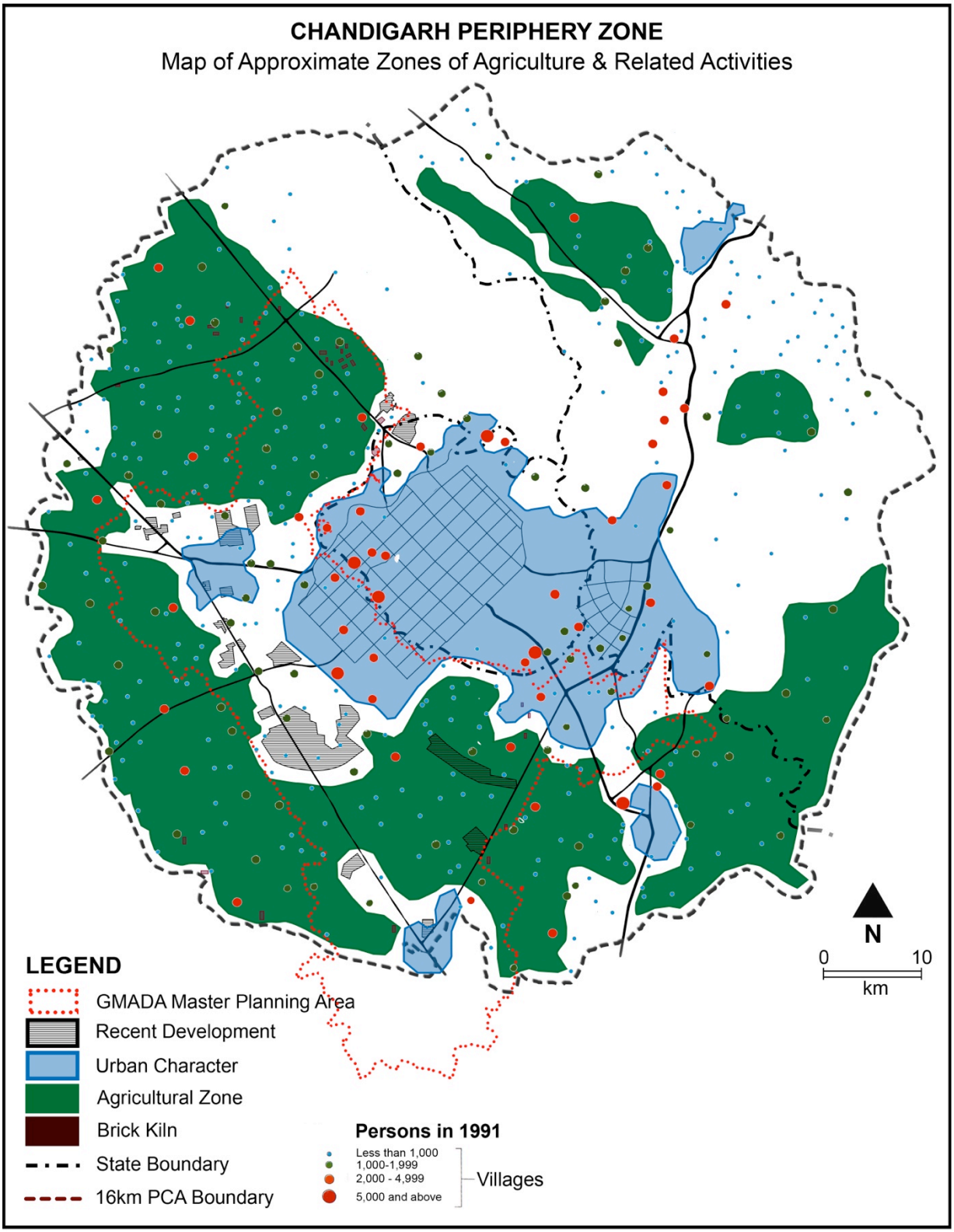
village boundary into lands zoned for agricultural uses. Yet agriculture and related uses still make up a large percentage of land use as evident from contemporary maps and fieldwork.

Functioning agricultural lands were observed in various forms throughout the Periphery. Figure 13 depicts the typical active agricultural landscape of rural village and farmland. The rural village is contained within the *lal dora,* literally translated as "red line" (Chalana 2014, 5). It is a boundary that has existed since colonial times, drawn around villages demarcating land for future growth. Over time, the villages have grown to meet this arbitrarily imposed boundary, even expanding beyond it. Figure 12 depicts a typical rural village that has grown beyond its *lal dora*. Farmers live within the village and travel to their

Figure 12: Aerial image depicting typical functioning rural landscape with active agriculture patterns and a village outlined (Google Earth 2014).

field within the surrounding agricultural lands across compacted dirt cart paths. Farms appeared to be relatively small-scale agricultural operations, typically rectangular in form and of the scale that can be farmed by an individual farmer or a small group. The site is occasionally accompanied by a small, low-lying out-building, but frequently lacks any structure.

During the month of March, farming and activities related to animal husbandry were observed. In related uses, the landscape is dotted with brick kilns and small plots of commercial forestry, and observed uses considered subservient to agriculture included wedding halls and large lot estates. The demand for building materials has expanded to include more modern materials such as steel. Construction within the existing villages appears to retain the use of brick.



Map 4: Map of approximate zones of agriculture and related activities (Map by author, informed by field reconnaissance, village mapping by Gopal Krishan, and Google Earth imagery (2014)).

RANGE OF ACTIVITY

A range of activities related to farming, and agricultural production and processing were observed along the relatively well-trafficked route of fieldwork. Crops observed during the month of March included sugar cane, mustard greens, wheat, and animal fodder. Crops were grown on small farms, as well as on vacant and underdeveloped sites within rural villages.

Figure 13: Typical active agricultural landscape, wheat fields in Punjab southeast of Chandigarh (Photo by author).

There is an acute presence of livestock within villages and on agricultural lands. The ownership of livestock, cows, water buffalo or goats, for the production of milk is common. In the village of Khuda Ali-Sher, cows were taken from the village core to the adjacent agricultural lands for grazing (Figure 14; Figure 15). Manure is collected and dried for fuel (Figure 16). Herds of sheep were observed grazing roadside (Figure 17).

Figure 14: Livestock within the Village of Khuda-Ali Sher (Photo by author).

Figure 15: Livestock within the Village of Khuda-Ali Sher (Photo by author).

Figure 16: Sheep observed grazing roadside on undeveloped site, located west of Banaur (Photo by author).

Figure 17: Manure collected and dried for fuel in Village of Khuda-Ali Sher (Photo by author).

Figure 18: In the field production of jaggery in Punjab west of Chandigarh (Photo by author).

Figure 19: Roadside production and sale of jaggery in Punjab, on route NH21 southeast of Kurali and northwest of Kharar (Photo by author).

The production of jaggery, concentrated cane juice, was one example on-site production observed (Figure 18). At the time the fieldwork was conducted, sugar cane was being harvested and processed on the fields into jaggery. The operation consists of sugar cane, either harvested on site or nearby, which is squeezed to extract the liquid; the cane juice travels into a kettle that is heated over a fire fed with the dry pulp of the sugar cane. The jaggery is available for purchase along the roadside (Figure 19).

Village sprawl was observed throughout the Periphery, but it was particularly evident in the villages of Naya Gaon and Karoran. Where there were once two villages with open space between, sprawling construction has filled the agricultural lands between the two and blurred the boundaries. Figure 21 and Figure 22 depict the extent of change from 2002 to 2014. This form of new village development is in stark contrast to new master planned developments. Village development continues the existing "organic" (i.e. unplanned) village growth patterns and uses locally available building materials like brick (Figure 20).

Figure 20: New residential construction north of Naya Gaon (Photo by Author).

Figure 21: 2002 aerial image of Naya Gaon growth and village sprawl, dotted line represents zone of village construction (Google Earth 2014).

Figure 22: 2014 aerial image of Naya Gaon growth and village sprawl beyond the zone of 2002 village construction (Google Earth 2014).

Additionally, several wedding halls were observed throughout the Periphery. These facilities meet the local demand for elaborate wedding ceremonies, available for rent by urban residents. It is assumed that these facilities are also operating as structures subservient to agriculture. One was even called "The Farm" (Figure 23). In some cases, portions of the Periphery may continue to be farmed by migrant farmers renting the land, but in most cases agricultural lands serve as lawns or open space to set up temporary tents for weddings or private parties.

Figure 23: Farmhouse in Punjab south of Zirakpur converted to a wedding hall for rent by urban residents (Photo by author).

FEATURE

As the urban encroaches on agricultural lands, the farmer is displaced and there is a shift in the rural way of life. However, in one observed instance, this did not stop villagers from continuing to harvest in and around new development. At the site of ANSAL Orchard County - a master planned residential community still under construction - two men were observed harvesting animal fodder from what would eventually be encased in the foundation of a multi-story residential structure (Figure 24). A conversation revealed that these men had been residents of the nearby village of Khuni Majra and were the former landowners of the farmland that was now under development. The villagers were compensated for their land, but one man spoke to the fact that from the sale of land he was able to purchase additional property that he was then able to rent for additional income. However, the men possessed no other skills and so they continue to rely on the yet underdeveloped pieces of land of the planned housing development for animal fodder. The conversion of their agricultural represented a significant lifestyle change.

Figure 24: Man harvesting animal fodder within new development of ANSAL Orchard Community (Photo by author).

The second story that reflects on the shifting rural way of life is the “farmhouse”. The farmhouse was permitted as a land use “subservient to agriculture” in order to meet the residential demand of rural landowners since 1966. Originally these structures were permitted on 5-acre minimum lots beyond the 8-kilometer belt. However, in response to high land values farmhouse regulations were later “liberalized”, lot minimums were

decreased to 2.5-acres and the original 8-kilometer belt restriction was eliminated (Government of Punjab n.d., 8).

While the farmhouse is permitted outright, it is often merely in the guise of functioning agricultural lands. These large lot estates serve as primary or secondary seasonal homes of the upper class and only some maintain active farming on site. In one observed case, a Panchkula family purchased a piece of agricultural land and constructed a secondary home, or "farmhouse", on site (Figure 25). The family uses the premises to host social gatherings, a caretaker lives on site to manage the property, and the land is rented and farmed by a tenant farmer traveling from a nearby village (Figure 26).

These stories are evidence of the changing rural landscape and shift in the rural way of life. On the one hand, villagers are being compensated for the acquisition of their land as it is converted to master planned developments, the land is taken out of production, and the farmer loses his occupation. On the other hand, the land is converted to a "large lot estate", but farming may continue to various degrees. In both instances the rural way of life is altered or disrupted.

Figure 25: Farmhouse in Punjab southeast of Panchkula (Photo by author).

Figure 26: Social gathering hosted at Punjab farmhouse (Photo by author).

MASTER PLANNED DEVELOPMENT & RELATED URBAN USES

SIGNIFICANCE

The development of the satellite towns Panchkula in Haryana and Mohali in Punjab paved the way for construction to proceed within the Periphery even before Chandigarh had reached its full capacity (Chalana 2014, 16). Increasing land values in Chandigarh drove people to these neighboring townships, or further out into the Periphery where urban services were not located. Unauthorized development began emerging in response to the rapid growth and demand for services, and in 1998 the Punjab Government permitted the regularization of all illegal construction in acknowledgement of these "emerging ground realities" (Government of Punjab n.d., 1).

Punjab and Haryana have undertaken similar methods of planning for development, designating areas of urban development and creating master plans. These new urban areas are located along the UT boundary. In Punjab, the Greater Mohali Area regional plan creates seven integrated "Economic Hubs", while Haryana's regional growth strategy incorporates five planned "settlements" (Chandigarh Administration n.d.). Throughout the Periphery, the location of these master plans is evident.

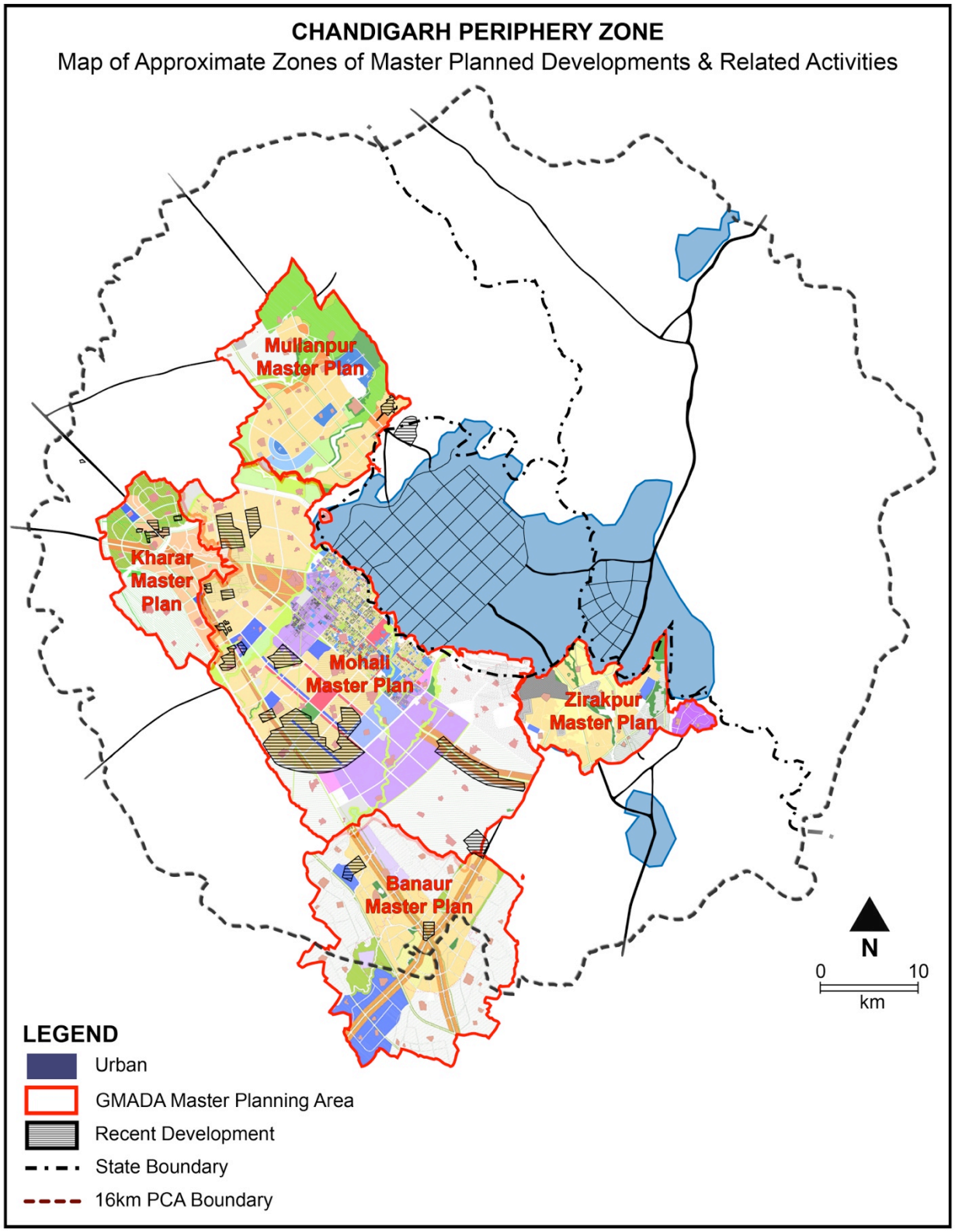
This trend of master planned developments has emerged over the last decade. Observed throughout the Periphery were township and residential, business, mixed-use and academic campus in various stages of development. The magnitude of land use change is evident from the study of historical and contemporary maps. However, future growth remains uncertain. The land is experiencing significant development, but it is unclear at this time whether the population growth will match this rapid rate of change. An area of

recent new development south of Chandigarh shows vacant residential towers taking on an already abandoned appearance (Figure 28).

In close proximity to Chandigarh, the rural village has changed significantly, becoming visibly more urban in density and commercial activities. Recently Punjab has even been upgrading villages to incorporated townships in an attempt to regulate growth (Chalana 2014, 17; CMP, 4; GMADA, 2-1). In both states, and additionally seen in the UT, new developments are permitted due to relaxed interpretations of the PCA and jurisdictions continuing to justify new projects in the "public interest". This rapid development reflects the large-scale shift from a primarily rural Periphery of agricultural activities to a Periphery of a mixed urban land uses and activities.

Figure 27: ANSAL Orchard County residential development, image depicts typical high-rise development observed during field reconnaissance (Photo by author).

Figure 28: Recently constructed vacant residential development south of Mohali on route NH21, abandoned appearance (Photo by author).



Map 5: Map of approximate zones of master planned developments and related uses (Map by author, informed by field reconnaissance, Google Earth (2014), and GMADA master plans).

RANGE OF ACTIVITY

The range of activities observed within the broader category of master planned developments includes the township and the residential community, business park or academic campus resulting from private development or public-private partnerships.

New development is typically located along major routes, with new private roads paved or graded. Sites of new development were observed in various stages. Some sites of future development were platted, while others were complete with paved streets and street lighting, but were not yet developed upon. Other sites were complete with mid- to high-rise residential towers, but were not yet inhabited, taking on an almost abandoned appearance.

The Village of Mullanpur is one example of an emerging master planned township. In 2007, GMADA engaged Jurong Consultants to produce a master plan and rebrand the township as New Chandigarh (GMADA 2014). The Mullanpur Master Plan incorporates existing rural villages into its layout, while the surrounding agricultural land is acquired and converted into urban uses (Figure 30; Figure 31). GMADA is involved in several public-private partnerships in association with the Mullanpur Master Plan, one of which is the Eco City residential development. At the time of fieldwork, the site was platted with new roads laid out; a singular high-rise tower was an indicator of coming development (Figure 29).

Figure 29: Future site of Eco City, part of Mullanpur Master Plan (Photo by author).

Figure 30: 2003 aerial image depicting Village of Mullanpur and active agricultural landscape (Google Earth 2014).

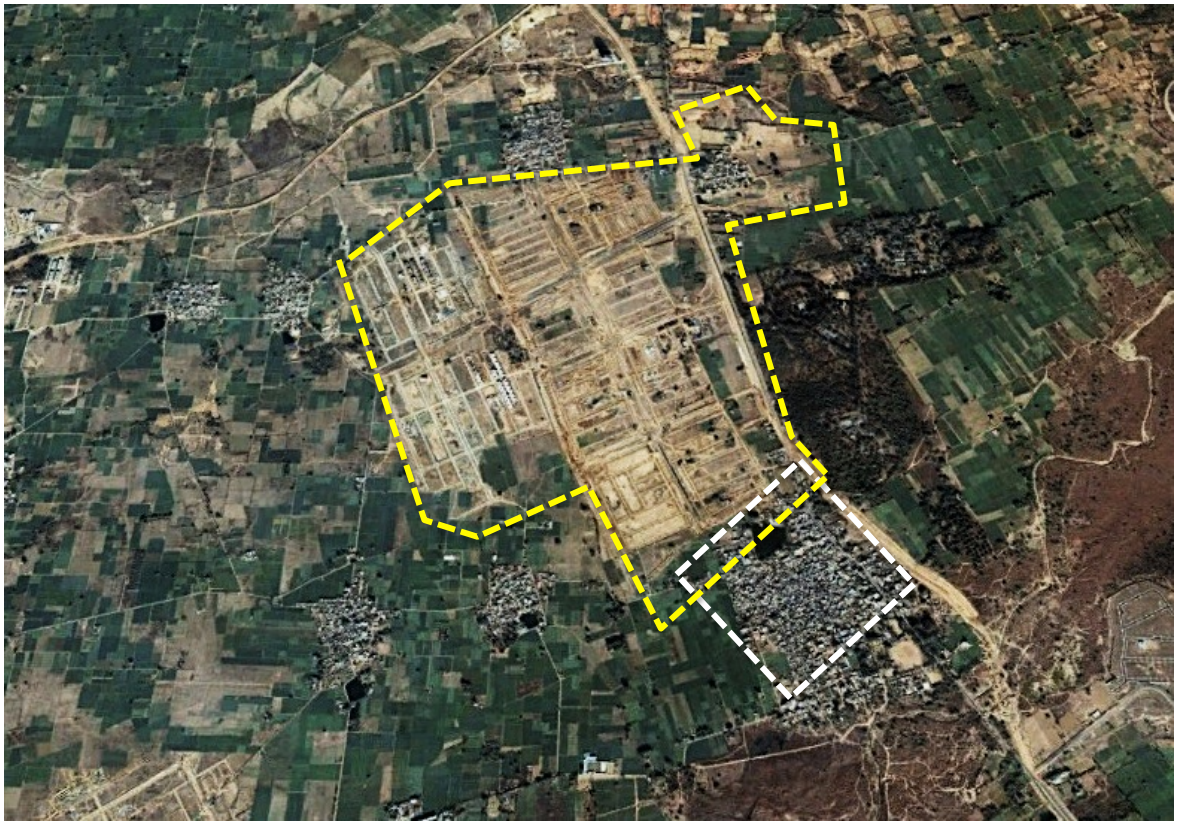


Figure 31: 2014 aerial image depicting Village of Mullanpur and encroaching Eco City development (Google Earth 2014).

Another form of emerging development within the Periphery is the mid- to high-density residential or mixed-use tower grouped as a planned campus. Roadside advertisements of plots or residential units for sale are frequently viewed throughout the Periphery, additional indicators of coming land use change (Figure 32). The new developments are taking names that reference the former "rural character", or taking names around the theme of sustainability or "green" that reference the larger natural environment.

Figure 32: Image depicting typical roadside advertising for new residential development (Photo by author).

Also observed throughout the Periphery are business and academic campuses. Several colleges were observed, including Institute of Technology and Future Management Trends outside Mullanpur, and Doaba Group of Colleges and Chandigarh Group of Colleges College of Engineering, both claiming campuses within Mohali, yet located beyond the town limits. Similar to the residential communities, the rural campuses are gated containing mid-rise structures. The sites are surrounded by continued agricultural uses or vacant properties; the assumed intention being development will fill in around it.

Figure 33: Migrant workers squatter settlement near site of new development south of Chandigarh (Photo by author).

Villages and migrant settlements

are also included in this broader category. The village referred to here is not the rural village of agricultural activity as previously discussed, but the village that is to be incorporated into a larger master plan. Figure 34 depicts the Village of Raipur Kalan encompassed by growth. The rural village is located within an area zoned for new residential development by the Mohali Master Plan. The migrant workers settlement takes the form of seemingly temporary, squatter settlements, in close proximity to sites of new construction (Figure 33).

Figure 34: Village of Raipur Kalan encompassed by new development, located in southern portion of the Mohali Master Plan (Google Earth 2014).

FEATURE

One significant feature that speaks to the magnitude of the shift from rural to urban character throughout the Periphery is the TATA Camelot project. Located in Punjab just

north of the capitol complex is a development proposed by TATA Housing Development Company (TATA Housing Development Company Ltd. n.d.). TATA, a large landholder in the Kansal Area, is proposing a 51.9-acre mixed-use complex offering 1,719 apartments. This proposal is a unique situation; the site is located in an area that Le Corbusier deemed "sacred" and a "no development zone" (Figure 38) (Le Corbusier 1950). The development was first contested

Figure 35: Image from TATA Housing Development Company presentation depicting future high-rise residential development northeast of the Capital Complex (TATA Housing Development Company Ltd. n.d.).

Figure 36: Proposed site of TATA Housing Development, located southwest of Shivalik Hills Reserve Forest and northeast of Capitol Complex (Google Earth 2014).

by the UT administration, seeking to uphold Le Corbusier's vision, but the court dismissed the case (Chalana 2014, 22). At this time, the project is held up in court under environmental review, but everything is pointing to its eventual approval. The example of TATA sheds light on the fact that the legal framework supposed to prevent this sort of development is insufficient (23).

Figure 37: GMADA 50-year phased development strategy with 16-km PCA and TATA site imposed by author (Greater Mohali Area Development Authority n.d., 16-25).

Another key aspect of the project is its location in a designated Agricultural/Tourism/Rural Area (A/T/R). In a 50-year phased development strategy, GMADA designates a large portion of the Periphery as a Primary or Secondary Urban Development Area, leaving the rest of the Greater Mohali Area designated as an A/T/R Area (Figure 37) (Greater Mohali Area Development Authority n.d., 16-23). One of the main principles behind the designation of A/T/R is protection from sprawl, yet GMADA has not stood in the way of the TATA Camelot project.

In the GMADA Regional Plan, these three different designations promise the application of innovative planning and design tools as a means to effectively respond to growth pressures. However, in the language of the plan promotes the continued expansion of Chandigarh and the focus is on the creation of Mohali as a world-class industrial, trade,

and institutional destination. The on-the-ground reality is that the periphery of Chandigarh is developing in a manner directly counter to the act originally intended to preserve it as a permanent, functioning agricultural greenbelt.

CONCLUSION

This chapter highlighted the on-the-ground reality that is the rapidly changing landscape on the periphery of Chandigarh, a landscape that has evolved out of the various self-interested states' liberal interpretations of the Periphery Control Act. Three different significant features were highlighted to tell the story of the depletion of natural areas, a shift in the rural way of life, and the significant development pressure on the urban edge. This rapid urban growth and development reflects the large-scale shift from a primarily rural Periphery of agricultural activities to a Periphery of an urban character.

5 | POLICY RECOMMENDATIONS

INTRODUCTION

This chapter presents policy recommendations for managing the periphery of Chandigarh. Each recommendation recognizes the problems at hand, and seeks to steer it in one particular direction. The objective of this section is to explore potential solutions, or alternative scenarios, as informed by the literature review and fieldwork. These solutions will be evaluated in regards to how they meet containment and preservation goals, promote development that is truly within the public interest, and respond to existing regional planning challenges.

Three solutions are presented, responding to these criteria to varying degrees. There is the "Do Nothing" approach, the "Expand the UT" approach, and the "Stated Mandated" approach. The outcome of this chapter, and by extent this thesis, is the selection of a preferred alternative based on how it meets the established criteria or, more specifically, a policy recommendation for managing the Periphery.

CRITERIA

The following three criteria are used to guide the development of policy recommendations and selection of the preferred alternative: achieve goals, promote public interest, and respond to challenges.

ACHIEVE GOALS

Does the recommended policy measure achieve the goals of urban containment and resource lands preservation? Urban containment goals have been discussed at various points throughout this thesis. Chapter two presented the general goal of urban containment, which is to create a clear separation between urban and rural land uses, and

the goals adopted by Oregon and Washington state growth management programs related to urbanization and resources land preservation (see Table 1). Chapter 3 presented the four main goals of the PCA, which primarily sought to maintain a clear urban-rural dichotomy and prevent unregulated development.

Continuing within this theme and adapting the aforementioned goals, recommended policy measures should achieve the following:

- *Goal 1: Urbanization.* Promote efficient land use by encouraging development within designated urban areas to reduce the conversion of agricultural and related rural land uses.

- *Goal 2: Functioning Rural Landscape.* Protect rural ways of life by preserving agricultural and natural resource lands, and promoting related rural uses/activities.

PROMOTE PUBLIC INTEREST

Does the recommended policy measure promote and accurately represent the public interest? This criterion is not concerned with the *what* of the "public interest" question. There is no consideration of how the land should be developed. Rather it is concerned with the *who*. *Who* is the public? Policy recommendations should ensure that if new development is justified as within the "public interest", the public's interest is accurately represented.

While there is no formula for public participation in the Periphery at this point, the voices of the people have not gone unheard. In 1995, Punjabi villagers' resistance to the New Chandigarh development project that would wipe out over two-dozen villages and active farmlands caused the Punjab and Haryana High Court to not approve the project (Chalana 2014, 17). This case shows that public input can work in the Chandigarh region if

the voices are loud enough, there is just not a formal process to engage citizen participation, to hear complaints, or challenge plans or decisions.

RESPOND TO CHALLENGES

Does the recommended policy measure respond to existing regional planning challenges? Chapter 3 identified three primary planning challenges plaguing the PCA: poorly coordinated or corrupted administrative bodies, the 1966 reorganization of Punjab, and mixed interpretations of the PCA in promotion of self-interests. Each of these challenges contributes to limited implementation success, whether of the PCA or subsequent regional planning efforts.

Implementation is certainly the biggest challenge faced by any recommended policy measure. There are several additional factors to address in regards to implementation. One, past regional planning approaches have seen limited success typically due to a lack of statutory power held by the planning authority. The inability to implement restricts outcomes. Two, urban containment may have limited appeal to a region that is experiencing rapid growth and increasing popularity. This stands in the way of actually establishing a revised planning strategy. Three, once a solution is implemented, it requires continued monitoring and intermittent revisions. It is in acknowledgement of these challenges that policy measures are recommended for managing the Periphery, but a renewed commitment to urban containment is also called for.

SCENARIOS

This section explores three alternative scenarios representative of a range of potential growth outcomes on the periphery of Chandigarh. The next section,

Recommendations, will select the preferred alternative scenario based on the three criteria and feasibility.

"DO NOTHING" SCENARIO

The "Do Nothing" approach is the most realistic scenario to be encountered on the Periphery. State, regional and local planning authorities would continue to plan for urban development as they are, taking advantage of Chandigarh's growing popularity as a regional center. The UT would fully develop as urban, retaining only the 0.9% of agricultural lands as indicated in CMP 2031. Lands that would hardly be considered rural with permitted land uses including garden centers and ethnic restaurants (Chandigarh Administration n.d., 342).

As GMADA and HUDA master plans are fulfilled, encroaching urban land uses would continue to push agricultural activities further out into the Periphery and threaten the rural way of life. Although one can easily argue that since the Periphery represents such a small fraction of the states' active agricultural lands, farmland preservation should not be an objective of regional planning efforts. However, there is no certainty of population growth. New development is speculative, rather than based on long-range population projections. This could lead to a collapse of the real estate market and depleted agricultural landscape. The PCA would continue to lose value and meaning leading to its eventual obsolescence, a direction in which the Periphery is currently headed.

"EXPAND THE UT" SCENARIO

The second scenario, the "Expand the UT" approach, presents a more utopian vision involving the revitalization of the PCA and acknowledgement of the Periphery's heritage as an integral feature of the historic master plan. The policy solution would be a directive of

the Central Government. The Central Government would redraw the UT boundary to encompass the Periphery Control Area, recognizing the initial short sightedness of not including the entirety of the Periphery within the UT under the 1966 state reorganization. The PCA would be amended to close loopholes related "planned expansion" and development within the "public interest" that have contributed to urban growth throughout the Periphery. New guidelines mandated by the Central Government, reflecting a revised approach to urban containment, would apply to the Chandigarh historic core, and the remaining functioning rural landscape of the Periphery.

The main objective of this approach is to recover rural lands within the Periphery from Punjab and Haryana, and restore the vision of the functioning rural landscape within an agricultural greenbelt initially held by Le Corbusier and his team. The new boundary would be redrawn to exclude the existing urban areas of Panchkula and Mohali. Punjab and Haryana may benefit in the long run from retaining urban areas in close proximity to Chandigarh, but may lose out on opportunities.

To prevent merely the displacement of problems, a larger regional strategy should be pursued along the lines of Ebenezer Howard's satellite social cities. New urban centers should be located beyond Chandigarh's greenbelt within their own zones of agriculture. The satellite cities would create a new regional network, eventually connecting to existing urban centers like Ambala, about 40-kilometers from Chandigarh, or Ludhiana, about 90 kilometers from Chandigarh. Each urban center, including those encompassed within the redrawn UT, should be developed according to Le Corbusier's principles of the vertical Garden City. New growth would be accommodated vertically in high-density towers, rather than horizontally, promoting the efficient use of land and encouraging the preservation of

open space. This would recognize current growth trends and steer hyper-development in a more responsible manner.

While this scenario maintains existing agricultural lands, it also acknowledges the Periphery as part of Chandigarh's heritage. Chandigarh, or a portion of it, may eventually obtain World Heritage Status. In 2006, India included it on the tentative UNESCO World Heritage List (Chalana and Sprague 2013, 199). As a critical feature of the Garden City concept and an essential element of Le Corbusier's Plan, the Periphery Control Area ought to be recognized as a part of the historic master plan – a fact that has not gone unrecognized among design and planning professionals (213). The incorporated urban areas of Panchkula and Mohali should be acknowledged as additional features of Chandigarh's living heritage, and the established regional network of satellite social cities would build upon Chandigarh's Garden City heritage.

The objective of this approach is to amend the PCA, rather than repeal. However, it is likely to meet strong resistance. Although it does retain the promise of implementation given the nature of an amended PCA as a federal mandate, it would be seen as impractical and unrealistic.

SCENARIO NO. 3: STATE MANDATED

The third scenario, the "State Mandated" approach, recognizes the PCA as an archaic concept and proposes implementing a state mandated program that would lead to the eventual repeal of the PCA. State mandated programs are desirable given their ability to ensure all communities, rural and urban, share the costs and benefits associated with growth management and containment policy. Relative to the former two, this scenario is founded in an active planning approach seeking to contain urban growth and preserve the

agricultural landscape. This approach is not presented as a viable option for the UT, given their limited supply of agricultural lands.

The directive would be at the level of the state rather than the region. While Punjab and Haryana hold significant interests in statewide agricultural activity, they stand little to benefit from restricting urban growth in the Periphery. The states stand more to benefit from urban development due to the economic opportunity presented by being in close proximity to Chandigarh.

This scenario is informed by the study of state growth management programs in the Pacific Northwest. One lesson gleaned is that effective growth management relies on a package of planning goals and techniques that reinforce one another. This revised approach would mandate statewide planning in accordance with a package strategies to better achieve outlined goals.

The desired outcome of this solution is the creation of a new piece of legislation that establishes overarching goals, policy, and strategies for implementation. With a renewed statewide commitment to urban containment and the preservation of agricultural lands, the arbitrary 16-kilometer PCA boundary would eventually be phased out. Regional planning authorities, like GMADA, would be required to amend their regional plans to conform to new state mandated containment policy. Urban growth, guided by smart growth principles, would be permitted within newly defined urban growth boundaries. A process informed by public input. Beyond which, recommended strategies would ensure the preservation of agricultural lands and related activities.

The concept of the Periphery Control Area may have lost its value, but only to be replaced by a more effective program seeking to achieve statewide goals of urbanization

and rural land preservation. The following section focuses on adapting this scenario and proposed policy solution for the State of Punjab.

RECOMMENDATIONS

The "State Mandated" approach is the preferred alternative. Table 2 presents a broad overview of how each scenario meets the criteria.

CRITERIA		SCENARIO 1	SCENARIO 2	SCENARIO 3
Achieve Goals	Urbanization	No	Limited	Yes
	Rural Landscape	No	Limited	Yes
Promote Public Interest		No	Potential	Yes
Respond to Challenges		No	Yes	Yes
Feasibility of Implementation		Yes	Potential	Yes

Table 2: Evaluation of scenarios.

This approach ignores the arbitrarily delineated Periphery Control Area, mandating state policy for managing growth. The effects of which will be experienced at the regional level, i.e. the Periphery. This section presents an adaptation of the state growth management program and urban growth boundary approach for the State of Punjab. However, this solution could be readily adapted for the State of Haryana.

APPLICATION TO PUNJAB

Circa 1950 Chandigarh was conceived to meet the need of a new capital for the State of Punjab. It was Punjab that established the 1952 PCA prior to any awareness of a future state reorganization. By implementing the PCA, Punjab displayed that they found value in urban containment, preserving the rural landscape, and planned growth. Roughly sixty-years later it is time to renew that commitment in a new piece of state legislation that integrates goals related to rural development, urban planning, and resource protection.

The successful renewal of a state commitment to urban containment and growth management is plausible due to the state's significant agricultural interests. While Punjab is

only 1.5-percent of India's geographical area, the state is responsible for about two-thirds of India's food grains procured annually, primarily wheat (Government of Punjab 2014). Punjab has a significant stake in the national agricultural economy; therefore, implementation of a state growth management strategy is in their interest. However, as such, the state stands little to gain from maintaining agricultural lands within the Periphery due to the real estate potential.

The recommended policy approach would ensure statewide benefits of urban containment and rural landscape preservation, beyond the PCA boundary. A new piece of state legislation would ensure that the functioning rural landscape is the result of active planning, not just an unplanned remainder under threat of urban encroachment.

Challenges

In addition to the aforementioned challenges to planning on the Periphery, to which these recommendations seek to respond, the State of Punjab presents its own set of unique challenges. These challenges pertain to the geopolitical complexity of the state, and are only briefly discussed here. Each state of India is divided into districts, like American states are divided into counties. Punjab is divided into 22 districts. Punjab can also be divided based on its six regional urban development authorities under the umbrella of PUDA. Additionally, there are metropolitan cities, townships and villages.

Each district would be responsible for planning in conformance with state mandated goals, particularly as they pertain to rural lands. The regional urban development authority would be responsible for planning for urban areas. While it may provide added administrative complications, the existence of regional authorities puts

Punjab in an advantageous position for they are perhaps better equipped to implement strategies within urban areas.

STATE OVERSIGHT & PROCESS

Oversight Committee & Stakeholder Involvement

Following the models established in the PNW, the Government of Punjab should establish an oversight committee consisting of members with shared interests in urban and rural development. The oversight committee would identify the overarching goals based on stakeholder feedback, and devise policies and strategies to implement these goals. Various public and private stakeholders would be engaged in the formation of the new law. Existing government departments should be included, such as Housing and Urban Development, Rural Development and village governing bodies (Panchayat), and Agriculture, and organizations such as PUDA and the Center for Research in Rural and Industrial Development, to name a few.

Goal Setting

Goals provide the foundation of the new piece of legislature. It is recommended that the previously listed goals pertaining to Urbanization and Rural Landscape be adopted. There are additional goals the committee will need to address to present a complete growth management strategy, such as public facilities, transportation, housing, recreation, economic development, and citizen involvement, but they are beyond the scope of this thesis. These are the statewide goals that will drive the local planning process, to be adopted as state administrative rules.

Inter-Jurisdictional Coordination

The new piece of legislation will require districts and regional planning authorities to plan in conformance with these overarching goals. Each District Plan will serve as the framework for directing growth, preserving agricultural interests, and resolving related issues. The regional urban development authority should be engaged in the designation of UGBs and urban related strategies, but it is the responsibility of the district to ensure coordination across the multiple levels of government.

Regional Planning

Regional responses to growth management often predate state growth management legislation and are later amended to respond to state mandates (Easley 1992, 16). This was the case in the PNW where today we see growth management mandated at the state level, but metropolitan growth management practices preceded it. Conversely, Punjab would enact state mandated goals and policy, and the local authority would be required to amend their current planning approaches to better address urban containment and rural landscape preservation.

Public Interest

Following the model of Washington's Growth Management Hearings Boards, the oversight committee would identify regions over which a singular hearings board would preside. Aligning these regions to the territories of the six established regional urban development authorities and expanding to incorporate remaining rural lands along District boundaries is recommended to avoid dissecting the state further. This regional board would hear issues related to non-conformance. The adopted goals would serve as the sounding board to which to validate land use decisions. The state would delegate planning

responsibility to the local district, but its up to the public to be responsible for the enforcement by contesting land use decisions. The idea that the PCA allows development in the public interest should be maintained, but the public should then be engaged in the process to determine what their interests actually are. A public participation process should be established.

Strategies & Techniques

The establishment of urban containment goals alone does not guarantee that land will be developed efficiently within it. Policy needs to be coupled with additional strategies and development regulations to aid implementation. The following recommended strategies would support overarching goals related to urbanization and rural landscape preservation. They also address the existing conditions identified in Chapter 4.

Recommendations are limited by the unavailability of land use data, the lack of information on parcel ownership, tenant versus owner farmers, and lot size means that recommendations need to be further nuanced. These limitations make it difficult to recommend site-specific development standards, for instance large minimum lot sizes or maximum densities that would protect rural open space.

Urban Growth Boundaries

Punjab should work with regional and local authorities to establish a UGB based on the land's capacity to accommodate projected population growth, and contain existing urban areas. The regional urban development authority would plan for urban areas within a UGB, while the District would plan for rural areas beyond the UGB.

UGBs should be drawn to exclude natural areas like the Shivalik Hills and reserved forests. Additional efforts would be required to identify environmentally sensitive areas

throughout the state. In the instance of the Periphery Control Area, the majority of existing urban areas are located on the Chandigarh alluvial plain, which is known for its fertile soil. Preserving this land for agriculture should be a topmost consideration when locating a UGB.

Furthermore, strategies for densification within urban growth areas should be based on an evaluation of current buildable lands to determine the land's capacity for growth, which would in turn drive the designation of tight UGBs. Land beyond the UGB would be designated as an Exclusive Agricultural Area (EAA), a Rural Activity Zone (RAZ), or a protected natural area.

Performance-Based Agricultural Zoning

EAAs would be supported through performance-based agricultural zoning measures. This model of zoning would demand specific agricultural performance standards that maintain the objective of the designation of EAA. This strategy would protect owner and tenant farmers on a range of parcel sizes, while ensuring active farmland is preserved throughout the Periphery.

The zoning language would be tailored to allow for a range of agricultural and related activities, including those previously addressed in Chapter 4 as observed through fieldwork: farming, animal husbandry, agro-forestry, and agro-industry related activities like production and processing. Industrial uses related to the production of building materials should remain as permitted activities, such as brick and lime kilns, since the objective is not to preclude existing activities that make up the functioning rural landscape. To that extent, a wider survey will be required to identify uses appropriate to be included

in an EAA. However, one additional objective of the EAA is to further restrict uses such as the "farmhouse"/wedding halls, or require them to maintain productive farmlands.

Rural Activity Zoning

In theory all land beyond the UGB would be preserved for agricultural and natural resource lands, but this is an impractical expectation. The landscape is dotted with rural villages. Rural regulations should not preclude existing activities that are already part of the functioning rural landscape. Therefore a RAZ should be established to encompass these existing land uses and activities.

The Rural Activity Zones would encompass existing villages; provide additional regulation pertaining to the "farmhouse" style of development; and respond to village sprawl. The RAZ would not prohibit agricultural activity. It would have fewer restrictions than EAA, but more land use restrictions related to urban growth and development than within a UGB.

CONCLUSION

While Le Corbusier's vision for a functioning rural Periphery may have been founded in overly romantic notions of rural India, its original objective has contemporary relevance for it is not far from the practice of urban containment in the PNW. The goal of urban containment policy is to distinguish between urban and rural uses, and in its essence the PCA sought to do that. However, implementing policy - like designating a greenbelt – was found to be just one step in a greater growth management strategy.

In Chandigarh, we found Le Corbusier's vision as the impetus for urban containment, whereas in the PNW, we found resource depletion and urban sprawl as the impetus. The former was found to lack strategies for implementation; the latter has been

implemented, tested and revised, and engages various strategies that have lead to successful policy implementation. Urban containment policy alone does not steer the type of development within or beyond its boundaries, it must be supplemented with additional strategies. Recommendations were developed for the State of Punjab and the Periphery based on lessons learned from the historical and contemporary practice of urban containment, particularly within the PNW.

LIMITATIONS & FUTURE DIRECTIONS

This thesis seeks to tell a complicated story through limited resources. While there exists a considerable amount of historical and critical literature on the urban core of Chandigarh (Jacobs 2007; Kalia 1987; V. Prakash 2002), there exists comparatively little literature on the Periphery Control Area (Chalana 2014). This thesis is focused on conditions of the Periphery as they are presented in the literature and observed through fieldwork. While the fieldwork presents an appropriate range of activity categorized in broader land use categories, there was only a limited time spent in the field.

The limited time in the field and the inaccessibility of land use data, such as parcel ownership, land use description, lot sizes, etc., restricted recommendations. There is room to further develop this thesis through increased contextualization of recommended approaches. For instance, the creation of an action plan that presents a more detailed outline of the necessary steps required for an Indian state to enact a growth management plan, or development standards that more accurately reflect Punjab land uses and activity. Additionally, this thesis recognizes past local and regional planning efforts on the periphery of Chandigarh, and acknowledges potential reasons for their limited success. It is in acknowledgement of these challenges that recommendations were produced.

REFLECTIONS

The functioning rural landscape should be the result of active planning and preservation, not just an unplanned remainder under threat of encroaching urban development. Punjab is responsible for roughly two-thirds of the country's food grains procured annually. This speaks to the nature of the state's rural and urban communities, residents who stand to benefit from increased regulation and protection of the rural way of life. Successful implementation of state mandated urban containment policy, goals and strategies would protect agricultural land uses and the rural way of life, supporting the people throughout the state dependent on the functioning rural landscape.

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APPENDIX A: GLOSSARY OF ACRONYMS

CISMeR 2021	Chandigarh Inter State Metropolitan Regional Plan for 2021
CMP 2031	Chandigarh Master Plan 2031
ISCR 2001	Inter State Chandigarh Region regional plan for 2001
LCDA	1973 Land Conservation and Development Act
GMA	1990 Growth Management Act
GMADA	Greater Mohali Area Development Authority
HUDA	Haryana Urban Development Authority
PCA	1952 Punjab New Capital (Periphery) Control Act; Periphery Control Act
PNW	Pacific Northwest; Oregon and Washington
PUDA	Punjab Urban Development Authority
UT	Union Territory