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Redeveloping Amherst Town Center: Sustainable Zoning and Design with Form-based Codes

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Redeveloping Amherst Town Center: Sustainable Zoning and Design with Form-based Codes

A Master’s Project Presented

by

Nathaniel J. Malloy

Submitted to the Graduate School of the University of Massachusetts Amherst in partial fulfillment of the requirements for the degree of Masters of Landscape Architecture

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Department of Landscape Architecture and Regional Planning University of Massachusetts Amherst
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Special thanks and love for Emily, whose [financial] support and optimism kept me motivated and inspired.
Today with 3-dimensional computer modeling and sophisticated mapping technology, a community can envision their future more readily and more realistically than in recent history. This software and technology can help communities plan to use energy-efficient construction, preserve open space, reduce dependence on the automobile, and increase the diversity, density and affordability of housing opportunities; these tools can help communities plan and develop sustainably. Many communities, however, continue to rely on conventional zoning and traditional land use techniques that cannot take advantage of these new resources—will sprawl ever end? Form-based codes have evolved in response to criticisms of conventional, Euclidean zoning and to utilize computer-aided drawings and models. Form-based codes are a radical approach to zoning as it primarily regulates the form of structures in relation to the street, public realm and other structures, while land uses are of secondary consideration. The flexibility of form-based codes provides the framework to integrate many sustainable development principles into a community’s zoning and land use regulations—form-based codes are a key component to a sustainable future. This project explores the feasibility of using form-based codes to help reinvigorate a portion of the town center in Amherst, Massachusetts, by identifying which design standards and dimensional requirements are most appropriate to transform the study area into a model of sustainable development that boasts mixed-uses, walkability, multi-modal transportation and integration of green infrastructure.
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CHAPTER 1
INTRODUCTION

A. Project Description—Planning and Designing a Sustainable Humane Habitat

The ideas of sustainability have reached an international audience and the term now encapsulates actions taken at the individual scale to international strategies that address global welfare. The Brundtland Commission of 1987 emphasized “sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations, 1987). Sustainability is also often expressed as improving the three E’s of society: environment, economics, and social equity (President’s Council on Sustainable Development, 1999). As the International Association for Humane Habitat (IAHH) emphasizes, sustainable development at a local level needs to include an integration of policies and design techniques that considers a settlement's core and its hinterland; a regional, multidisciplinary approach needs to be taken just to achieve a sustainable microcosm. In order to encourage planners and designers to grapple with issues of sustainability, the IAHH is sponsoring its sixth annual design competition. The competition embraces this regional approach to sustainability, asking that participants choose a site and region for analysis which will culminate in a design that responds to the area's social, cultural, economic and environmental context.

The design competition does not prescribe a site or define sustainability. Rather, each participant must choose a site to design that lies within the core-hinterland study area and after thorough research, create a development that is sustainable for the region. Since participants are given the latitude to define sustainability as it applies to their project, it is imperative that they have an intimate knowledge of their core-hinterland area to know its nuances and cultural underpinnings that cannot be gleaned from texts or images. This project will therefore focus on a study area in downtown Amherst, Massachusetts, taking advantage of my knowledge as a graduate student at the University of Massachusetts in Amherst and as an intern in the Town’s Planning Department. The study area is a location that citizens and local officials wish to see redeveloped into a more pedestrian-friendly, mixed-use area with affordable workforce housing and a vibrant street life of shops and plazas. In order to
achieve their community vision, the Town is investigating form-based codes. Unlike traditional, Euclidean zoning\(^1\), which primarily regulates land uses, form-based codes emphasize the physical form of structures without prescribing specific uses, and this strategy is a radical approach to development.

The design competition provides the appropriate framework to illustrate that increased density and mixed-use structures, a key component of form-based codes, are necessary to develop a vibrant, sustainable town center in Amherst or any community. It is also intended that this project will serve as model for future smart growth scenarios by articulating a design that integrates not only with the architecture and aesthetics of a small town center, but successfully shows how form-based codes can be used to increase affordable housing opportunities, increase economically viable in-town space for a range of businesses, and create a network of open spaces linked to pedestrian corridors.

**B. Background—Sprawl and Sustainable Design**

Nationwide, communities are becoming increasingly concerned about how current development patterns affect their quality of life. Low-density residential and commercial development which takes place in what was farmland, forests, or meadows— a phenomenon commonly referred to as sprawl— can lead to pollution of a town’s water supply, habitat fragmentation, and increased costs for building and maintaining new roads and services (Calthorpe, 1993; Langdon, 1994; Szold & Armondo, 2002). Surprisingly, zoning, our nation’s “most widely used and far-reaching form of land use regulation” (Hamin et al., 2007) encourages sprawl by segregating uses and dictating building shapes and sizes. The typical family has adapted to these low-density developments by taking an astounding ten vehicle trips per day (Roseland, 2005). In addition to increased traffic congestion, the

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\(^1\) In Euclid v. Ambler Realty (1926), the United States Supreme Court upheld single-use zoning in which incompatible land uses such as residential, commercial and industrial uses are separated into distinct, highly rectilinear zoning districts. This decision has served as a model for zoning ever since.
average size of a newly constructed single family home has increased from 1,500 square feet in 1970 to 2,434 square feet in 2005 (National Association of Home Builders, 2006). This transformation equates with increased dependence on non-renewable fossil fuels for basic utilities and social isolation as people retreat into their McMansions after the workday.

Planners, landscape architects and environmentalists have all formulated concepts such as 'smart growth' or 'sustainability' to address the salient impacts of sprawl—but only recently have such concepts gained a foothold in development patterns. A major obstacle to many of these solutions is the density of development, which is often prohibited by zoning. Density is conflated with high crime, low income and obtrusive architecture as seen in the housing projects of the mid-twentieth century that are being torn down; it is believed that density belongs in urban areas and not in the suburbs. Even though such organizations as the Environmental Protection Agency (EPA) and the Smart Growth Alliance explain that higher density developments are necessary to curb sprawl, promote vibrant affordable communities, and makes inclusion of renewal energy sources more cost effective, Americans are reluctant to embrace such solutions.

Using renewable energy and compact development are not new ideas, but the overarching theme to more recent concepts may be the inclusion of political and economic factors, which considers sustainability as “economic growth that consciously seeks to avoid wastefulness and damage to the environment and communities” (Gillham, 2001). One can also add the term 'ecological design principles' and 'green design' to the solutions as these guiding standards aim to reduce pollution and minimize the impact of development on the local...
environment (Calkin, 2005; U.S. Green Building Council). In order to achieve sustainable, smart growth, a comprehensive development process needs to be established that increases density to make housing more affordable (especially for the growing middle class), community open spaces more accessible to the pedestrian, and requires the use of renewable energy sources and green building techniques.

Professional affiliations, however, differ when it comes to using on-the-ground techniques that try to mitigate sprawl using sustainable design principles. One highly touted tool is the Open Space Residential Development (OSRD’s) (Arendt et al., 1994), which seeks to protect a portion the site’s open space, and has been used in various forms for nearly thirty-five years in Massachusetts. Recent research indicates that these developments provide many benefits such as protecting open space at no cost to the public; increased home values (Lacy, 1990); and it can provide pleasing environments that promote social activity (Austin, 2004; Kaplin, Austin & Kaplan, 2004; Ryan, 2002). Even though OSRD’s have preserved thousands of acres throughout the United States, critics argue that these developments do not prevent sprawl, but may actually contribute to it by scattering dense housing clusters into rural areas, thereby fragmenting habitat and reducing the ecological value of the open space (Daniels, 1997; Porter, 2002). Other criticisms also emphasize that it is not just the environmental impacts, it is the locale and form of the Open Space Residential Developments; there are no requirements that its location be limited to compact development areas or that it adopt a village-center form.

![Figure 4. Conventional subdivision](image1) ![Figure 5. Open space residential subdivision](image2)

(Source for images: Arendt, Randall. Conservation Design for Subdivisions)

Even noteworthy solutions to sprawl such as Transit-Oriented Developments (TOD’s), new urbanism, and the newly created Leadership in Energy and Environmental Design (LEED)
certification for neighborhood development have their limitations. Transit-Oriented Developments are new or redeveloped communities with medium to high density concentrated within walking distance (typically 2,000 feet) of significant modes of public transportation. New urbanism is a design philosophy that draws upon neighborhood characteristics from the early 20th century, especially the pedestrian-friendly aspect of narrow tree-lined streets with front porches, small block size, accessible storefronts and opportunities for moving about the community without the automobile. Leadership in Energy and Environmental Design is a national program that certifies projects as being sustainable if they meet criteria from comprehensive design guidelines for a range of elements, from architecture to site planning.

A significant drawback to these concepts, however, is that they may exclude rural and small-town developments with their strict guidelines for infill development, housing density, street networks and transportation accessibility. It appears that such solutions are incompatible in most rural and suburban communities. For instance, TOD’s may be the optimal growth strategy in southern California (Calthorpe, 1993) or the suburbs of major cities where the population density and physical infrastructure make it economically and socially viable, but are they applicable in Amherst, Massachusetts? It can be argued that the typical New England town or village center is the progenitor of TOD’s, but in the 21st century, many rural and semi-rural towns may not have the physical & public infrastructure to support such large mixed-use developments.

Recently, however, a new approach to zoning has been gaining prominence with theoreticians and practitioners alike: form-based codes. Traditional Euclidean zoning strictly regulates land uses and the intensity of use by focusing on such things as separating uses, setbacks, the number of dwelling units per acre, parking ratios and floor area ratios; it is not necessarily concerned with the physical form of structures and the community. Form-based codes, on the other hand, are not focused on individual dimensions but use dimensional codes based upon the form of buildings. Communities may use form-based codes by adopting “form districts” within the conventional zoning framework or create new stand-alone

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2 The ratio of the total floor area of a building to the total land area of the site.
districts. Regardless of how it is administered, form-based codes create a unified, identifiable urban form by effectively addressing the relationships between such things as building facades, pedestrian corridors, and vehicular traffic. Just as important, form-based codes are applicable both to new development & redevelopment, and can be tailored to work in cities or small towns. Amherst is investigating whether areas in their town center can be revitalized using form-based codes as this system typically results in high quality design without the hassle of extra permitting or design review now required to build sustainable compact, mixed-use developments.

As sustainable development principles increase in popularity, so too has taking a regional approach to land use planning. Each zoning or development solution when examined in isolation from other planning tools and techniques fails to grasp the 'bigger picture'. The benefits of a regional approach are that it can use various tools and concepts to achieve the broader goal of curbing sprawl, limiting irresponsible development patterns, and addressing issues commonly ignored by land use policies and zoning such as renewable energy, food production and increasing cultural/social capital.

C. Context—Amherst, Massachusetts

In Massachusetts, between 1985 and 1999, forty acres of land were consumed by development everyday. “Almost 9 out of every 10 acres consumed go to residential development, with 65% of that used for low-density, large-lot development” (Mass Audubon, 2003). A significant challenge in Massachusetts to implementing statewide land use plans is the statutory power embodied in each of the commonwealth's 351 towns and cities through 'home rule'; state and regional plans have minimal effect when neighboring communities can have disparate, even competing, land use regulations. Massachusetts has created a very accessible smart growth
toolkit with progressive zoning standards and increased density requirements, financial incentives for developers, and emphasized the importance of open space, but without recourse to mandate these plans, towns must take their own measures to curb sprawl. Towns across Massachusetts need new planning tools that support residential growth and minimize its negative impacts, especially in western Massachusetts and the Pioneer Valley where prime farmland and woodlands are threatened by development.

Although Amherst is located approximately 90 miles west of Boston, it has seen the effects of sprawl: a decrease in prime agricultural land, skyrocketing home values that out-pace area earnings, financial strain on schools and public services, traffic congestion, decreased air quality and much more. The sprawl Amherst experiences, however, is not generated by the outward expansion of the Boston suburbs, but is a result of more local, internal influences: people moving out of the small cities within the region, families building new homes and immigration of new residents. Located in the scenic Connecticut River Valley which boasts working landscapes and small, rural towns, Amherst is a combination of bucolic open space and traditional village centers that are in stark contrast to the area's commercial strip malls and large-lot residential suburbs. The location of the University of Massachusetts’ campus in Amherst increases the town’s population to approximately 35,000 residents (U.S. Census Bureau, 2000); in essence, creating a small city that tries to function following the traditions of a small New England town. In 2000, enrollment for the three higher education institutions in Amherst totaled 26,400 students, and although not all of these students live in town, “those that do have a significant impact on the Town’s population composition” (Amherst Department of Planning and Conservation, 2007). Town officials recognized these incongruous relationships and its causal development pressures decades ago, implementing a suite of alternative development standards and using progressive zoning policies that emphasize the protection of open space, active agriculture and community character. Yet even these measures have not been effective at creating a sustainable community.
The foresight to initiate alternative development strategies has not helped Amherst avoid an astronomical increase in real estate value or experience a dramatic increase in sprawling residential development. As with many Massachusetts communities, Amherst has seen a significant increase in the median home value which nearly doubled in five years, from $177,000 in 2000 to $323,100 in 2005 (Page & Makker, 2006). The housing market peaked, however, in 2005-06, such that current trends indicate stagnant home prices. Nonetheless, the over inflated real estate market has made new home purchases financially unfeasible for many professionals, especially schoolteachers, firemen and policemen. At the same time, Amherst has been trying to attract businesses and industries to town that can help offset the reliance on residential property taxes to finance public services and maintain necessary town infrastructure. In response to these concerns, the town’s Planning Department is forming an updated Comprehensive Master Plan with extensive input from the community; Amherst is taking the right steps to develop a sustainable town plan.

Since there is a long tradition in Massachusetts of individual communities implementing zoning and land use controls, they may be reluctant to completely abandon traditional zoning
and development standards. Form-based codes are applicable in such communities because it can be used as a stand-alone district, or it can be integrated with current zoning standards to create a hybrid land use policy. The Town of Amherst hopes that form-based codes can be used to achieve smart, sustainable development and can help the future Amherst reflect its unique community vision rather than emulate typical suburban sprawl.

**D. Masters Project—Goals and Objectives**

The primary goal of this Masters Project is to propose a conceptual design in Amherst’s town center that illustrates how the principles of sustainability, smart growth and form-based codes can be integrated to revitalize the town center and be used as a model for other small towns.

The International Association for Humane Habitat Design Competition: *Planning and designing a micro-cosmic sustainable humane habitat*, requires each participant to develop a detailed site plan after researching the social, cultural, economic and environmental characteristics of the core and its hinterland. This project proposes to satisfy those requirements and help Amherst realize that a compact, mixed-use town center is possible. As per the design competition requirements, the site-hinterland analysis will be accompanied by a design that must be on a site no larger than 25 acres, can support a community of at least 1,000 people and 250 jobs. The expected number of residents may seem extreme for Amherst, yet it is the intention of this competition to challenge traditional concepts of density and land use by articulating a new paradigm for sustainable development.

The concepts of sustainability and smart growth will be incorporated into the design at the conceptual site planning and land use scale, while specific detailed applications will be researched and described in the literature review and project analysis. The final conceptual plan of this project will show that a dense, compact mixed-use development can revitalize a small town center by maximizing connections with the surrounding community, especially the University of Massachusetts, by emphasizing pedestrian-friendly streets and paths, and by increasing the diversity and affordability of in-town housing and business opportunities. It is hoped that this project will help the town determine if form-based codes are the most
appropriate planning tool necessary for the sustainable redevelopment of Amherst center.

Conducting the project in Amherst is of particular significance for many reasons, including the following: (1) critics claim that Massachusetts has land use regulations unique in the nation that impede the use of sustainable principles, (2) Amherst faces constant development pressure, and (3) communities across the state need design examples that help assuage the fear of increased density and mixed-use developments.

The specific project objectives are as follows:

**Objective 1:** To examine current concepts and theories of sustainability and smart growth to determine their appropriateness for small town redevelopment.

**Objective 2:** To articulate a conceptual design that integrates form-based codes and sustainability that can be used as smart growth model for small towns.

**Objective 3:** To propose a design solution that revitalizes a town center by creating a more pedestrian-friendly, multi-modal, mixed-use area with affordable workforce housing and a vibrant street life of shops and plazas.

**Objective 4:** Evaluate Amherst’s Mixed-Use Infill District Ordinance and determine if form-based codes are the most appropriate planning tool for the sustainable redevelopment of Amherst center.

**E. Methods**

The approach for this project used a combination of research and creative design processes. In order to understand how sustainable design is defined and how it is integrated into actual developments, research was conducted on the history of development and land use policies in the United States, especially Massachusetts. Relevant literature, contemporary planning and landscape publications, texts, and phone interviews were used to achieve this objective. Once the general development trends were identified, alternative development strategies and concepts of sustainability were examined through review of environmental design manuals.
and contemporary publications, phone interviews, and two case study projects that helped elucidate sustainability and form-based codes in practice. This step helped show how sustainable, ‘green’ design evolves from a conceptual land use policy to on-the-ground techniques. Most importantly, the research determined that sustainable design can curb sprawl while preserving town character and actually increasing the diversity and vibrancy of a community.

After the broader, national scale issues were researched, the core-hinterland area was determined by assessing the geographic, socio-economic and cultural characteristics of the area surrounding Amherst. With Amherst as the core, the hinterland was identified as the southern Pioneer Valley, a distinct region in western Massachusetts, which can be seen in Figure Eleven. In order to understand the core-hinterland study area, the New England region and the state of Massachusetts were analyzed for general trends in land use and economics. State-level polices & initiatives, political trends and socio-economic data were also researched. A more thorough regional (hinterland) analysis followed, making use of existing demographic reports, market analyses, environmental studies and other relevant publications to identify the most practical housing and commercial solutions for Amherst. This research helped produce an economically viable and socially responsible design.

The Town of Amherst’s zoning regulations, Planning Department reports, and Master Plan documents were utilized to determine the feasibility of sustainable, smart growth in town. The site analysis examined such items as pedestrian and vehicular networks, land use
combinations, connectivity with the local amenities, and how sustainable design could create a new architectural aesthetic that revitalizes the town center.

The design phase made use of conceptual diagrams, site plans and sections, computer-aided 3-dimensional simulations and sketches. An iterative process helped refine the design to be more responsive to site conditions and regional factors such as employment indicators, levels of affordable housing, and who would be prospective users of the site. A comparative analysis was used to rate and evaluate three design scenarios that that used varying dimensional and design standards of form-based codes. This comparative analysis helped inform an evaluation of the preliminary Mixed-Use Infill District ordinance drafted as part of the master planning process in Amherst to determine if its dimensional requirements, massing, circulation recommendations and targeted land uses are most appropriate for the town center.

**F. Delimitations**

The term sustainability encompasses many aspects of design and planning; it is an umbrella term flexible enough to accommodate all types of development. This project realizes that a truly sustainable design may be an impossible endeavor due to the complexity of achieving social, economic and environmental equity—the three E’s of sustainability (The President’s Council on Sustainable Development, 1999). This project will examine sustainability by addressing major development issues of land use, transportation, open space networks, affordable housing, storm water management and increased density. Even affordable housing has many definitions that encompass different socio-economic sectors of the population. A recent trend is to differentiate between affordable housing and workforce housing. This research will define affordable housing as being financially feasible for a person or family earning less than 80 percent of the area median income (AMD) as determined by the Secretary of the U.S. Department of Housing and Urban Development (HUD). Workforce housing typically accommodates households earning between 80-120 percent of the area median income.

In addition to defining a nebulous topic as sustainability, this project will be conducted
within the political and economic environment of Massachusetts where necessary zoning reform has been unable to gain a foothold. The results of the research, although hoped to be feasible within the existing regulatory framework in Massachusetts, may require that the state reexamine their policies. Critics of the 'home rule' doctrine in Massachusetts may argue that statewide reform is necessary to produce smart, sustainable growth. Urban growth boundaries as found in Oregon would be an obvious solution, where areas outside the urban core are down-zoned to one unit per 20-40 acres while inside the urban core, form-based codes, financial incentives and streamlined permitting attract developers. Realistically, town residents and many state and local officials would vehemently oppose urban growth boundaries with their severe land-use restrictions; it is contrary to the political and cultural foundations of Massachusetts. For instance, a proposal for 20-acre zoning to encourage forestry operations in the heavily wooded town of Shutesbury, which borders Amherst on its Northeast corner, was defeated after vociferous arguments. This project, therefore, does not propose such broad, radical growth management solutions as abandoning zoning, but will use design techniques that could potentially be adopted by the Town of Amherst.
A. Current Development Patterns—Land-Use Policies and Sprawl

Peter Calthorpe writes, “Settlement patterns are the physical foundation of our society and, like our society they are becoming more and more fractured. Our developments and local zoning …increasingly isolate people and activities in an inefficient network of congestion and pollution…” (Calthorpe, 1993). He assumes that zoning regulations and our current development patterns of sprawling land uses are the main factors leading to a fractured society; and that they need to be seriously examined to manage exponential growth predicted for the 21st century. We are so accustomed to separate land uses, such as distinct residential and commercial zones, that many communities cannot envision an alternative development scenario that would add desirable amenities such as public open spaces, a biking trail or a pedestrian-friendly mixed-use town center.

It is important that zoning reflects a community's goals because it is the most widely used land-use control in the United States. Zoning is typically administered at the local level, shaping development patterns by dividing a community into districts in which certain land uses are allowed by-right, allowed conditionally, or prohibited. It is common for zoning districts to separate seemingly incompatible land uses so that residential, commercial and industrial uses are not integrated, but confined to their specific district and geographic area (Gillham, 2001). Zoning also regulates building intensity with the intention of limiting the density of a development. It achieves this standard by requiring minimum lot sizes, by limiting how many units are allowed on each lot, with parking restrictions, and by the floor area ratio. The floor area ratio (FAR) is a multiplier: if the FAR is five, then the building can be five times the area (in square feet) of the lot, such as a single five-story building covering the entire lot or ten floors covering half the lot (Hamin et. al., 2007). Zoning also prescribes dimensional and bulk restrictions that regulate the massing of buildings through setbacks (the distance from the street to the side of the building) and height limitations.

As a very powerful land use control, zoning should be a flexible, adaptable tool that can
accommodate evolutions in society, technology and culture, without losing sight of a broader, long-term goal; a tool used in combination with other planning strategies. Zoning ordinances provide for a minimal standard of living (health, safety and public welfare) by organizing uses spatially and integrating various systems needed to keep populated areas functioning. “The legitimacy of zoning rests on the legal concept of the police power. That perhaps misleading term refers to the right of the community to regulate the activities of private parties to protect the interests of the public” (Levy, 2006). Historically, zoning and planning policies were based less on cultural traditions than on ‘objective’ sciences such as occupancy standards, wastewater management, and traffic congestion. Initially, the plans worked to help organize land uses and augment sanitary reform in urban areas. However, as technologies improved, zoning did not change, but relied on antiquated standards even if they were not the optimal strategy needed to have a well-functioning society. In the nascent United States, for instance, engineers and surveyors developed city plans based on a gridiron street layout that systematically spaced buildings with uniform setbacks (Juergensmeyer and Roberts, 2003), but did not mimic organic settlement patterns of European villages. This pattern dominated city development for decades even if a more efficient system could have increased green spaces or accommodated growth by encouraging the familial organizations of different cultures.

In a landmark case, the Village of Euclid vs. Ambler Realty Company, 1926, the U.S. Supreme Court set the precedent for single use zoning when it upheld the village's zoning ordinance that prohibited a commercial use in a residential zone. Prior to the enforcement of single-use zoning and planning policies, American towns and residences took shape based on locations of employment centers, schools, food production, civic centers—but may have looked like a messy hodgepodge of uses and structures. “The City Beautiful Movement, like the Sanitary Reform Movement, was oriented to physical improvements to rectify a
perceived evil: the lack of order and cleanliness in American towns” (Juergensmeyer and Roberts, 2003). However, the idea to improve towns did not include zoning or land use regulations; there was no spatial component to the clean up. The movement to clean towns was grounded in basic improvements such as sanitary standards, stable road surfaces and organizing garbage disposal, but without taking a holistic approach and looking at land use patterns, improvements may have been incongruous with current uses of a place.

New York City enacted the first modern zoning ordinance in 1916 that created single-use zones that separated residential areas from retail and industrial uses in an effort to keep family life safer (Juergensmeyer and Roberts, 2003). The zones also established minimum lot sizes, setbacks, and building height as proportion of street width to prevent areas from being continually cloaked in shadow. The zoning districts were generally accepted because they “tended to validate existing land use patterns by including them on the zoning map, and also provided the opportunity to over-zone for profitable industrial and business uses” (Juergensmeyer and Roberts, 2003). New York City may have responded to the conditions 'on the ground' when they implemented their first zoning ordinance, but it also encouraged land speculation by limiting developable land to specific districts. Developers were eager to exploit the burgeoning commercial and housing markets within these new zones making “it difficult to implement the open space and civic design elements of city plans such as those for Philadelphia and the District of Columbia” (Juergensmeyer and Roberts, 2003). The gridiron street layout and systematic organization of early American cities encouraged land speculation even if that was not its original intent. In such a culture where monetary rewards are highly valued, it seems that endeavors which increase social capital and intangible benefits, are less likely to be implemented—and it appears on the surface that this is encouraged by zoning.

Cities and governments soon realized that zoning should be accompanied by a comprehensive plan, and therefore passed the Standard City Planning Enabling Act of 1928. The passage of the Act was to ensure an inclusive approach to land use regulation and managing a community's future growth. However, it

“contributed to the confusion over the differences between city plans and zoning
ordinances, by stating that the plan should include a zoning element. As a result of this confusion and because of the growing interest in zoning, many communities prepared and adopted zoning ordinances without ever making the general, comprehensive plan upon which zoning was supposed to be based.”

— (Juergensmeyer and Roberts, 2003).

City plans were neglected as landowners became embroiled in zoning decisions that affected individual properties; a piecemeal approach to land-use planning was born. Although comprehensive plans and zoning helped organize land uses, it also increased America’s zeal for private property, which proliferated after World War II. Residential development outside urban areas was fueled by a variety factors, most notably mortgage subsidies and tax deductions through the Federal Housing Authority and Veterans Administration, increased dependence on the automobile, and substantial transportation subsidies through the federal Interstate Highway System which helped construct miles of roadway (Benfield et al, 1999; Duany et al, 2001; Hall and Porterfield, 2001; Platt, 2004). The rate of development skyrocketed such that “every year from 1947 to 1964, housing starts would exceed 1.2 million” (Platt, 2004). Most, if not all of the development, was detached single family homes; sprawl was born.

The growing suburbs transformed farms and forests into enclaves of middle-class workers who fled city centers. The suburban population in the United States exploded in the latter half of the twentieth century, from 55 million residents in 1950 to over 141 million in 2000 (Platt, 2004). As families moved further away from city centers, lot sizes as dictated by zoning, increased correspondingly. Surprisingly, our nation’s land use policies and local zoning regulations encourage sprawl by segregating uses and subsidizing homeownership. In recent years, however, as wages and the dollar’s purchasing power have remained stagnant (Emmons, 2000), homeownership has become a financial struggle for the lower and middle income groups (Grunwald, 2006). Zoning typically requires such large lots that it has become ingrained in development patterns. Higher densities that could alleviate many effects of sprawl are not allowed and not accepted; it is believed that density belongs in an urban area and city centers.

The prevalence of large-lot single-use zoning translates into depletion of natural resources as
land is rapidly developed; even though the “nation's metropolitan population grew by 17% between 1982 and 1997, urbanized land grew by 47%” (Platt, 2004). “Communities are literally zoning out traditional patterns of settlement, such as compact businesses in urban centers” (Campoli et al, 2002). The identifiable characteristic of many American towns was a commercial and civic center within walking distance of the residential neighborhoods, regardless if the town was rural or more urban (Calthorpe, 1993). The vibrant downtowns of older cities that so many people enjoy visiting could not be developed under conventional zoning; the mix of uses, the density, and the limited setbacks makes such desirable places illegal to build today. By separating land uses, zoning also had the unintended consequence of creating strip malls, commercial centers and business parks isolated from residential areas accessible only by automobile. Our dependence on the automobile influenced the design of whole communities where collector streets in residential subdivisions feed into larger, faster moving streets (lined with commercial development) and then to major highways—there is limited opportunity for pedestrian or cycling circulation (Duany et al, 2001; Hall and Porterfield, 2001). Sprawl subjugated pedestrian circulation from walking along mixed-use town centers to scurrying across large, vacuous parking lots surrounding ‘big box’ retail stores.

Figure 13. Big-box commercial development along Route 9 in Hadley, Massachusetts
(Source: http://maps.live.com)

These development patterns, which Peter Calthorpe finds detrimental to the social well being of our society, have many negative environmental, economic and social impacts that are all interrelated. A major obstacle to reshaping sprawl, however, is that after decades of such unprecedented growth, it is the dominant development pattern throughout the entire United States. In 2000, approximately 50 percent of Americans lived in suburbs and this percentage
is only expected to increase (U.S. Census Bureau, 2000). The average American moves every six years (Duany et al., 2001), a continuous cycle where people move to the fringes of suburbia only to reiterate the development patterns which they just left. Sprawling residential suburbs and office parks are so ubiquitous that they are categorized as 'edge cities', 'bedroom communities' and “older suburbs could even be considered full-fledged cities but for their proximity to a much larger city” (Platt, 2004). Andres Duany, in Suburban Nation: The Rise of Sprawl and the Decline of the American Dream, emphasizes five main characteristics of sprawl:

1. Homogeneity—large areas of distinct land uses separated from one another,
2. Shopping centers (Strip malls and big box stores) only for shopping and separated from residential uses,
3. Office parks accessible by automobile,
4. Civic buildings relegated to the periphery of communities; no longer a focal point, and
5. Roadways—a mosaic of road networks.

These five characteristics cannot be taken lightly when assessing the effects of sprawl. Rural sprawl for instance, is seen as the worst kind of sprawl because of habitat fragmentation due to the loss of farmland and open space from low-density development, increased water pollution, and unmanageable traffic congestion (Buchan, 2004; Silberstein & Maser, 2000). Furthermore, the American ideal of freedom through owning a car has resulted in thousands of miles of roadways that encourage unnecessary driving: the average American takes ten car trips per day (Roseland, 2005). Between 1978 and 1998, the number of vehicle miles traveled increased four times faster than population growth, illustrating how automobile dependent our society has become (Porter et. al., 2002). This staggering figure corresponds to dramatic increases of greenhouse gas emissions, reduces time spent with family or exercising, and it means Americans consume exorbitant amounts of fossil fuel and other nonrenewable energy sources. Approximately 70 percent of the oil consumption in the United States is used for transportation (Taylor, 2006), while motor vehicle emissions account for 57 percent of all carbon dioxide emissions (EPA, 2001). Roadways and impervious surfaces also pollute waterways: “often storm-water from cities and suburbs—together with agricultural runoff containing chemicals and animal wastes—constitutes a greater hazard to water quality than factories and other specific sources do” (Lowe, 1991).
The social and economic ramifications of sprawl compound the environmental impacts of this low-density development.

Social inequities blossomed in the 20th century as middle class residents fled inner cities, which became home to less affluent citizens. As residents fled the city, businesses and commercial centers followed, leaving the urban core rife with unemployment, failing infrastructure, declining school systems and increasing debt needed just to keep the city functioning (Benfield et al, 1999; Calthorpe, 1993; Duany et al, 2001; Hall and Porterfield, 2001; Platt, 2004). The central cities and once vibrant business districts are vacant after the workday, leaving nearby residents with little opportunity for socializing. It also leaves those without access to an automobile or public transportation, such as the elderly or low-income families, isolated from livelier, economically viable areas. Even within the suburbs, income classes are segregated by lot or house size, or with more flagrant measures such as gated communities (Duany et al, 2001). The cost of living has increased so much that a 2000 report by the National-Low Income Housing Coalition (NLIHC) found that a full-time minimum-wage earner could not afford fairmarket rent for a two-bedroom apartment in any town or city in the United States.

A survey from Disney World reported that park visitors spend only three percent their time on rides, while the majority of their time is spent walking around and enjoying what suburbia does not offer: social space (Duany et al, 2001). The lack of social space may be attributed to the spatial pattern of sprawl where the homes and civic buildings do not frame spaces and streets as they do in older neighborhoods (Calthorpe, 1993; Hall & Porterfield, 2001); there is not a hierarchy of spaces and streets such that way-finding and place making are extremely difficult. One critic of sprawl concludes that if the roads and parking were taken away and we “just saw the footprint of homes and structures, it would be hard to tell where the roads were” (Campoli et al, 2002). Just as urban centers have their critical issues, suburban development also isolates individuals and makes community activities almost impossible. The indiscernible pattern of public and private spaces, the separation of uses, and the lack of a cohesive pedestrian network mean that for many in the suburbs, they are prisoners in their oversized homes.
Recent studies indicate that 20 percent of the average U.S. Household budget is spent on transportation, not including pollution and time spent commuting. Furthermore, the average price of a home in the United states is a much larger percent of annual income than just a few decades ago—many researchers explain that the average household now spends more than 30 percent of its income on housing. The U.S. Department of Housing and Urban Development (HUD), however, defines affordable housing as spending no more than 30 percent of income on housing. This troubling statistic is exacerbated by the reality that nearly two-thirds of Americans are homeowners with many in a financially unstable predicament. The average household spends approximately 50 percent of its budget on housing and transportation alone, leaving minimal resources to prepare for a child's education or to save for retirement (Calthorpe, 1993; Benfield et al, 1999). Even as individual households may struggle to keep up with the rising costs of sprawl, towns and cities are faced with numerous obstacles.

The undeniable costs of sprawl strain public budgets as municipalities struggle to build new infrastructure to reach the expanding suburbs, increase the capacity of public schools and augment public safety services. The tax revenue generated by sprawl rarely offsets the economic and social effects of such development. As new infrastructure is built to accommodate such exponential growth, more efficient improvements such as light-rail train service, preservation of open space and protection of natural resources are often overlooked, due to upfront costs and the time required developing a thoughtful community plan. Just as alarming, however, is that existing infrastructure and buildings are failing, requiring
absorbent amounts of maintenance or replacement costs that compete with moneys spent in the sprawling suburbs.

Sprawl also encourages a consumer driven society where products are used once and then thrown away; a through-put cycle as opposed to life-cycle where items are reused and recycled. It has been estimated that “for every 100 lbs of product manufactured in the United States, there is 3,200 lbs of waste created” (Hawken, 1997). In addition to individual actions that contribute to sprawl and climate change, the built environment and existing infrastructure increases pollution dramatically: U.S. buildings account for 39 percent of total energy consumption, 71 percent of electricity consumption and 39 percent of carbon dioxide emissions (U.S. Green Building Council). Unfortunately, renewable energy’s share of the market is approximately two percent, even though the technology and payback period have greatly improved in recent years (Homsy, 2007). This means that 40 percent of the United States’ greenhouse gas emissions comes from electricity generation (Homsy, 2007).

With respect to single family home construction, 89 percent of new homes built in 2005 had central air conditioning, only four percent of homes were built with 1 ½ baths or less compared to 41 percent in 1975 and homes are extremely large, requiring more energy and material to build and maintain (National Association of Home Builders). These are troubling statistics considering that more than one million new homes are constructed each year in the United States.

We Americans are such great consumers that scientists recently developed the 'ecological footprint' as a measure for how much space is needed to produce what a person, region or nation consumes. It is a generic measurement that emphasizes
the environmental impact of populations and it is a useful indicator for the consumption and waste patterns of countries. It is estimated that the current ecological footprint for the average American is twenty-four acres compared to eleven acres per capita in Japan and six acres per capita in Brazil. Although there are limitations to the ecological footprint analysis, it shows general trends. One for instance, is that if the current population consumed as much as the United States, it would take five Earths to produce the amount of necessary resources (www.footprintnetwork.org). The ecological footprint analysis also shows that countries such as the United States, Canada, and Kuwait need to reduce their consumption of non-renewable resources if we wish to maintain our current standards of living with an exponentially growing world population.

The U.S. Census Bureau estimates that in the next fifty years, the population of the United States will increase from approximately 300 million persons to over 400 million people; an almost unimaginable amount of growth with two-thirds of it expected to occur in outer suburbs (Nelson & Lang, 2007). If the current development patterns of sprawl and through-put consumerism continue, we will quickly deplete natural resources and threaten thousands of acres of farmland and forests. It is estimated that by 2040, almost as large an area will become urbanized as in the whole history of the nine largest megalopolis areas in the United States (Nelson & Lang, 2007).\footnote{The Northeast, Great Lakes, Piedmont, Florida, Texas Triangle, Front Range, Sun Corridor, Northern California, and Southern California} It is also important to consider that the family structure prevalent after WWII has changed from a nuclear family with an average household size of over three persons in 1950 to today, where household sizes are falling and are estimated to fall to just under two persons in the next fifty years (U.S. Census Bureau, 2000). Although the number of people per household has fallen, the size of

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\footnote{The Northeast, Great Lakes, Piedmont, Florida, Texas Triangle, Front Range, Sun Corridor, Northern California, and Southern California}
the average home has increased dramatically, from 1,500 square feet in 1970 to 2,434 sq. ft. in 2005 (National Association of Home Builders, 2006). This transformation equates with increased dependence on fossil fuels for basic utilities, the depletion of non-renewable building materials, and social isolation as people retreat into their McMansions.

**B. Curbing Sprawl—Sustainability and Smart Growth**

Twenty years ago, the Brundtland Report emphasized sustainable development that “must not endanger the natural systems that support life on Earth: the atmosphere, the waters, the soils, and the living beings” (United Nations, 1987). The report also stated that consumption patterns need to be ecologically responsible so that future generations can enjoy the same resources as people today. That report is even more pertinent now because we are undeniably depleting resources faster than they can regenerate (Kenny & Meadowcroft, 1999). The definition highlights the interrelated aspects of sustainability and it “raises ethical, social, ecological and economic questions” (Moffatt et. al., 2001). Most importantly, the 1987 report helped people understand sustainability as a process, not just an end goal, and that a holistic approach is necessary to solve our current patterns of development and consumption; sustainability provides a framework to solve future problems. (Kenny & Meadowcroft, 1999).

The systems approach enables various policies and programs to have the same goal and objectives, but varying strategies to achieve those same objectives (James & Lahti, 2004)—thus creative, competitive solutions will spur better strategies. Even with advanced technology and more efficient systems of production, sustainability demands that we continue to question our behavior and institutions that guide society. Although a more fuel-efficient car will reduce greenhouse gas emissions and consumption of fossil fuels, the more problematic issue of automobile-dependence may be overlooked. Using a sustainable approach will help elucidate alternatives to vehicular travel, such as rapid transit improvements, integration of bicycle trails in a community, or mixed-use centers that combine businesses with homes, eliminating many reasons why people own cars.

Sustainability is process oriented and strives to minimize our impact on the environment,
whether it is the social, economic or ecological environment (Benedict & McMahon, 2001; James & Lahti, 2004). Sustainability, however, is a broad term that is difficult to narrowly define and equally difficult to measure. Various indicators have been developed to gauge the success of policies and actions in order for general patterns to become apparent. The ecological footprint, mentioned earlier in this report, is one indicator of sustainability, and helps clarify which nations and regions need to reduce their consumptive behaviors (Moffat et al, 2001). Using ecological footprint—which measures the total area required to maintain a given population at an average resource per capita consumption rate (Moffat et al, 2001)—corresponds to human behavior, which scholars refer to as “patch disturbers”; we greatly degrade a central area and disturb areas around the core to a lesser degree (Kenny & Meadowcroft, 1999). A commonality using all indicators, however, is that the United States consumes more per capita than any other country (Cooper & Vargas, 2004; Moffat et al, 2001). As a process, sustainability needs to be a multi-disciplinary approach that examines issues at a range of scales, from individual and site specific recommendations to international policies (Benedict & McMahon, 2001; James & Lahti, 2004; Roseland, 2005). A slogan of sustainability: “think globally, act locally,” underscores the regional approach essential to solving many issues, even if the impacts are salient only at the local scale.

Individual or site specific programs can target household waste by encouraging composting and reusing materials or offering financial incentives for installing renewable energy sources. Annapolis Royal, Nova Scotia, offers an example of a progressive composting program where the region supplied private homes with composting tubs and educational pamphlets so that in 2005 the community would produce ‘zero waste’ in terms of biodegradable or recyclable materials. The benefits to homeowners spilled over to the region since it saved $15,000 annually by opting out of a regional waste disposal program (Roseland, 2005). The economic benefits of a sustainable program are necessary if the program intends to last. At a local or regional scale, penalties for non-compliance with regulations, tradable permits, or financial incentives are essential components of many sustainable programs (James & Lahti, 2004; Kenny & Meadowcroft, 1999; Roseland, 2005). Sustainable programs can be administered within political boundaries at the town, county and state level, but may also be adopted by watersheds or ecological regions if the objectives are to improve water quality or
conserve species habitat.

At the national and international level, subsidy and grant programs increase the viability and use of such programs, but this scale is also important for helping entire nations reevaluate quality of life indicators. In the United States, it is currently, “whoever dies with the most toys wins” (Roseland, 2005), a socio-cultural phenomenon that can be changed; we can increase our quality of life and reduce our impact on the Earth. An innovative approach that links housing affordability, walkable communities, and compact development is the location efficient mortgage (LEM), developed by the Center for Neighborhood Technology and Fannie Mae. “The LEM considers household savings in transportation costs associated with living near public transit. In including these savings in calculating housing affordability, LEMs enable potential homebuyers to qualify for higher mortgages, making more housing affordable” (Burchell, 2000). Employer-assisted housing and live-near-your-work programs that subsidize the cost of housing near employment centers may be used in addition to the LEM; there are various strategies that encourage compact development.

Although governments at all levels can serve as exemplary role models and offer extensive educational awareness programs, enforcement and severe penalties may be necessary at the national level. It is widely known that chlorofluorocarbons (CFC's) have a deleterious effect on the ozone layer and international policies have banned its production. Yet, its commercial superiority as “aerosol-spray propellants, refrigerants, solvents, and foam-blowing agents” (http://www.c-f-c.com/supportdocs/cfcs.htm/) makes CFC's smuggling “a bigger business than gun-running or smuggling prescription drugs. The dollar value of intercepted CFC's is second only to that of intercepted drugs” (Moffatt et al, 2001; Sheff, 1997). State and national level leadership is essential to help show how, as a society, we can change our consumption and development patterns to embrace more sustainable practices.

The success of any sustainable program also derives from its set of guiding principles which can be monitored and tested. Even at the various scales of sustainability, a grassroots or bottoms-up approach is most effective in creating attractive, widely used guidelines and policies (James & Lahti, 2004; Moffat et al, 2001; Roseland, 2005; Silberstein & Maser,
A recent study recommends that all sustainable programs adhere to four overall objectives that can accommodate a variety of strategies:

1. eliminate community’ dependence on fossil fuels,
2. eliminate dependence on synthetic chemicals,
3. limit encroachment on Nature and
4. meet human needs fairly and efficiently

— (James & Lahti, 2004)

The objectives are not overly prescriptive, illustrating the 'systems' approach where a variety of strategies can be used to achieve predefined goals. Furthermore, the objectives can be measured quantitatively, providing tangible results that can arouse public participation.

The generality of sustainability makes the term attractive for many organizations and programs whose goals are similar to the four objectives previously mentioned. Since sustainability encompasses such a broad spectrum of actions and policies directed at individual behavior to national standards, it commonly overlaps with more specific terms.

For instance, sustainability can be used as an approach to help solve sprawl by reducing dependence on fossil fuels and using site-specific applications that preserve open space while reducing impervious surface area. Smart-growth is another term often used in opposition to sprawl (epitomized by McMansion's on absurdly large lots) that tries to mitigate many of its detrimental effects to the environment and society. The strategies used by smart-growth initiatives may also encourage more sustainable choices; the two approaches are very similar when applied to land use and zoning. Smart growth “changes the public context of the development process from regulatory restrictiveness to collaborative planning for the community in process” (Porter et. al., 2002). Traditionally, smart-growth focused on land use patterns, recommending compact Transit-oriented Developments or mixed-use areas as solutions to sprawl. More recently, smart growth has adopted such objectives as increasing the amount of affordable housing, encouraging renewable energy, and using energy efficient construction methods—analogous objectives of sustainability. Oliver Gillham in the Limitless City lists four quantifiable measures of smart growth:

1. Open space conservation
2. Mixed use/compact development with affordable housing opportunities
3. Efficient transportation
4. Energy efficiency
In addition to these four principles, many professionals and scholars consider smart growth to include enhanced livability, emphasis on infill and adaptive redevelopment in built-up areas, and efficient expansion of infrastructure (Porter et. al., 2002). Smart growth seeks to reinvent the density, built form, and vitality of older town centers so that new developments will have a sense of place and community as residents of all income levels can walk about town and socialize in well-designed public spaces. Even if such goals were latent within early smart-growth principles, they have become more publicized as the idea of sustainability spreads globally.

The benefits of sustainability and smart-growth are as numerous as the terms are broad and generic. Sustainability is often expressed as improving the three E’s of society: environment, economics, and social equity (President’s Council on Sustainable Development, 1999). Social sustainability seeks to preserve and enhance local cultural identity and tradition while facing increasing development pressures. Environmental sustainability requires that planners, architects, engineers and many professions be aware of nature’s cycles and systems so that they can design in accordance with those processes. Economic sustainability tries to keep local markets viable and competitive by integrating new technologies and adapting to global trends. The terms are not mutually exclusive, nor do they convey the myriad resolutions possible by using a sustainable strategy.

For instance, it is now commonly known that when impervious surfaces exceed ten percent a watershed's area, then ground-water quality deteriorates due to runoff and the soil's reduced ability to filter pollutants. Developers who use low impact development standards and sustainable principles that reduce the amount of impervious surfaces (roadways, parking lots, sidewalks, larger homes) also find that it reduces infrastructure and construction costs (Weiner & Egan, 2006). Minimizing costs and maintaining the land’s ecological viability can have the added benefit of increasing housing affordability. This scenario illustrates the
advantages of using sustainable design principles and smart-growth measures to help curb sprawl.

Figure 19. Water cycle in pre-development conditions (Left) and post-development condition (Right). (Source: Massachusetts Smart Growth Toolkit)

From a site planning and land use perspective, sustainable development aims to mitigate the effects of our current, sprawling suburbs. Sustainable design guidelines can be used when renovating or updating existing structures and communities, and when building entirely new subdivisions. Green Communities, an organization that promotes sustainable developments, lists eight objectives that individuals, developers and civic leaders can follow:

1. Integrated design process
2. Location and neighborhood fabric
3. Site improvements
4. Water conservation
5. Energy efficiency
6. Materials beneficial to the environment
7. Healthy living environment
8. Operations and maintenance

— Source: (http://www.greencommunitiesonline.org/resources.asp)

These guidelines illustrate the multi-disciplinary approach required to fully achieve smart, sustainable design. It is unlikely that a development can satisfy every objective, but the importance is that a clearly defined list makes it easier to achieve at least some of the objectives. Another organization, Sustainability Works, lists eight objectives for smart growth:

1. Land - location, land use, urban design and density
2. Buildings - adaptability, environmental impacts and healthy internal environments
3. Society - social exclusion, community, crime and local economy
4. Travel - public transport, cycling, pedestrians and cars
5. Waste - pollution, domestic and construction waste and recycling
6. Landscape - ecological value, microclimate and open space
7. Energy - energy conservation and renewable energy
8. Water - water conservation, sewerage and storm water

— Source: (http://www.sustainabilityworks.org.uk/public/features/ref_database/)

Sustainable development, therefore, encompasses site-specific applications such as
construction processes that minimize waste, inclusion of affordable housing, green building
techniques, and use of energy efficient appliances. In addition to site-specific practices, it
includes regional and state level policies that encourage the site-specific implementations.
Examples of housing strategies that fall within the sustainable umbrella and are applicable in
the town center of Amherst, Massachusetts, are: Transit-Oriented Developments (TOD’s), the
Leadership in Energy and Environment Design Neighborhood Development (LEED-ND)
program sponsored by the U.S. Green Building Council, form-based codes, and possibly co-
housing communities.

C. Sustainability on the Ground—Development Techniques

The American Society of Landscape Architects lists environmental stewardship as a primary
goal on their website in addition to the plethora of public information that highlights the
benefits of using sustainable development guidelines. Why then, have many current
developments failed to incorporate these principles into their design process? Recent studies
have shown major impediments to be resistance by stakeholders to accept innovative design,
the lack of awareness of these technologies, and a market barrier for these products (Calkins,
2005; Clark, 2001; Engel-Yan, et al., 2005; Spooner, et al. 2000). The Program Director of
Northeast Sustainable Energy Association (NESEA) begrudgingly admits that the amount of
new homes built using ‘green technology’ and renewable energy solutions in Massachusetts
“is not even a drop in the bucket” relative to the number of new homes constructed annually
(David Barclay, 2007)—there is a wide gap between the growing knowledge of sustainable
design techniques and its implementation. Recent studies also show that there are minimal
guidelines that capture stakeholders (residents, developers and planners) opinions about such
things as acceptable density or what makes a neighborhood enjoyable (Ryan, 2002); a
problem when academics, professionals and the general public have varying opinions about
such critical design elements.

Compounding the problem is that zoning and land use regulations often restrict the use of sustainable design by making it more expensive, requiring extensive permitting and by prohibiting certain essential elements. For instance, modular homes are still stigmatized as being the 'small, dirty' trailers reminiscent of the 1960's and therefore prohibited in many communities in Massachusetts. The reality, however, is that modular homes have changed. Their construction process is efficient and reduces material waste, installation of modular homes reduces site preparation damages and these homes tend to be more affordable than houses built on-site (Empyrean International). Noji Gardens, an affordable housing development in Seattle, Washington, was able to provide high quality housing that was affordable for low-moderate incomes because 54 of the 75 units were manufactured homes. “Manufactured housing presented a viable, affordable alternative to stick-built homes” (Burchell, 2000).

Figure 20. Stereotypical image of manufactured house. (Source: http://www.andersonsrealty.com)  
Figure 21. Modern manufactured home. (Source: http://www.deckhouse.com)

If developers and homeowners decide to develop sustainably, the legal and regulatory policies in the United States do not substantially reward such endeavors that they will become mainstream. The guidelines referenced earlier in this report need to be integrated in regional plans and political agendas at the local, state and national level if we are to effectively curb sprawl. There are numerous design guidelines and strategies that can help actualize smart growth. Research has even shown that new residents to the suburban fringe value views of nature from the home, mature trees within the development and proximity to natural areas more than large lots (Austin, 2004; Kaplan, Austin & Kaplan, 2004; Ryan, 2004; Sullivan 1996). Residents are satisfied with their neighborhood for two main reasons: an opportunity to mingle with neighbors in common open spaces and along pedestrian-

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friendly streets and if nearby homes are screened with vegetation (Austin, 2004; Kearney, 2006). These elements can be easily integrated into many development patterns, and if combined with environmental design principles, would satisfy a seminal belief of environmentalism that “land used for processing wastes can often be used for other purposes” (Lyle, 1994).

The following development techniques are exemplary in their ability to achieve sustainable goals and may be applicable in Amherst center.

i. Form-based Codes

Conventional Euclidean zoning separates uses and in the process, has created an automobile dependent society “characterized by communities of isolated populations” (Burdette, 2004). Euclidean zoning strictly regulates land uses and the intensity of use by focusing on such things as setbacks, the number of dwelling units per acre, parking ratios and floor area ratios\(^2\); it is not necessarily concerned with the physical form of structures and the community. Form-based codes, on the other hand, are not focused on individual dimensions but use dimensional codes based upon the form of buildings; they elevate the physical design of a community rather than focus on use restrictions like conventional zoning. An innovative development strategy, form-based codes have their origins in New Urbanism with hopes that mixed-use, walkable communities can be reinvented in the 21\(^{st}\) century (Langdon, 2006).

Communities may use form-based codes by adopting “form districts” within the conventional zoning framework or by replacing existing zoning with a form-based code zone, effectively addressing the relationships between building facades, pedestrian corridors, and vehicular traffic to create a unified, identifiable urban form. Form-based codes can generate such high quality design because it represents a multi-disciplinary approach that connects the physical form of a community—public space networks, buildings and streets (Altman, et. al., 2003). Form-based codes “regulate fewer elements than typical zoning regulations because the provisions do not constrain every possible

\(^2\) The ratio of the total floor area of a building to the total land area of the site.
combination of setback and density” (Dover, 2003). The code is also presented
illustratively with such tools as three-dimensional drawings, annotated sections, and even
photographs. The visual representations of the design code help citizens, developers, and
planners better understand the end result (the physical design) than conventional zoning
where the final building form is not revealed until after the permitting, usually during
construction. Form-based codes consider physical design to be paramount, considering
design elements that are most important to citizen and pedestrian scale.

Since form-based codes do not prescribe specific uses it is applicable both to new
development and redevelopment; it serves as a template showing building alignment and
spacing, building forms, and architectural details. Regulating form not use, form-based
codes can be used in areas with disparate uses. For instance, it can be used to effectively
redevelop commercial strip development or aging apartment complexes by shaping the
physical form and allowing market forces to determine the most appropriate uses. The
buildings can be developed with flexible interior spaces so that it can accommodate new,
unforeseen uses without changing the initial code (Katz & Ferrell in Burdette, 2004). The
code’s ability to integrate into the fabric of any community makes it desirable for use in
cities, small towns and the suburbs.

Form-based codes are a place-specific development
guideline that must be drafted with consideration of a
community’s vision; it must be able to adapt to future
growth but still create the form and architectural
aesthetics with which the community identifies. This is
achieved with the following components: a regulating
plan, building envelope standards, definitions, and
architectural standards.

The regulating plan is similar to a traditional zoning map
in that it regulates land uses and building envelope
standards, yet it is more comprehensive than a zoning

Figure 22. A proposed regulating plan for the Amherst site.
(Source: Amherst Planning Department)
map because it “provides specific information for the character of each building site” (Burdette, 2004) by examining the relationship between the buildings, street widths, interstitial public spaces, and general connections with the surrounding neighborhood. The regulating plan also differs from a traditional zoning map because it is a designed plan that indicates the building types most appropriate for the site, their expected footprints, and detailed elements such as a street alignment line. Elements of a traditional zoning map such as the maximum density, by-right uses, minimum lot sizes and parking requirements are eschewed in the regulating plan; the building type is paramount.

Building envelope standards regulate the building form such as setbacks, overhangs, height elements and how each building is sited in relationship to adjacent buildings, streets or public spaces. The critical difference here than with a traditional zoning ordinance is that these standards are represented graphically with cross-sectional drawings, photographs and other visual aids that clearly illustrates what is expected from a developer. Building envelope standards also address where specific uses are allowed in the structure, such as first-floor retail with apartments above, and the standards also describe the location and articulation of major architectural elements such as windows, doors, and front porches.

The definitions section of each form-based code is the component which tailors the built form to a particular community. As an integral element necessary for desirable development, the definitions should be thoughtfully drafted with involvement from the community and planning officials. In order to better articulate definitions, many communities include architectural standards as part of their form-based code to require a higher level of aesthetic control without the hassle of extra permitting now required in many towns. Architectural standards often regulate such things as exterior materials and color, roof slopes, and trim details.
Not surprisingly, implementing form-based codes requires professional staff, well-written codes, and a community willing to stray from conventional zoning. The town of Amherst is a place suitable for such an effort since it introduced form-based codes to the community during the formation of its updated Comprehensive Plan. This has ensured that if the codes are adopted, they reflect the town’s unique vision. “A town’s visual quality not only defines its character, but also tells a story about its economic vitality, quality of life, and how much the townspeople care about their community” (Segedy & Daniels, 2007). Amherst is investigating whether areas in the town center can be revitalized using form-based codes as this system typically results in high quality design without the hassle of extra permitting or design review now required in town to achieve built form other than conventional development patterns.

**ii. Transit-Oriented Developments (TOD’s)**

Peter Calthorpe promotes Transit-Oriented Developments (TOD’s) of compact mixed-use neighborhoods that are connected to efficient transportation services such as high-speed trains. These neighborhoods infuse New Urbanism principles with sustainable elements such as on-site storm-water management, renewable energy sources and decreased dependence on the automobile. Calthorpe believes that an entire region, including city, suburbs and rural areas needs to be considered when developing land use strategies. The idea of Transit-Oriented Developments is that communities, which have commercial, professional offices and cultural centers within walking distance of residential neighborhoods (2,000 feet or less), will reduce our reliance on the automobile. The pedestrian scale will return as the 'measure of the community,' not driving distances. These communities can have moderate to high densities and are applicable in all places, ranging from warmer climates to New England and can be designed to reflect the region's architectural aesthetic. Similar to Ebenezer Howard's 'Garden Cities', TOD’s were envisioned as discrete communities surrounded by contiguous open space; strong planning strategies are needed to keep the communities from coalescing into one big suburb. The street network so prevalent in current suburbs would be minimized, as the pedestrian would regain their dominance in the neighborhood. “Transit can order and formalize the region in much the same way a street network orders a neighborhood. It supports the life of the
pedestrian throughout the region” (Katz, 1994).

From a regional perspective, it may be more feasible if Transit-Oriented Developments are built without transit but follow their guiding principles: focus on the pedestrian scale to develop mixed-use neighborhoods. “The growth of such pedestrian-friendly developments, if coordinated at a regional scale, can form the armature for future transit growth” (Calthorpe, 1993). TOD’s may be more easily conceived in new developments or areas where efficient transportation systems are in place. Amherst, Massachusetts, may seem like an unlikely place for TOD’s as it may not have the density or public infrastructure to support such developments. However, Amherst is comprised of approximately six village centers surrounded by open space and woodlands (and growing suburbs); this New England development pattern is the progenitor of TOD’s.

Amherst center, therefore, could be redeveloped using the design principles of Transit-Oriented Developments. In addition to revitalizing the core of the community, TOD principles would help inform improvements to public transportation systems, preservation of open space, and increasing densities within the village centers so that the new developments blend architecturally and culturally with current conditions. Just as important, TOD’s may be developed using conventional zoning and land use policies; communities in New England can create TOD’s without abandoning traditional zoning standards that are held in such high esteem in this region.

iii. Leadership in Energy and Environment Design—Neighborhood Development

Recently, LEED created a set of flexible guidelines from three affiliations that address neighborhood design with hopes that a straightforward, inclusive approach will entice developers and communities alike. The criteria were refined through countless surveys, interviews and questionnaires; a bottoms-up approach was integral to the guideline's development. Their list of criteria, which derives design principles from the U.S. Green Building Council, the Congress for New Urbanism and the Natural Resources Defense Council, appears to be exhaustive but is not overly prescriptive; this allows developments to coalesce with a community's master plan or to be used with conventional land use
policies. Of course, to satisfy a majority of the criteria, a community may need to rezone areas and experiment with innovative land use strategies (U.S. Green Building Council). The program is only in its piloting stages, but it offers a comprehensive approach to site planning by combining smart-growth, new urbanism and green building in a national standard for neighborhood design. The program also encourages improvements in the construction process so that a natural systems model is emulated. This means that the site is minimally disturbed to allow for drainage processes to remain intact, material waste is minimized, and the building materials themselves use as few hazardous chemicals as possible.

The LEED certification program also targets the reality that solving environmental and economic problems may result in new communities that are incompatible with the surrounding character or displeasing aesthetically. Only a handful of studies (mentioned earlier in this report) have concluded that Open Space Residential Developments (OSRD’s) can be compatible with local character. Typically, the contrary is true, as Victoria Tschinkel, a former Secretary of the Florida Department of Environmental Regulations summarized,

“I think we can probably take care of pollution-related problems...but even if we do, I'm not sure that this is going to be a very nice place to live in because of the density of the population and the lack of a sense of community”

— (Duerksen, 1986).

A recent study found OSRD’s that used progressive site planning techniques were as visually unappealing as conventional subdivisions (Farias, 2006). New Urbanism principles which inform the LEED guidelines, however, hope to mitigate this scenario by emphasizing neighborhoods with narrow streets, minimal setbacks, integration of mixed-use structures into the housing fabric and using architectural guidelines to keep building patterns on the human scale (Duany et al, 2001; Katz, 1994).

The LEED guidelines are a flexible framework that encourages local governments and developers to find creative design solutions that are compatible with community character and more importantly, align with goals and objectives found within state, regional and
federal plans. The U.S. Green Building Council defines this as Green Design that seeks to eliminate unnecessary impacts from development in five broad areas:

1. Sustainable site planning
2. Safeguarding water and water efficiency
3. Energy efficiency and renewable energy
4. Conservation of materials and resources
5. Indoor environmental quality

— (U.S. Green Building Council)

The flexibility of the LEED program allows for site specific applications such as roof-water harvesting, on-site storm water management, permeable paving, alternative energy sources (solar energy), providing areas for socializing and integrating wildlife habitat with open spaces. The criteria, however, may require municipalities to adopt innovative zoning strategies, redefine appropriate land uses, and re-examine current development patterns. The LEED program also demands that designers get creative to truly understand how we can achieve sustainable design now.

iv. Co-Housing Communities

A fourth development pattern, co-housing, embodies many of the ideals found in the LEED criteria and tenets of sustainability. Co-housing, however, differs from traditional subdivision design in the United States because a community of friends and acquaintances intentionally designs co-housing communities. Although co-housing is not necessarily founded upon ecological principles, it is common for such communities to value natural resources and sustainable principles (Hanson, 1996). Similar to a sustainable policy framework, co-housing uses six guiding principles that allows for communities to adopt different forms and housing typologies. The six principles are:

1. A participatory process,
2. Intentional 'neighborhood' design,
3. Common facilities,
4. Complete residential management,
5. Non-hierarchical structure and decision-making process and
6. No shared community economy

— (McCamant & Durrett, 1988; Cohousing Association of the United States).

These six principles emulate the steps many critics believe are necessary for any smart growth policy, especially when creating complex systems such as an international
sustainable program or creating an entire neighborhood.

“Co-housing is a means for people to make a major step toward community without giving up their privacy” (Hanson, 1996). As a general rule, co-housing communities are between 12-36 units, as it is believed this is an optimal number to encourage socializing with one's neighbors, it provides ample diversity of residents, and any fewer units would not be economically unfeasible to design or construct. These communities also cater to the pedestrian by designing pathways that connect open spaces with the common facility and private homes, and by relegating the car to the periphery. Many co-housing communities also strive to make each unit more affordable than a typical single-family home found in suburbia by assessing the life-cycle cost of materials, using shared energy systems (district heating) and reducing the size of the dwelling units. Co-housing communities commonly use modular units since the per unit cost decreases as customized amenities are eliminated and if structures can be prefabricated in a warehouse where minimal material is wasted. The common facilities within these communities is designed for communal meals, may have space for a day-care or home-based businesses, and is designed to be the focus of the community, similar to traditional neighborhoods where civic institutions were the identifiable landmarks. If co-housing appears to embody many sustainable, ecological principles, it does. However, creating a co-housing community can take years of planning and setbacks (Hanson, 1996).

Amherst, Massachusetts, has two cohousing communities that were developed using different zoning standards, but both share the goals of cohousing stated above. Cohousing, unlike TOD’s or form-based codes, is concerned with a lifestyle and not just the built form. The ideas of shared communal spaces and sharing meals with one’s neighbors are paramount to achieving social sustainability, especially in an era when people retreat to there detached single-family homes. Co-housing offers an alternative to typical mixed-use structures where uses are separated by building floor since in the common house, the space is used for a variety of uses ranging from cooking and eating to office space—the space itself is mixed-use. The ideas of cohousing communities are pertinent to any sustainable design.
v. Green Building and Site Planning

Green building is the practice of increasing the efficiency of buildings and their sites with respect to energy consumption, rainwater harvesting, construction waste, material reuse, preservation existing site amenities, improved operations and maintenance costs, and reduction in waste output and pollution. Proper site orientation and location of trees and landforms can reduce traditional energy use by capturing solar power, and on-site storm water management can be integrated into such a design. Something as mundane as changing a light bulb can have a dramatic effect: “if every American household replaced just one incandescent bulb with a compact fluorescent bulb, the country would conserve enough energy that it would be as if 800,00 care were taken off the road” (Environmental Protection Agency). The idea of green building is not new, yet the number of such buildings is extremely low. The Program Director of Northeast Sustainable Energy Association (NESEA) begrudgingly admits that the amount of new homes built using ‘green technology’ and renewable energy solutions in Massachusetts “is not even a drop in the bucket” relative to the number of new homes constructed annually (Barclay, 2006)—there is a wide gap between the growing knowledge of sustainable design techniques and its implementation.

Many developers and project managers believe that the upfront costs associated with green building is not offset by a reduction in labor and material used in other stages of construction. However, according to a 2006 report by the Massachusetts Sustainable Design Roundtable, “First cost premiums, if present, generally do not exceed four percent and commonly have simple payback periods of as little as three or four years” (Golledge & Perini, 2006). Furthermore, the extra expenditure of $3-5 per square foot to ‘green’ a structure produces a direct operational savings of $15 per square foot over twenty years. In addition to reducing long-term operational costs, green building benefits the community with reduced expenditures for public infrastructure and services (Weiner & Egan, 2006).

As green building technologies become more widely used, it will also generate an entire industry that uses such technology—it could be a catalyst for economic growth. The costs of using green building techniques for new structures are not insurmountable. However,
the cost to retrofit existing structures is daunting for many homeowners and businesses. Renovating existing structures is a key component of sustainability as the embodied energy in a structure is worth more than tearing down and building new. Economies of scale may be necessary when retrofitting homes, such that entire neighborhoods or communities participate in green building programs. America’s original suburb, Levittown, is taking such an approach to curb energy use: any of Levittown’s 17,000 homes can have energy audits at reduced costs and low-interest loans offered by local credit unions can help residents install energy efficient appliances and solar thermal installations (Walsh, 2007).

Improving the environmental efficiency of the built environment is crucial to prevent impacts from sprawl and irresponsible development. According to the Federal Energy Information Administration, “buildings in the United States account for 40% of total energy consumption and more than 70% of total electricity consumption” (Golledge & Perini, 2006). The same administration reports that constructing all these buildings produces 25 percent of the solid waste in the United States. Green buildings can address such issues. Studies have concluded that green roofs, where layers of soil, drainage material and plants are constructed on the roofs of buildings, reduce “heat loss from a building 50%, reduce air-conditioning costs 25% and reduce heat island effect by 3.6 degrees” (Kluger, 2007).

Green building is important because it looks at the waste generated and energy consumed through the use of life-cycle analysis. Buildings have a long life span and reuse capability, so that upfront costs are easily defrayed over the long term. The idea of life cycle costs is quite pertinent when it is realized that upfront ‘first’ costs only account for ten percent of total building ownership cost while almost 85 percent is spent on maintenance and operation (Golledge & Perini, 2006). When designing a green building,

“An integrated design process can be critical to minimizing any additional up-front costs related to innovative products, processes, or technologies. For example, taking advantage of the energy reductions resulting from enhanced southern exposure, installation of energy efficient windows, and incorporating daylighting might result in the need for a smaller HVAC system, offsetting any up-front costs for these design features.”

— (Golledge & Perini, 2006)
It is not surprising then that a green building generally recoup costs within eight years. More importantly, these structures consume less energy and water while producing far less pollution than traditional structures. In April 2007, Massachusetts’ Governor, Deval Patrick, issued Executive Order 484 that has its goal, reduction of energy consumption by state agencies. The goals are ambitious, such as reducing energy consumption 20 percent by 2012 and greenhouse gas emissions 25 percent by 2012. Furthermore, all newly constructed state buildings and major renovations must meet LEED certification. These measures are promising, yet to green buildings will not become mainstream if zoning standards, building codes, and subdivision regulations are not reexamined and revised.
A. Saratoga Springs, New York

i. Town Overview

Saratoga Springs is a community very similar to Amherst, Massachusetts. Both places are relatively affluent college towns with many historical and cultural amenities that are in stark contrast to recent development. Both municipalities are also fortunate to have strong local government with a progressive planning department that actively engages the community in its endeavors to manage growth while respecting the existing community character. Saratoga Springs is renowned for its horse racing and spring baths, while many people are drawn to Amherst because of its colleges and universities and its location in the Pioneer Valley. The two municipalities also have a similar population size, with Saratoga’s year-round population of 26,000 burgeoning during the summer months, while Amherst’s population of 34,000 includes many students who do not remain in town during school vacation.

Saratoga Springs is quite different from Amherst in that it developed a compact downtown with industrial and commercial neighborhoods adjacent to the city center. Saratoga recognized and embraced its urban character, becoming an incorporated city in 1915. Today, Saratoga Springs is the fourth largest city in land area in the state of New York, yet much of the area outside the city center remains open space. In order to help preserve the open space and the historic nature of the city, Saratoga’s downtown underwent a major revitalization in the 1970’s that continues today. The community concentrated their efforts on historic preservation in the city center and open space preservation outside the developed core.
Saratoga updated their Comprehensive Plan in 2001 with a tremendous amount of community input. The planning process identified residents’ major concerns that were addressed in the general goals of the Comprehensive Plan. Most salient of these goals was the desire to “enhance the vitality and success” of Saratoga’s downtown by increasing the diversity and affordability of housing opportunities, by providing economic incentives to attract businesses to the city center, by enhancing the historic sense of community, and by keeping the downtown compact and walkable. In order to achieve these goals, planning officials decided a radical approach to growth management was necessary.

The community adopted form-based codes\(^1\) in 2004 for areas within the city center as a means to achieve the goals of the Comprehensive Plan without losing the downtown’s unique charm and vibrancy, especially the historic form of the city center. The community had adopted a planned unit development ordinance that initially seemed to work, but it actually added to the complexity of infill development and obfuscated the permitting process. Citizens and officials agreed that traditional zoning had created many of the problems the new Plan hoped to alleviate: separation of land uses, automobile dependent transportation, and a complex permitting process that discouraged new economic uses not anticipated by the old zoning. The city realized that the many zoning districts and layers of regulations made infill development or town center revitalization cumbersome and daunting. Form-based codes were seen as an alternative that streamlined the permitting process.

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\(^1\) “Form-based codes create a predictable public realm primarily by controlling physical form, with a lesser focus on land use”— http://www.formbasedcodes.org/definition.html
process, used clear easy-to-understand language supplemented with many diagrams, and the codes allow mixed-use structures of appropriate size and scale.

**ii. Structure of the Zoning Code**

When Saratoga Springs investigated form-based codes, it decided to apply the transect model to specific areas in their city center and completely eliminated the old zoning designations. Other municipalities may have created a form-based overlay or tried to create a hybrid zoning district that combined conventional zoning regulations with form-based codes, yet Saratoga believed that to truly manage growth and retain the scale and design of its city center, form-based codes needed to be used as a stand-alone zoning district.

The transect model borrows from the ecological principle that as one moves across a geographical transect (cross-section) from a mountaintop to the valley floor, there is a continuum of discrete zones or habitats. Adapted for land use purposes, the transect model was popularized by Andres Duany and Elizabeth Plater-Zyberk, who simplified the cross-section into six zones that extend from rural to the urban core, with additional special districts for such uses as a university campus, airport or stadium. The most rural zone is designated as T1, while the urban core is designated as T6. The flexibility of the transect model is that for each community, a unique transect is formulated so that the character and form of each zone will reflect characteristics of the specific location. The transect model also allows the inclusion of other development strategies, such as LEED certification, on-site storm water management or inclusion of renewable energy sources.

At the heart of the transect model is the idea that a structure relates to its context, a design philosophy that traditional zoning cannot achieve according to Duany (Sperber, 2005). The six zones of the transect model show environments of

![Figure 27. The Transect](http://www.smartcodecentral.com/)
increasing density and infrastructure so that a unique form-based code can be applied to each of the six zones (Duany, 2002). By catering each code to the appropriate zone, Duany believes that the intensity of development will follow a gradation from urban center to rural areas without any interruptions or ‘violations’ of the built form. This gradation also allows for a diversity of building types and civic spaces, each designed to fit into its appropriate context. A violation occurs when an incongruous massing or built form is out-of-place, such as single-family homes scattered amongst multi-story brick buildings along a town’s main street. Each form-based code must therefore be crafted after thorough site analysis and research that determines the acceptable range of building form and lot layout for each zone.

In Saratoga Springs, the community replaced seven traditional zoning districts with three transect zones of T4, T5, and T6 to help encourage infill development in the city center, and as a means “to preserve and add onto the historic fabric of its downtown” (The Green Valley Institute). The zones are designated as Urban Neighborhood (T4), Neighborhood Center (T5), and Urban Core (T6). The transect zones are listed in the zoning ordinance with all other zones, but they have separate use and dimensional charts as well as diagrams illustrating the code. “Design standards were established for setbacks, height, parking location, street design, façade treatments, and creation of a public realm” (Rouse and Zobl, 2004). All new uses in the T4 and T5 zones require a special permit to assured mixed uses. Saratoga Springs applied the transect model because of its clear development guidelines with ample graphics illustrating the code, and because the transect model allows mixed-use structures that would integrate with the city’s existing fabric (Langdon, 2006).
The Urban Neighborhood (T-4) zone is intended primarily for residential uses (detached units with side yards or attached dwellings) that conform to the existing street grid. The city’s zoning ordinance also states “residential lots shall be served by alleys to preserve the pedestrian character of the streets”. The structures must be a minimum of two stories with a “flat roof with cornice or a pitched roof”, (Article II- Establishment of Districts, Saratoga Zoning Ordinance) and shall have “shallow” build-to-line and frontage requirements.

Although the zone is intended for residential uses, small commercial and retail uses are allowed on the first floor and on-street parking is required to accommodate both residents and customers. To make the street more pedestrian friendly, specific standards for the T-4 Zone allow “open porches, stoops, balconies, awnings and bay windows” to “encroach up to 50% of the distance between the build-to-line and the frontage line” (Article II- Establishment of Districts, Saratoga Zoning Ordinance) and lot widths of less than 54 feet.
The Neighborhood Center (T-5) promotes a wider variety of “residential and non-residential uses, building types, and lot sizes” (Article II-Establishment of Districts, Saratoga Zoning Ordinance). The mixed-use character of this zone is strengthened by the allowance of first floor restaurants, cafés, offices with walk-in clientele, and general retail outlets. This zone allows for greater maximum height and parking spaces than the Urban Neighborhood (T-4) zone, and porches, stoops and awnings can encroach up to the frontage line. Other design standards in the T-5 zone include: first floor of buildings with residential uses should be elevated two feet from the street level; symmetrically pitched roof or a flat root with a cornice; and cross access easements to minimize curb cuts for alleys. The Urban Core (T-6) district, the most dense zone, encourages mixed-uses and has strict design guidelines, such as buildings must be two stories tall but no taller than seventy feet, and that they are close to the street with their façade parallel to the sidewalk. Buildings on corners are to ‘wrap’ their facades around the corner to maintain architectural elements on both street fronts. The intent of this district is to

“Appropriately regulate design and creation of a consistently high quality pedestrian oriented public realm in character with the historic forms, materials, and colors of Downtown Saratoga Springs without unduly restricting re-use of historic structures or architectural diversity”.

— (Article II-Establishment of Districts, Saratoga Zoning Ordinance)

Within Saratoga’s Zoning Ordinance, there is a section for “Development Standards and Guidelines” applicable to all transect zones. The section includes streetscape guidelines,
architectural standards, parking requirements and voluntary guidelines for each of the three individual zones. These written standards do not appear to be accompanied by visual graphics (at least not in their online version).

iii. Summary and Outcome of the Code

Since 2004 when Saratoga Springs adopted form-based codes, the downtown has completed numerous projects. Although market forces have also attracted development, the form-based codes have been cited as a reason for more interest in redeveloping the urban core. The form-based codes help produce a predictable form and have streamlined the permitting process for many desirable downtown uses. In 1-½ years after adopting the form-based codes, the city had approved twelve major projects totaling 850,000 square feet and generating $182 million (Langdon, 2006). One major project transformed a six-acre commercial strip with a one-story Woolworth’s and vacant parking lots into a pedestrian-friendly mixed-use neighborhood with first floor office and retail space and apartments above (McLean County Newsletter, 2006). As more projects are being proposed and completed, city officials worry that the transportation infrastructure will not be adequate to handle the increased demand. Saratoga has therefore formulated a Downtown Transportation Plan for the City to help prepare for future scenarios.

As form-based codes are place specific and prescribe design guidelines, the codes are intended to be updated regularly. Saratoga Springs has learned that their codes need more specificity with regard to front setbacks, frontage on corner lots, and building heights. The city even conducted a building height analysis in their urban core to determine maximum

Figure 30. Images of infill projects completed using Saratoga’s form-based codes (Source: Amherst Planning Department)
building height on specific streets. City officials would also have created a more detailed list of allowable uses in each zone and not made any uses by special permit (Lash, 2007).

Figure 31. Existing building height on Broadway Proposed building heights
(Source: Building Height Study Report, http://www.saratoga-springs.org/)

Citizens, however, have been more critical of the codes, even launching a website: http://disutopiaofsaratogasprings.blogspot.com/. As one entry suggests, the transect zones in Saratoga Springs were not actually new, but helped clarify what was already happening in the city center. Saratoga had ‘special project areas’ where all uses were required to go through the special permitting process in which there was no set density and permits were granted mostly on the form of development. The transect zones, as many point out, actually maintain separation of employment and housing, and even contributes to the high cost of housing in Saratoga Springs because the zones were adopted in areas mostly built out. When Saratoga adopted the transect zones, they also down zoned areas outside the city to 2+ acres to help preserve open space. These measures have increased the price of real estate so that it excludes much development, families and young professionals from the city center.
B. Northampton, Massachusetts

i. Town Overview

Northampton, Massachusetts, is just eight miles southwest of Amherst; the two towns lie on opposite sides of the Connecticut River and share prominent locations in the Pioneer Valley. There are many similarities between these two places, especially since their residents, commuters, and student populations continually move between the municipalities. The cultural and geographic similarities however, belie the significant differences between Northampton and Amherst.

Although Northampton’s population of 29,000 is smaller than the number of residents in Amherst, the community has established itself as having a premier main street in all of the country. “Northampton offers a sophisticated rural lifestyle rich in cultural, artistic, academic, and business resources” (Northampton Community Indicators Report, PVPC) such that its downtown is a vibrant, active place—an exemplary mix of uses, balanced modes of transportation, and an integration of architectural styles and building masses. The American Planning Association recently named Northampton’s Main Street one of the Ten Greatest Streets in the Nation, and AmericanStyle magazine voted the city one of the top 25 arts destinations in the country.

Northampton became an incorporated city in 1884, realizing that it could develop a strong economic and cultural center surrounded by smaller village centers and open space.

Amherst, on the other hand, embraced its identity as an agrarian town, developing a town center that does not have the prominence and built form of Northampton, even though both
locations are about the same age and share their downtown with local colleges. Northampton’s city center shares space with Smith College, one of the five colleges and universities that is part of a college consortium with Amherst and South Hadley. Northampton also has a small airport and regional public transit service that connects the city with surrounding towns, but most important for economic stimulus, Northampton has two interchanges with Interstate 91 within its city limits; this provides quick access to an interstate highway system and has helped attract many industries to the city.

The city’s thriving downtown can be attributed to many factors, but the historic preservation movement of the mid 20th century coupled with a revitalization effort in the 1970’s helped propel Northampton into a mecca for creative industries such as musicians and artists, as well as establish a niche of specialty boutique shops, retail outlets and numerous restaurants. Unfortunately, traditional uses that anchored the ‘old’ downtown—“department stores, hardware stores and similar establishments”—have left due to competition from big box retailers on the outskirts of town. The stores and restaurants in Northampton’s downtown have succeeded because they do not compete with shopping malls, and they take advantage of the foot traffic and tourism generated by other industries. The city center is alive throughout the day and evening, with almost half of Northampton’s population living within one mile of the downtown and 25 percent living within a half-mile. The “downtown also has a much higher proportion of rental units than the rest of Northampton” (Downtown Northampton: Today, Tomorrow and the Future, 1996). The city has also benefited from a strong planning background that has worked diligently to maintain the historic character of the main street while attracting new uses and adaptive infill development that enhances the scale and walkability of the city center.

ii. Structure of the Zoning Code
Northampton’s zoning regulations are at first glance comparable to Amherst’s; neither municipality has adopted form-based codes or abandoned traditional zoning methods. Both places have reworked their zoning codes to reflect current trends of sustainability and smart growth, taking advantage of the many state and federal resources available to fund development projects, but the built form and shape of their downtowns are quite distinct.
Northampton has benefited from its historical development as a city, which left intact three to five story buildings lining the main street and adjacent neighborhood streets. The building pattern preceded modern zoning, surviving through the decades as nonconforming structures that also housed desirable uses; city officials aware of this problem have revised Northampton’s current zoning regulations to allow for such structures without extra permitting. This decision has paid off as new construction blends with the historic fabric and human scale of the main street area. Business owners and retailers find that Northampton has such a robust economy that even rising real estate values do not affect vacancy rates. Northampton’s reputation attracts investors and developers so that the city can be more discretionary when approving new building projects.

Even so, the city’s zoning codes, architectural standards, and streetscape guidelines at first appear similar to many towns in Massachusetts. The regulations and manuals describe generically how to improve walkability with landscaping and wider sidewalks, but where Northampton’s regulations differ are in the details. For instance, Northampton’s dimensional regulations in the Central Business (CB) district, which encompasses all of the main street and adjacent neighborhoods, does not have minimum lot size, setbacks or frontage requirements, but sets maximum limits and minimum requirements where necessary. The Central Business district has a maxim height limit of 55 feet and a minimum height of 30 feet to discourage demolition of existing, historic buildings and replacing them with high-rise structures. The city does not restrict lot coverage, only stipulating that five percent of the lot needs to be open space, but the permit granting authority can waive this criterion and the definition of open space is flexible, such that it could describe interior courtyards. In terms of uses allowed, many uses in the CB district are allowed by-right, while most are allowed with a special permit issued by the Planning Board; a process very similar to

Figure 34. Northampton’s Central Business District (Source: http://maps.google.com)
Saratoga Springs form-based zoning.

The zoning regulations discourage automobile dependent uses (take-out restaurants, drive-through windows) by requiring a special permit while encouraging mixed-use structures to bring pedestrians to the city center—residential uses are allowed on the upper floors of buildings. Stand alone drive-through uses are prohibited in the downtown (unless accessed by another street) as they interrupt pedestrian pathways and the building pattern necessary for a vibrant, commercially viable business district. The flexible parking requirements also encourages new construction and mixed-use buildings: a new second floor addition to a one-story building is not required to provide more parking since there is a five-level public parking garage and on-street parking throughout the Central Business District. Even “changes in use of existing building space do not need to provide new parking and do not get credit for parking, regardless of whether they are changing to a more or less intensive use”—this allows for adaptive reuse of older structures (Downtown Northampton: Today, Tomorrow and the Future, 1996, Office of Planning and Community Development). The special permit process even creates a mechanism where developers can pay into a parking fund in-lieu of providing parking spaces; this money is used to maintain the existing garage and is placed in a coffer to help subsidize construction of any new public parking garages.

A Central Business Architecture Ordinance that provides design guidelines that are more flexible than a local historic district also bolsters planning in the Central Business District. Many of the buildings and places in the downtown are listed on the National and State Registers of Historic Places, yet this regulates projects that involve only state or federal monies. A Central Business Architecture Committee, similar to an (advisory) design review committee (not an Historic District), administers the CB Architecture Ordinance, such that “no building or structure within the Central Business Architecture District shall be constructed, altered, or demolished in any way without a central business architecture permit from the Central Business Architecture Committee” (Zoning Ordinance, Ch. 156: Central Business Architecture). The Committee is given the latitude to waive certain requirements if such action would enhance the pedestrian activity and human scale of the downtown. The CB Architecture Ordinance also explicitly states which projects the
Committee does not have authority to regulate, clarifying that even in projects that require a permit, there are design elements outside the jurisdiction of the Architecture Ordinance. For instance, interior work, exterior features not visible from a public street, landscaping, and signage are elements exempt from review by the Committee.

The Committee uses the Design Guidelines Manual for Downtown Northampton Central Business District as its reference for reviewing projects. The manual uses a combination of graphics and written code to convey design standards. The design manual also categorizes buildings in the downtown as theme commercial buildings, landmarks, transitional residential buildings or anomalies. “Approximately 85 theme commercial buildings line major downtown streets, and comprise 43% of all buildings” (Design Guidelines Manual for Downtown Northampton Central Business District), while there are approximately 29 landmark buildings in the Central Business District. The following excerpts illustrate the content of the design manual:

- For theme commercial buildings, there should be no front or side building setbacks except when necessary to preserve high quality views or to create quality public spaces.
- New theme buildings should be at least 30' and two stories high to any street, but not more than 55' tall. Street facade fenestration should be designed to appear to be at least 2 stories high, even if a building has only one interior story.
- New theme buildings which are wider than tall should be visually divided on street facades into one or more divisions, each taller than wide. Divisions should be defined by piers built into the facade at least 12" wide and 4" deep, or of equivalent separation, on street facades.
• All buildings on corner lots should present high quality and architecturally related front facades to both streets, in accordance with all other guidelines herein described. If one street is more heavily used, then the facade of a new or renovated building facing that street may be more highly articulated and/or detailed than the facade which faces the side street.
• A new or renovated theme or anomaly building on a corner lot should have highly glazed first floor facades with recessed entrances on both streets, in accordance with guideline #7, or, a traditional angled corner entrance with a corner support column, and additional entrances for any facade walls that are more than 30' wide.
• Roofs for new theme buildings should not usually be visible from streets, and should normally be screened by raised parapet walls with decorative cornices. Mansard roofs which encompass the top floor may be used for theme buildings of at least 3 stories.
• Roofs for new landmark or transitional residential buildings, or for additions thereto, should be traditional configurations of gables (between 8:12 and 12:12 pitch), hips, mansards, gambrels or sheds in keeping with the general style of the building.
• For any building, visible roofs should not rival or exceed walls in their respective visible proportions from street views.
• Historic landmark and transitional residential buildings should retain their traditional patterns of fenestration on the ground floor.
• First floor street facades of theme and anomaly buildings should have at least half their surface area in clear, non-mirrored, non-opaque glass. Bulkhead base walls should be built below first floor glass and should not rise less than 12" above outside grade, nor more than 30".
• Theme or anomaly street facades should have at least one doorway every 40', recessed at least 36" from the sidewalk.
• Windows for new theme buildings should be organized so as to create rhythmic, symmetrical patterns. Windows should be aligned vertically and horizontally.
• On new theme building facades, windows should cover a minimum of 20% and a maximum of 40% of the facade area above the first floor (coverage based on window outer frame size).
• On new theme building facades, windows should be evenly spaced in the horizontal direction, with no more than 1.25 window frame widths between windows or from windows to building corners. Exceptions may be made if windows are arranged in groups.
• New horizontal window groups should form rhythmic, symmetrical patterns on the building. Within groups, there should be a wall space between window frames of not more than 1/2 window width. Such wall spaces shall be of masonry materials the same as or compatible with other facade materials. Wall spaces between or next to new window groups should be no more than 6’ wide.

Figure 38. Recessed entry and first floor transparency standards
Figure 39. Window sizes and patterns
iii. Summary and Outcome of the Code

Northampton’s zoning regulations and Central Business Architecture Ordinance have been crafted to allow for adaptive reuse of historic structures and is successful at creating a pedestrian-friendly mixed-use downtown. There have been a number of new construction projects and renovations that have resulted in the structures enhancing the architectural character and pedestrian experience of Northampton’s city center. The city realizes that such codes are not static, but must be continually revised and updated, especially since such an attractive city center also has unintended consequences. The vacancy rates may be unaffected by rising real estate values, but many local shop owners, small stores, artists, and young professionals find Northampton too expensive—demand exceeds supply for space and has increased prices beyond what is reasonable for many people. The spillover effect has led to small market niches forming in towns surrounding Northampton. Even within Northampton, commercial activity has spread to streets that are not designed for the pedestrian—areas traditionally occupied by light industrial uses that have since vacated the area. Offices and retailers are moving to these new locations because of the reduced rents and abundant parking.

Recent community workshops held as part the city’s master planning process have highlighted areas that Northampton officials could reevaluate. Many citizens and committee members suggested the city consider form-based codes in conjunction with revised design guidelines and performance standards to have an even more potent system for regulating new development projects. Many believe the visual graphics of form-based codes would help clarify the design standards and would streamline the permitting process. Another recommendation was to increase the maximum height of buildings in the city.
center to 65 feet to allow for more residential space atop commercial and retail space; this could also alleviate the demand for in-town housing.

Even though city officials and citizens strive to improve the pedestrian character of Northampton’s downtown and increase the economic viability of its shops and stores, the city’s Main Street in the Central Business district was recently named one of ten greatest streets in the nation by the American Planning Association. Their rankings were based on such criteria as: pedestrian connectivity to surrounding neighborhoods, balancing different modes of transportation, architectural design, landscaping, relationship of buildings to public realm, and having a memorable character—goals typically found in form-based codes. The physical dimensions that help make Northampton’s Main Street attractive, which can be seen in Figure 41, are its wide sidewalks, first floor height of twelve to fifteen feet, transparent windows lining the first floor, and a rhythmic pattern to architectural elements.

Figure 41. Northampton’s Main Street pedestrian characteristics and dimensions (Source: Author)
A. Regional Context—New England

The idea of regional planning and broad-scale growth management takes on a different meaning in New England¹, where individual municipalities have ultimate home rule power by regulating land uses through zoning. This tradition of local (home) rule makes it especially difficult to implement many sustainable development principles as local authorities may value the protection of private property rights than experiment with unfamiliar, possibly regional, planning practices. In addition to strong local land use control, New England has a cultural, historic and social identity that helps unify its many communities. Examining the entire region is therefore important to understand general trends influencing policies and strategies that are implemented at the state and local levels. However, the general trends of New England may not apply to local areas where distinct factors such as a strong economic niche distort its growth and demographics.

According to the United States Census Bureau, the growth rate of New England was half the national average of 13 percent during the 1990’s and was considerably lower than many states outside the region. Such figures however, belie the amount of development and construction that occurred during a similar time period. During the fifteen years between 1982-1997, the New England region may not have experienced a strong population growth (approximately 10 percent), but developed land increased 34 percent—the area experienced sprawl (Wallace, 2002). Furthermore, between 1980 and 2000, more than one million acres of open space and farmland were developed in New England; in Vermont, 40 percent of

¹The New England states are: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont
development occurred on agricultural land (Wallace, 2002). The sprawling development in New England has occurred not within the traditional city or town centers, but on the outskirts of those places and in once rural areas, eroding the social character and economic viability of many New England communities.

The economic trends of New England are harder to generalize as the region has such disparate local economies. A number of metropolitan areas, such as Burlington, Vermont, and Boston, Massachusetts, successfully adapted to the changing economy of the 1990's. Although many traditional employers experienced slow growth in these urban areas, new markets and industries created job growth in such fields as “financial services, post-secondary education, software and communications, computers, technology and defense, biotechnology, and life sciences” (Wallace, 2002). Communities in western Massachusetts and rural areas of Maine, Vermont and New Hampshire, however, experienced a dramatic decrease in employment opportunities. Manufacturing and resource-based industries declined exponentially, making visible a clear dichotomy between the economies of urban centers and their suburbs and semi-rural to rural areas. The transition has resulted in the need for adaptive reuse of existing infrastructure, and the expectation of a college degree to find even an entry-level position—

“In general, the regional economy is laden with jobs that are either well-paying, requiring a high degree of skill and education, or low-skill jobs that do not pay enough to support a family. For a worker without a college education, there are fewer opportunities to find a job between these two extremes”

— (Wallace, 2002).
As the suburbs and urban centers adapted to the new global economy, housing prices and cost of living skyrocketed, forcing many people to move even further from cities and centers of employment. As droves of people moved 50-70 miles away from cities such as Boston, they inadvertently drove up housing prices and real estate values in semi-rural areas, decreasing the availability of affordable, workforce housing. This trend has created an ostensible gap in communities where 'local' people who may not have the education, work experience, or inclination to commute long distances struggle to find employment and in certain locations, affordable housing, while the wealthier, long-distance commuters live in the community but do not add to the social capital of the area.

The regional impacts of sprawl felt throughout New England are representative of such effects felt by individual communities. As the suburbs and rural areas transform from productive agricultural land and wildlife habitat to low-density housing and big box commercial development, the financial investments and businesses that left the urban centers are not evenly distributed outside the city. Many towns in New England, even though they have experienced a sharp decrease in environmentally viable habitat due to increased housing development, have not received financial support from the private corporations that employ the long-distance commuters. Sprawl cannot be sustained much longer.
The salient impacts of sprawl are becoming increasingly visible in New England because although there is not a lot of land area, there is an “impressive diversity of natural resources” (Heart et. al., 2002), which are monitored and used as barometer to summarize the general ecological health of the region. New England communities are beginning to take action to address the effects of sprawl, realizing that haphazard development needs to be addressed because in this region, “the quality of our environment is one of our greatest economic assets” (Wallace, 2002). For instance, in 2001, Massachusetts had the most local ballot initiatives in any state to support open space preservation and affordable housing through the Community Preservation Act, a voluntary increase in property tax matched by state funding (Wallace, 2002). Unfortunately, a majority of those sixty-eight local initiatives in Massachusetts were not approved because of home rule and the public’s fear of dense housing or innovative growth management techniques.

Even though the states of New England face similar challenges concerning future development, there is not a regional smart growth movement or organization (there is the New England Housing Coalition). Each state may encourage compact, ‘green’ development with incentives and progressive policies, but a unified program has not been adopted that could address the development of projects that impact the entire region—such as interstate highways, high speed transit, and energy supply generation. The relatively small size of the New England states makes inter-state planning possible geographically, yet it is politically unattainable. Most of the New England states have multi-disciplinary non-governmental organizations that try to mitigate the effects of sprawl, yet even these organizations do not work together: Vermont’s Smart Growth Collaborative, New Hampshire’s Smart Growth and Livable Communities Partnership, and Massachusetts’ Community Preservation Coalition.
B. State Context—Massachusetts

Massachusetts is one of the more densely populated states in America, the 5th densest, with a population of 810 persons per square mile (U.S. Census Bureau, 2000). Yet it too has experienced sprawl and its numerous effects. During the 1990’s the state did not experience growth in the rate of single-family housing starts, but the size of the individual lots and dwelling units increased exponentially. The average lot sized doubled between 1970 and 2002 in western Massachusetts and along Cape Cod (Mass Audubon, 2003) such that between 1985 and 1999, forty acres of land were developed daily. The rate of land consumption has been seven times greater than the state’s population growth, reflecting the haphazard development pattern so common today. This also translates into more expensive homes and real estate values, forcing homebuyers to live further from cities and employment centers as the availability of affordable workforce housing dwindles. It is estimated that the state will need an extra 30,000 housing units over the next ten years, in addition to the average annual market production of approximately 16,000 units, to keep housing prices relatively affordable for working professionals (Bluestone et. al., 2007). Recent trends in affordable housing are not promising, even if housing production can generate those extra units:

- “The number of communities in Massachusetts where a household earning the median income for that city or town could afford a median-priced home has fallen from 148 in 1998 to 27 in 2004.”
- Between 1999 and 2004, the percentage of renter households (all income levels) paying more than 30% of their income for rent rose from 36% to 43%.”

— (Citizen’s Housing and Planning Association, 2006)

A major obstacle to sustainable development in Massachusetts is the scale and density of developments allowed by zoning. “The subdivisions here [in Massachusetts] are tiny by
comparison to the fast growing areas of the country. It is rare to find one that has more than 100 houses…This region is missing out on the economies of scale that production housing provides” (Bluestone et. al., 2007). Since the upfront cost of ‘green’ building and using renewable energy sources increases housing prices between five to fifteen percent, large developments would help mitigate those effects. Larger subdivisions or mixed-use developments can integrate renewable energy sources without passing the cost directly to the consumer. Even with financial incentives and voluntary state programs that encourage environmentally sensitive design, the proportion of newly constructed innovative developments is miniscule when compared to the sheer number of conventional subdivisions and big-box retail outlets sprouting across the state. The Program Director of Northeast Sustainable Energy Association (NESEA) begrudgingly admits that the amount of new homes built using ‘green technology’ and renewable energy solutions in Massachusetts “is not even a drop in the bucket” relative to the number of new homes constructed annually (Barclay, 2007)—there is a wide gap between the growing knowledge of sustainable design techniques and its implementation.

Resistance to density is another factor that makes sustainable, compact development difficult to implement in Massachusetts. Many towns have such large minimum lot sizes—1 to 2-acre lots—that even if a developer wanted to construct dense housing, it would require extensive permitting. Communities often worry that with housing will come more school-aged children, creating an enormous financial burden on strained school budgets without recouping the expenses through property taxes. This is such a concern that when the State Legislature passed the Chapter 40R program in 2004, which rewards communities with up to $4,000 per housing unit if they change their zoning to allow for denser, affordable housing, many communities did not utilize the program. The density requirements are eight single-family dwellings per acre, twelve two- or three-family residences per acre, or twenty apartments or condominiums per acre, on land that is either in or near a town center, near transit, or on a vacant industrial site. The program also requires that 20 percent of the zoning district require affordable units and allow mixed uses; the idea is to create compact, walkable developments around existing infrastructure. The State Legislature observed that the program was unpopular and made one critical change a year later so that Chapter 40R is now
widely used. The state created a corollary program, Chapter 40S, which reimburses a community for the cost of “educating any school-age children who move into such districts” (Massachusetts Executive Office of Housing and Economic Development (EOHED)). State officials and many local authorities realize that we need radical changes in zoning to allow for more density and mixed-use developments because, ironically, a traditional New England town center—mixed-use structures that abut property lines and have architecturally significant front facades with porches or awnings—is prohibited under typical zoning in Massachusetts.

State level agencies aware of such obstacles have created strategies to encourage ‘green’ building and have recently required that all new state buildings be LEED certified. The agencies determined that there are five “pivotal periods” in the construction process when sustainable design elements can be incorporated: funding, bidding and awarding, planning, design and construction” (Grund, 2005). In addition to state offices, voluntary efforts are underway to build affordable, energy-efficient housing. The Green Communities Initiative is just one example, and combines the efforts of three organizations—the Massachusetts Housing Finance Agency, the Massachusetts Technology Collaborative, and the Enterprise Foundation— “to provide about $209 million in incentives, including loans, grants, and tax credits for developers to build 1,000 “green” homes for low-income families across the state” (Nichols, 2005).

The ability of the state government, however, to enforce regional planning strategies that could alleviate the current development patterns is limited; there is no comprehensive approach to manage sprawl. Massachusetts is a home rule state, such that the Commonwealth’s 351 cities and towns, not the state government, regulate land uses through zoning, design review committees and historic districts. Massachusetts, unlike the rest of the New England states, does not require local comprehensive plans to meet state policies or guidelines nor does it even require consistency between local and state-level plans. Even if a community wants to adopt innovative zoning, it must pass town meeting by a two-thirds super-majority, a sometimes huge obstacle when many people may be reluctant to try something unfamiliar. Even with smart zoning and subdivision regulations in place, two
major loopholes in Massachusetts exempt landowners from conforming to new standards:

1. Approval Not Required—lots with adequate frontage on a public way are exempt from subdivision regulations, and

2. Grandfathering—Massachusetts allows landowners who complete a preliminary subdivision plan followed by a definitive plan to be exempt from the zoning change for up to eight years, even if no project is constructed.

Without a strong regional approach to manage growth and development, many towns are struggling financially as more land is devoted to large-lot residential subdivisions and commercial strip developments. These new uses compete with locally owned stores in the town center, require large investments in public infrastructure, and strain local services such as schools and public safety. There are a few examples however, such as the Martha’s Vineyard Commission and Cape Cod Commission, where communities have organized to manage growth and preserve the unique character of their region.

Nonetheless, the building blocks are in place to achieve sustainable design. Massachusetts has taken progressive measures to help educate the public about alternative development strategies and the state provides financial incentives to help implement sustainable design. The state has policies, initiatives and financial incentives to help address brownfield redevelopment, agricultural preservation, historic preservation, affordable housing, and compact development; Massachusetts was actually a national leader by implementing these programs before many states. The Community Preservation Act, for example, gives communities the right to raise the local property tax levy up to 3 percent to fund land conservation, historic preservation and affordable housing, and if certain smart growth requirements are met, the state will contribute significant monies toward such projects.

Massachusetts has even formulated ten sustainable development principles that are used as a basis to judge new developments and are incentives for developers and communities alike to combat sprawl. For instance, the state’s Commonwealth Capital program awards approximately $500 million annually through grants to communities that implement planning strategies that help achieve statewide goals and if they satisfy the state’s sustainable development principles (Golledge & Perini, 2006). The ten principles are:

1. Concentrate Development and Mix Uses
2. Advance Equity
3. Make Efficient Decisions
4. Protect Land and Ecosystems
5. Use Natural Resources Wisely
6. Expand Housing Opportunities
7. Provide Transportation Choice
8. Increase Job and Business Opportunities
9. Promote Clean Energy
10. Plan Regionally

— (http://www.mass.gov)

Massachusetts has also created transportation, energy, and environmental plans with coordination from multiple agencies and offices. In 2004, a State Water Policy was adopted that promotes on-site storm water management, grey-water reclamation, and other conservation measures. That same year, a Climate Protection Plan was passed that set targets for reducing greenhouse gas emissions, including the adoption of California’s strict automobile emission standards which seek to achieve 1990 levels by 2020. The current administration has bolstered the state’s sustainable development principles and has combined smart growth with energy and environmental conservation, but these measures have yet to be proven significant. The state realizes that although it cannot require sustainable, regional planning, it can encourage it through programs that target broader scale issues such as air pollution to site specific applications such as green building techniques. Policies and incentives are beginning to be utilized: numerous Transit-Oriented Developments (TOD’s) are under construction throughout the Boston suburbs, with many more planned along existing rail lines and proposed future extensions of high-speed rail service.
C. Hinterland Context—The Pioneer Valley

i. Introduction
The Pioneer Valley is a distinct geographic and cultural region in Massachusetts with sixty-nine municipalities that had a 2003 population of 688,500 and 18,505 businesses with 285,064 employees (Pioneer Valley Planning Commission (PVPC), 2006. The Pioneer Valley Plan for Progress). The region’s communities are located within the Connecticut River Watershed, an area that sits between the Worcester area to the east and the Berkshire Mountains to the west. “The third largest city in Massachusetts, Springfield, is the region’s cultural and economic center, and is home to several of the region’s largest employers” (PVPC, 2007. Valley Vision 2). Even within the region, the different natural resources have shaped development patterns for decades, even centuries. Land adjacent to the river and along the valley floor has a rich agricultural history that continues today, while the many tributaries of the Connecticut River in the area’s forested hills encouraged mill towns and industrial activity that are struggling to adapt to a global economy. The perseverance that helped early settlers thrive in the region is now needed to help revitalize post-industrial cities and towns of the Pioneer Valley in the 21st century.

ii. Land Use
The region’s agricultural history continues today as farming, forestry and working landscapes produce millions of dollars of annually. Approximately 40 percent of Massachusetts’ farmland is in the Pioneer Valley; a valuable asset for the local economy that is threatened by sprawling residential development (PVPC, 2007. Valley Vision 2). The American Farmland Trust named the Pioneer Valley one of the most threatened agricultural regions in the United States (American Farmland Trust, 1997), especially since developed land increased eleven times faster than population growth during the last twenty years. “Between 1971-1999, over 30,000 acres (20.6 % of all farmland) were converted to
residential development, while only 4,500 acres were developed for commercial and industrial uses” (PVPC, 2007. Valley Vision 2).

![Figure 48. Sprawling development threatens America’s best farmland in Massachusetts (Source: American Farmland Trust)](image)

The low density residential development not only occupies once productive farmland, it increases the value of land so that farming is no longer profitable; the number of farms in the region has declined precipitously as the number of homes has increased. In addition to the environmental degradation caused by sprawl, this persistent trend erodes community character and quality of life that initially attracted the new residents. The constant development pressures and competition from national and international markets makes it extremely difficult for communities to protect the many small farms in the region—farms that just manage to break even each year. The average sized farm in the region is eighty-eight acres, with approximately 70 percent of the farms between 10-179 acres (PVPC, 2007. Valley Vision 2).

### iii. Demographics and Housing

During the 1990’s, when the population of Massachusetts grew by almost six percent, the Pioneer Valley’s population increased by less then one percent. The population of the region is also aging and the average number of people per household is declining. “In
1970, 47 percent of households had one or two people, and by 2000 this number had increased to 60 percent of all households” (PVPC, 2007. Update to the Regional Transportation Plan). As the large numbers of baby boomers in the area retire, it appears that there will be fewer people to fill their jobs, purchase their homes, and maintain the social vibrancy of the Pioneer Valley. In recent years however, the population of the region has increased more steadily. Between 2000 and 2004, the population of the Pioneer Valley increased by 7,000 people. This growth may have slowed more recently due to the downturn in the housing and economic market and mortgage market decline.

The region’s miniscule population growth rate is attributed not to increased births, but immigration:

“Every year of the 1990s the region experienced a net loss in domestic migration... Apart from the arrival of 16,025 foreign-born persons in the 1990s, the region would have experienced a 1.7 percent loss in population during the decade.”

— (PVPC, 2007. Update to the Regional Transportation Plan)

The increased foreign-born populations are not distributed evenly within the region, but are concentrated in the more urban communities of Amherst, Chicopee, Holyoke and Springfield. The Latino population experienced the largest growth rate of 51 percent during the 1990’s, with most of the new residents living in Holyoke and Springfield and slight increases in smaller cities such as Amherst, Ludlow and Northampton.

Yet the age and number of people leaving the Pioneer Valley is troubling: “two-thirds of the domestic out-migration from 1990 - 2001 can be attributed to people younger than 45 years old” (PVPC, 2007. Comprehensive Economic Development Strategy (CEDS) Annual Report). This translates into a loss of young families and potential workers, and decreases the proportion of the population with a college degree. Although there are thirteen colleges and universities in the Pioneer Valley, only 28 percent of the population has earned a college degree while 87 percent are high school graduates. Amherst, Longmeadow and Pelham have the highest concentration of those with a bachelor’s degree or higher, but it appears the region is struggling to attract and retain people with a college degree—people with the “skills and knowledge critical for the health of the region’s economy” (PVPC 2007. CEDS Annual Report).
Similar to the rest of the nation, many communities in the Pioneer Valley are comprised of detached single-family units. In the more urban areas, however, such as Springfield, Chicopee and Holyoke, there is a large concentration of multifamily units. Even though there are many multifamily units in the urban centers, approximately 80 percent of all housing units in the Pioneer Valley are detached single-family homes (PVPC, 2007 Update to the Regional Transportation Plan). The affect of so many single-family homes on large lots is that affordable housing opportunities are severely limited within the region, especially if someone wishes to live in a compact mixed-use development.

Within these single-family suburbs and rural towns, “married couple families are the dominant household structure, accounting for more than 60 percent of households” (PVPC, 2003. A Socio-Economic Atlas of the Pioneer Valley Region). In the urban areas, there are more single parent households while in the college communities of Amherst, Hadley and Northampton, there are concentrations of non-family households. The composition of the household does not relay information about housing affordability, a critical issue as large numbers of people move to the area for its quality of life. “Between 1997 and 2004, the median price of a single family home in the Pioneer Valley rose by 60 percent, while during this same period the median household income in Pioneer Valley fell by 0.7 percent” (CEDS Annual Report, PVPC 2007). This exponential increase in real estate value illustrates that housing affordability is a major issue in the region.

iv. Economic Development

The historic settlement pattern of agriculture on the valley floor, mill towns along streams and rivers, and rural hill communities with forestry and gravel extraction operations continues to some extent today, even though the economic landscape of the region has changed. Just as the Pioneer Valley has struggled to retain its working-aged population, so too has it struggled to attract and retain businesses. The region’s unemployment rate has been consistently higher than the state and national averages since 2005, an indication that business opportunities are leaving the Pioneer Valley. The area’s proximity to major cities—within three hours driving distance of New York City, Boston, and Albany—has
not helped attract necessary jobs. In the mid 1990’s the Economic Development Council of
Western Massachusetts was formed to attract and retain “manufacturing and agricultural
jobs as national and international competition make profitability much harder” (PVPC,
2006. The Pioneer Valley Plan for Progress.). The region’s economy is in transition, losing
manufacturing positions which “employed more than 29% of the region’s workforce in
in the Pioneer Valley (known as the “Knowledge Corridor”) has not been successful at
creating specialty niches or attracting large employers that could utilize college graduates;
many students leave the area after graduating from school.

![Graph showing percent change in Pioneer Valley employment by major industry, 2001-2005](image)

Figure 49. Change in Pioneer Valley employment by major industry, 2001-2005
(Source: PVPC; Massachusetts Dept. of Workforce Development, ES-202 Program)

The four largest industries in the Pioneer Valley by total employment are health care &
social assistance; educational services; retail trade; and manufacturing. These four sectors
account for 55 percent of the region’s employment. Industry clusters identified in the
region are centered around “agriculture and organic farming; paper and paper converting;
building fixtures, equipment and services; financial services; metal manufacturing and
production technology; and printing and publishing” (PVPC, 2006. The Pioneer Valley
Plan for Progress). As many of the traditional industries need fewer and fewer employees,
promising sectors have emerged. The area hopes to build on its natural resources and
capitalize on a growing hospitality and tourism sector, as well as exploit the educational
facilities in the region to attract health care businesses, science-based industry, pharmaceuticals, and plastics. Between 2001 and 2005, the fastest growing industries in the Pioneer Valley were “other services; arts, entertainment & recreation; educational services; and professional & technical services” (PVPC, 2007. CEDS Annual Report). However, these industries account for a small percentage of the total employment of the region. Disappointingly, many high-paying sectors are losing employment and leaving the area, with the information & technology sector and business management continuing to reduce the size of its workforce. The loss of employment opportunities means failing infrastructure and a disinvestment in many of our region’s assets.

![Figure 50. Employment in the Pioneer Valley by major industry, 2001 and 2005](Source: PVPC; Massachusetts Dept. of Workforce Development, ES-202 Program)

President Clinton designated the Connecticut River an “American Heritage” area in 1998, emphasizing that the health of the river and natural landscapes is crucial if local towns are to remain economically viable; the environmental and economic health of the region are inseparable. Ironically, as more farmland and forest is lost to residential construction, businesses have not been moving to the area. People are willing to commute longer distances so that employment opportunities have not relocated closer to the workforce. There are a few industries that experienced growth in the past twenty years, most notably
services, government, transportation and utilities, and construction. These employers are not distributed evenly throughout the region, but are found in the urban centers of Springfield, Holyoke and even Amherst with its colleges and universities. The city of Springfield is home to 31 percent of the region’s jobs, and when combined with the adjacent urban centers of Holyoke and Chicopee, these cities employee 120,000 people. Northampton and Amherst, when combined, only employee a total of 30,000 people. (PVPC, 2007. CEDS Annual Report).

The size of the region’s employers is quite small, with “two of every five employees in the Pioneer Valley working in businesses with fewer than 50 employees” (PVPC, 2006. The Pioneer Valley Plan for Progress). Nearly three-quarters of the businesses in the Pioneer Valley employ less than ten people and 98.4 percent of businesses have less than fifty employees. These small businesses now account for 41 percent of all jobs in the region while businesses with 50-250 employees account for 30 percent of all jobs (PVPC, 2007. CEDS Annual Report). The largest employers in the region are insurance companies in Springfield, hospitals located in the urban centers such as Springfield and Northampton, and the area’s colleges and universities, which have thousands of employees.

The falling employment in the region has created ripple effects such that the median household income and per capita income in the Pioneer Valley has slowly decreased in
recent years. The region’s per capita income is significantly less than the state and national average (PVPC, 2003. A Socio-Economic Atlas of the Pioneer Valley Region). The amount of households below the poverty level increased to a poverty rate of 13 percent for the entire Pioneer Valley in 2004. In Holyoke and Springfield, poverty rates commonly exceed 20 percent. Even in communities with significant employment, such as Amherst, Chicopee, and Northampton, there are pockets of high levels of poverty. When examining the entire region, clear disparities in median household income become apparent: the wealthiest communities are suburbs adjacent to the urban areas of Amherst, Holyoke, Northampton and Springfield. Yet even within the wealthy communities, homeownership has become so expensive that it is a struggle for existing residents to remain in the area.

The highest paying sectors are utilities, finance, and management of companies, with an average annual wage over $54,000.

“Manufacturing, educational services, and health care, three of the region’s largest industries by employment, have average annual wages between $37,778 and $46,696. Unfortunately, several of our region’s fastest growing industries’—arts and entertainment as well as other services – are among the lowest paying with average annual salaries of $15,158 and $20,488 respectively”


v. Natural and Cultural Resources

The Pioneer Valley is now a hotspot for tourists and outdoor enthusiasts. The region has many attractions, ranging from historical and cultural amenities to recreational sites. The Basketball Hall of Fame in Springfield, the Yankee Candle Company in South Deerfield, Northampton’s downtown (recently voted one the best places to shop by the American Planning Association) and the Connecticut River attract many non-residents to the area. The Connecticut River was named one of only fourteen American Heritage Areas, a designation that increases funding for economic and environmental revitalization. Unfortunately, the river and communities along its banks need solutions that can balance development with environmental quality. From Holyoke south to Long Island Sound, for instance, the water quality does not meet Class B (swimmable, fishable) federal water quality standards (PVPC, 2006. The Pioneer Valley Plan for Progress).
vi. Transportation and Circulation

Like many parts of the nation, the Pioneer Valley is automobile dependent. The aging infrastructure makes it only more salient that people drive their cars in this region. The Pioneer Valley Planning Commission reports that the number of registered cars increased almost 30 percent between 1996 and 2005, with 97 percent of that increase attributed to increased registrations for light trucks and SUV’s. As the number of vehicles on the road intensifies, so too has the number of vehicle miles traveled, rising 27 percent from 1980 to 2000. Unfortunately, the amount of people carpooling decreased dramatically during this same time period, resulting in more cars commuting to work. The average commute time for the area was twenty-two minutes in 2000, with some communities and populations commuting much longer distances (U.S. Census, 2000). All this driving corresponds to large amounts of greenhouse gas emissions and pollutants that degrade the valley’s air quality.

![Pie chart showing Pioneer Valley travel modes for employment](https://example.com/pie_chart.png)

Figure 52. Pioneer Valley travel modes for employment
(Source: PVPC)

The Pioneer Valley Metropolitan Planning Organization (MPO) works with communities to develop transportation plans and improve the viability/ use of mass transit options. Although a regional transit authority services the Pioneer Valley, it has limited capacity to efficiently serve the many communities in the region. It is inefficient and impractical...
financially to expand bus routes or transportation infrastructure to the many rural communities that have few commuters traveling to the same destination. In the more urban areas of Amherst, Holyoke and Springfield, a higher proportion of the population rides the bus, yet many people continue to commute by car, especially if they work in another town. There is not enough ridership to expand bus routes to accommodate more commuters.
D. Core Context—Town of Amherst

i. Introduction-Planning Capacity

Amherst is fortunate to have a competent Planning, Conservation and Information Technology staff that make it a priority to disseminate as much information as possible through the town’s website, informational brochures and formal reports; Amherst is a logical place to implement form-based codes. The town also collaborates with two local regional planning agencies, the Pioneer Valley Planning Commission and the Franklin Regional Council of Governments, whose reports are also available through the Internet. The following analysis may be supplemented by reports and publications available online:


ii. Master Planning Process

Amherst has not adopted a Master Plan since 1969; an effort in 1973 to encourage five compact mixed-use village centers was rejected by town meeting. Since that time, Amherst has taken many steps to manage growth, yet nothing has been comprehensive in nature. More recently however, citizens concerned about current development patterns have been working with officials from the Town of Amherst to draft an updated Master Plan. The process has used many sustainable principles, especially using various strategies to elicit public opinion and involving the community from the beginning. Professional consultants, in concert with community groups and town staff, have compiled existing conditions reports and written a new draft Master Plan based on the following goals:

1. Balance land preservation objectives with more intensive development in appropriate areas.
2. Encourage vibrancy in the downtown and village centers.
3. Enhance Town/Gown relations.
4. Maintain the Town’s existing charm and existing community character.
5. Promote an ethic of sustainability in all Town activities.
6. Strive for diversification of community amenities to meet the needs of all residents.

Residents and town officials hope this Master Plan can serve as a ‘blueprint’ that can help Amherst grow and adapt to changes in the 21st century yet still retain the existing community character with which so many people identify.

iii. Land Use

The Town of Amherst is a combination of town/village centers and working landscapes even though it is part of the Springfield Metropolitan Statistical Area (MSA). The total land area is 27.7 square miles (17,765 acres) and as of 1999, approximately 5,614 acres were developed. Much of the historic development occurred in the centers, with these places still serving as hubs of activity and housing. The largest village is the town center, while smaller villages help strengthen neighborhoods outside the downtown. The farmland and forests that once buffered the village centers has transformed into residential subdivisions and strip commercial development along the two major transportation routes through town: Route 9 (east-west) and Route 116 (north-south). Even though the Town’s Master Plan is founded upon the belief of compact centers,

“Multi-family permits [awarded in recent years] were relatively few due to a variety of factors, including severe limits on areas in which multi-family development is permitted, high land costs, and organized opposition from neighborhood groups”

— (Existing Conditions Report: Housing, Amherst Planning Department).

A considerable amount of residential growth as subdivisions and apartment complexes occurred in the 1960’s (to accommodate an expanded enrollment at the University of Massachusetts) and in the 1980’s. Currently, residential uses account for 23 percent of the town’s land area while commercial areas account for slightly less than one percent. Residential growth occurs most commonly as Approval Not Required (ANR) lots or cul-de-sac subdivisions that do not increase pedestrian connectivity within neighborhoods. An almost unbelievable 30 percent of all land is permanently protected open space, which includes forests, wetlands, open land, and urban open space.
The large amount of Amherst’s open space helps define the community and sustain local businesses. It is important to emphasize that 18 percent of all land area is protected farmland and another 18 percent is in conservation. Even with all this conservation land however, a recent build-out analysis for the town determined that 3,400 new housing units could be constructed under the current zoning standards, which translates into approximately 8,800 residents (Applied Geographics, Herr & Associates, 2002). Much of the expected development, like recent growth, would occur as ANR construction along existing roadways or large-lot residential subdivisions, fragmenting forest habitat and forcing farming operations out of business as real estate values make working landscapes less profitable.

The town has been managing growth through aggressive conservation land acquisition and reactive ‘stop-gap’ zoning measures (Existing Conditions Report: Land Use, Amherst Planning Department). Without an updated Master Plan, Amherst has been managing growth with zoning and subdivision regulations that have their foundations in the early to mid 20th century, creating a patchwork of nineteen different zoning districts. It may be argued that the number of districts is necessary to guide growth in areas with distinct land uses and environmental features, yet it creates arduous layers that complicate development as each zoning district has its own dimensional

Figure 54. Land use in Amherst, 1999  
(Source: Amherst Planning Department; MassGIS)

Figure 55. Developable Land  
- Permanently protected open space  
- Institutional land  
- Developable land  
(Source: Amherst Planning Department)
standards, allowable uses and special permitting requirements. Years of revisions and reactionary measures have created a complicated growth management system that may actually prohibit the type of development desired by many in the community: compact, mixed-use village centers. Surprisingly, these measures helped maintain a 1:1 balance between population growth and developed land between 1971-1999, but in recent years, the pace of developed land has been much greater than the town’s population growth. Amherst, like many surrounding communities, has experienced increased growth of low-density, automotive dependent sprawl; residents can no longer walk to the village centers.

The three institutions of higher education in town—although they provide many jobs and a desirable quality of life—own almost 16 percent of all land in Amherst, with two campuses straddling the town center. These colleges and universities may not pay property taxes, but they are the mainstay of the town’s economy, providing thousands of jobs and bringing students and visitors downtown to create a vibrant street life. Town officials, citizens and university members hope to improve ‘town-gown’ relations with the new Master Plan.

**iv. Demographics and Housing**

Amherst’s population is directly related to student enrollment at the area’s local universities. As the colleges and the University of Massachusetts expanded enrolled in the mid twentieth century, the population of Amherst increased correspondingly. In recent years, the town’s population has remained stagnant, with a 2000 population of 35,000 and a student enrollment totaling 23,500 (not all students live within town). The density in town ranges from 1,206 people per square mile to less than 200 people in outlying areas. The local universities also translate into a younger, more diverse population in Amherst than the county and state, with half the households in town occupied by non-family persons. Amherst also has a higher proportion of college graduates than many of the surrounding towns.
Just as land uses and population are closely related to enrollment at the colleges and universities, so too is the number of housing units in Amherst. Since the student population increased sharply in the 1960’s and 1980’s, a significant number of housing units have been built since this time period. Although there are a number of historic homes and historic districts within Amherst, more than half the housing units have been built within the past forty years. The increase in housing production has been more consistent in recent years, with the number of housing units increasing nearly seven percent between 1990 and 2000. Between 2000 and 2006, 90 percent of all new residential building permits were issued for detached single-family homes. Even with all this new single-family home construction, only 44 percent of housing units are detached single-family structures, while 33 percent are multifamily of five or more units and 11 percent are multifamily structures with 3 or 4 units. With the large number of students living off campus, approximately 60 percent of housing units in Amherst are renter occupied, a statistic far greater than the region and the state. The number of rental units actually accounts for one-quarter of all rental units within the county, but very few of these units have more than two bedrooms to accommodate families.

![Figure 57. Units in housing structure, 2000](Source: Amherst Planning Department)

![Figure 58. Residential building permits issued, 2000-2006](Source: Amherst Planning Department)

In Amherst and most of Massachusetts, resistance to density has created an almost insurmountable shortage of affordable housing, stratifying the community by age, income and race. The colleges and university increase residential densities in Amherst higher than communities of comparable size, yet the densest off-campus housing still has less than 15 units per acre:
<table>
<thead>
<tr>
<th>Property</th>
<th>Type</th>
<th>Size of Parcel</th>
<th>Number of Units</th>
<th>Units Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salem Place</td>
<td>C</td>
<td>4.47 acres</td>
<td>62</td>
<td>13.9</td>
</tr>
<tr>
<td>East Amherst Village</td>
<td>R</td>
<td>3.99 acres</td>
<td>48</td>
<td>12.0</td>
</tr>
</tbody>
</table>

* C=Condominiums, R=Rentals

(Source: Amherst Planning Department)

Figure 59. High-density housing developments in Amherst
(Source: Source: http://maps.live.com)

The ‘high-density’ housing shown above looks more like sprawl than compact development as it is single-use design that is automobile dependent and lacks pedestrian connectivity to local amenities. Even though Salem Place may be one of the more dense housing developments in Amherst, the condominium units are not affordable or subsidized, effectively excluding much of Amherst’s population.

As with many Massachusetts communities, Amherst has seen a significant increase in the median home value, which has nearly doubled in five years, from $177,000 in 2000 to $323,100 in 2005 (Page & Makker, 2006). The booming real estate market has made new home purchases financially unfeasible for many professionals, especially schoolteachers, firemen and policemen. Approximately 20 percent of homeowner-occupied households pay more than 30 percent of their income towards housing, a figure which according to the U.S. Department of Housing and Urban Development makes housing unaffordable.
Surprisingly, according to the Massachusetts 40B program administered by the Department of Housing and Community Development (DHCD), over ten percent of Amherst’s housing units are considered affordable, accommodating persons earning below 80 percent of the area median income.

v. Economic Development
“The Town of Amherst has a stable but relatively narrow employment base compared to the Pioneer Valley and Massachusetts” (UMass Donahue Institute, 2007). In 2006, approximately 14,100 people worked in town, and according to the 2000 U.S. Census, over half the working age population living in Amherst worked in Amherst. The colleges and universities are the largest employers in town and within the region; “educational services account for 58.2 percent of all jobs in Amherst” (Existing Conditions Report: Economic Development, Amherst Planning Department). The University of Massachusetts has approximately 7,800 employees (a portion of this number are part-time employees and graduate students with assistantships), more than half the total employment in Amherst. Amherst College and Hampshire College employ approximately 840 and 440 respectively, considerably fewer employees than the University of Massachusetts. The remaining businesses in town are modest in size when compared to the institutions of higher education, with most employing less than 50 workers and relying on part time help. Approximately 9 percent of the jobs in Amherst are in firms with three or fewer employees (UMass Donahue Institute, 2007).

Even with the presence of the educational institutions, there has been limited growth in Amherst’s economic base in the past decade. The town appears unable to attract businesses based in science, technology or research, which could benefit from the abundance of college graduates. Nonetheless, industries that are dependent on the student population, in particular the retail sector, food services and accommodations, experienced modest growth in recent years. The town has also increased its elderly care and medical services as more retirees move into Amherst, yet this is still a small percentage of total employment figures. Rental real estate is another significant income generating sector, with apartment complexes and individual housing units distributed throughout town. The harsh reality is
that the number of higher wage jobs is limited and have actually decreased in recent years. Low wage jobs in arts & entertainment, recreation, and other services have experienced the most growth since 2000. The 2005 median household income was approximately $42,567, annual earnings that make homeownership extremely difficult when the median home value in 2005 exceeded $300,000.

The educational institutions, although they employ many people and are the mainstay of Amherst’s economy, are tax-exempt institutions. This greatly increases the financial pressure of residential property taxes to provide local services, maintain public infrastructure and finance the school systems. These institutions also appear to reduce the demand for commercial real estate in town, as neighboring towns offer more incentives that attract national corporations. The bottom line is that Amherst is struggling to attract high wage jobs and businesses that can take advantage of the large numbers of college graduates.

vi. Open Space and Natural/Cultural Resources
The Town of Amherst occupies an almost idyllic New England landscape with the Holyoke Mountain Range in the South, the undulating Pelham Hills in the west, and numerous streams and rivers cascading to the Connecticut River on the Valley floor just west of the town boundary. Lawrence Swamp, in south Amherst, is a large wetland that is home to endangered species and is home to all the town’s public water drinking wells—it is therefore an important area to protect from development, septic systems, and agricultural and roadway runoff. Amherst’s farmland is another valuable resource that needs protection from sprawling development, especially since a third of Amherst’s farmland and forests have been developed since 1971 (Existing Conditions Report: Natural & Cultural Resources, Amherst Planning Department).

The Town’s Conservation Commission and other committees have preserved 2,600 acres for conservation purposes such as wildlife habitat, scenic views, and to provide recreational and educational opportunities. Amherst has over fifty miles of trails in town that create a network of open spaces and parks that connect with the surrounding communities. Town
committees and private organizations also work diligently to preserve land in Amherst. However, much of this open space is not connected to the town center through trails or green corridors, and there are very few public parks within the town center.

Amherst has balanced development and land preservation, with 72 percent of its remaining farmland protected through Agricultural Preservation Restrictions. In addition to protected land, over 900 properties are on the National Register of Historic Places, and parts of the town center are one of four Historic Districts approved by the National Register. Amherst has made extensive use of the state’s Community Preservation Act to help fund historic preservation, open space acquisition, and increase affordable housing. It appears that Amherst has been more successful at protecting open space than providing residents with affordable workforce housing. However, even with so much protected land, valuable stream corridors and prime farmland is still threatened by development.

vii. Services and Facilities
The Town has numerous sources of public water and through conservation efforts, has maintained a constant water usage for the past ten years. Local colleges and universities account for almost half the annual water usage, and although technology has improved water use efficiency, as the institutions increase enrollment and more residents move into town, the demand for water will increase.

Amherst’s wastewater treatment plant is in great condition and has almost 3 million gallons per day of excess capacity. The town collects storm water through “a combination of
swales, drainage ditches, culverts, catch basins and piped collection systems” (Existing Conditions Report: Services & Facilities, Amherst Planning Department), trying to make use of on-site best management practices whenever possible. The town is exempt from the EPA Phase II Storm water Requirements, relaxing standards for new construction and redevelopment sites. Although all of the water systems are currently in good condition, Amherst cannot meet the expected population growth without increasing water conservation and improving wastewater treatment. The town will need to find other sources for drinking water at the same time as it will need to finance maintenance and repair of its aging infrastructure; these two endeavors may be quite problematic in the future.

viii. Transportation and Circulation
“The Town of Amherst has an extensive and comprehensive series of transportation modes including roadways, public transit, rail, private transport services, sidewalks, multi-use trails, nature trail, bike lanes, and rideshare programs” (Existing Conditions Report: Mobility, Amherst Planning Department). In addition to Route 116 and Route 9 that crisscross town, Amherst is within a half hour drive of Interstate 91, a major north-south highway that connects with Springfield and Hartford, and the Masspike, an east-west corridor providing access to Boston and Albany. Within Amherst, there are 144 miles of roads: the town owns and maintains 68 percent while 7 percent are state owned routes. The highest traffic volumes are on Route 9, with an average of 23,000 vehicle trips per day—mostly commuters driving to Northampton or to the interchange with Interstate 91. Even with all this traffic heading out of town, approximately 68 percent of the working aged population in Amherst works in town, relying mostly on public transportation or cycling to get to work. Within and around the town center there is an interconnected network of sidewalks, off-road trails and bike lanes that promote alternative modes of transportation. Outside the village centers however, the rural roads often lack sidewalks or adequate lighting and shoulders so that cycling is dangerous at night or during rush hour when there is heavy traffic volumes.
If people are traveling outside Amherst, there is an extensive public transit service and ridesharing program with the neighboring communities. Parking lots at the University of Massachusetts and other commercial developments in town allocate a number of parking spaces for people who use the local bus service to travel about town. The Pioneer Valley Transit Authority (PVTA) has many routes that serve Amherst and Northampton, and the five colleges within the area. The average commute time for people working outside of Amherst is twenty-two minutes, a much shorter commute than most people in the Pioneer Valley because of the town’s proximity to the other major employment hubs of Northampton and Springfield. If one wishes to travel outside the region, Amtrak makes a daily stop in Amherst, bringing passengers directly to Montreal and New York City. Peter Pan Bus lines also stop in Amherst, providing an opportunity to travel to countless destinations.

Figure 61. Pioneer Valley Transportation Authority (PVTA) route map. Note the amount of bus routes through Amherst.  
(Source: http://www.pvta.com)
E. Study Area Analysis

i. Study Area Location and Context
The study area occupies a prominent location in Amherst center, acting as a gateway to the
downtown and as a transitional zone between the University of Massachusetts, Amherst
Regional High School and the residential neighborhoods adjacent to the general business
areas of the town center. The study area itself may be categorized as having distinct
districts:

1. Residential buildings and uses along its western boundary separated from the
   commercial district by
2. Kendrick Park, three acres of open space in the center of the study area,
3. Commercial and retail uses along the northern, eastern and portions of the
   southern boundaries, and
4. Apartments along the site’s southern edge behind the Amherst Post Office and
   adjacent to the West Cemetery, a significant cultural landmark.

![Study area context](Source: MassGIS)

![Study area districts](Source: MassGIS)

The 32-acre study area is an amalgamation of building types and uses such that it is
difficult to uniformly apply single-use zoning and rigid streetscape design guidelines in this
area of the town center. In order to better understand the character of the study area, the
following pages will show photographs detailing the area’s distinct districts.
Figure 64. Town center and study area gateway

- Heavily traveled
- Inconspicuous arrival

Figure 65. North of Triangle Street

- One-story commercial buildings
- Extensive surface parking behind structures
Figure 66. Carriage shops

- Dispersed retail and commercial structures
- Extensive surface parking

Figure 67. West Cemetery

- Historic district and local landmark
- 5-acre open space
Figure 68. Post office and Kellogg Street

- One-story retail structures
- Residential apartments

Figure 69. Henion Bakery district

- Transitional zone-residential structures with mixed uses
Figure 70. Kendrick Park

- 3-acre central open space
- Relatively level with areas for active and passive recreation

Figure 71. Westside of Kendrick Park

- Historic structures built in the mid 19th century
- Mostly residential uses
**ii. History**

Many of the residential structures in the study area were constructed prior to 1900, while most of the commercial buildings have been constructed in the past forty years. The commercial areas in the study area—Carriage Shops and North of Triangle Street—have little historic significance and could be altered or demolished without extensive permitting.

The Historical Commission, however, has established numerous Local Historic Districts in order to discourage the demolition of historic structures or landmarks in Amherst. Although the study area is not within an Historic District, it is surrounded on three sides (West, South and East) by such districts.

![Figure 72. Local historic districts (Source: MassGIS)](image1)

![Figure 73. Year structures built (Source: MassGIS, Amherst Planning Department)](image2)

**iii. Zoning**

Three zoning districts intersect in the study area, reinforcing its location as a transitional gateway to the town center: RG (General Residence), BL (Limited Business), and BG (General Business). Within the BL and BG zones, retail and commercial activities are promoted, while most residential uses are prohibited. Apartments, multifamily units, converted dwellings and townhouses are allowed by special permit in an effort to encourage mixed-use structures and dwelling units that retain the scale of the downtown.
These zones also have smaller lots sizes and setback requirements than the residential zoning districts.

In the RG district, unlike the business zones, retail, office, and research & industrial uses are not allowed, while limited commercial uses are allowed by special permit. The General Residence zoning district allows single-family homes by-right, multifamily units and apartments with a special permit, and prohibits overnight lodging uses, such as boarding homes, hostels and hotels. The General Residence zone encompasses Amherst center in an area where historic neighborhoods developed with small lots, skinny streets and architectural articulation on the front of homes—covered porches, front stoops, and decorative molding. In an effort to validate the existing settlement pattern, this zoning district has smaller dimensional requirements and lot sizes than other residential zones, and even has more flexible requirements than the Limited Business district. However, within the General Residence zone, the maximum lot coverage is only 40 percent compared to 85 percent in the Limited Business district and 95 percent in the General Business (BG) district which covers the town center.

In all three districts, the maximum height of a structure in floors is three, while the height in feet varies from 35 feet in the BL district to 50 feet in the BG district. Another commonality between the zoning districts is that they are essentially single-use zones that reinforce separating uses and promote automobile dependence.

Figure 74. Study area zoning districts
(Source: MassGIS)
iv. Land Use

Even though the study area is approximately a quarter mile north of Main Street and the central Town Common, light industrial uses, home offices, and commercial uses anchored the site at the turn of the 20th century. Today, commercial and retail activities dominate the study area, and many of the existing residential structures have been converted to office use. Much of the commercial areas, however, are dedicated to surface parking and paved right-of-ways, subjugating the pedestrian to narrow sidewalks or walking alongside vehicular traffic in the parking lots. The retail and commercial buildings are typically one-story structures placed at the back of the lot and do not create the structural rhythm and street life characteristic of Amherst Center. Kendrick Park, the study area’s central open space, is relatively unused although it is maintained for active and passive recreation.

![Figure 75](image1)

**Figure 75.** Study area general building uses as percent of total floor area *(Source: Author)*

![Figure 76](image2)

**Figure 76.** Study area general building uses as gross floor area (square feet) *(Source: Author)*
v. Parcel Configuration and Ownership

The study area consists of 62 parcels that combine for a total land area of approximately 32 acres. The larger lots are used for commercial, retail or for apartments, with a significant amount of the surface area paved for parking. Many of the commercial lots have multiple owners and are irregularly shaped. The smaller residential lots were created to validate historical settlement patterns and are therefore rectangular in shape with narrow road frontage and a depth typically twice as much as the frontage.

![Study area parcelization and ownership-common ownership shown in same color](Source: MassGIS)

vi. Transportation and Circulation

1. Vehicular:

Two major routes intersect within the study area to form a gateway that welcomes people into Amherst’s town center. Many commuters and students drive through this area of the town center en route to other locations—it is constantly busy throughout the day. During rush hour (in the morning and evening), traffic backs up in all directions as people wait to get through the intersection. A small number of secondary roads offer shortcuts for people unwilling to drive through the downtown, however, these streets are much more residential in scale and character than major vehicular routes shown in bold in Figure 78 on the following page.
East Pleasant Street (runs North-South), which bisects the study area, is a major in-town route heavily used by pedestrians and vehicles. Eight bus routes stop within the study area to take advantage of the walk-in businesses, cultural landmarks (churches and historic homes) and civic buildings within the study area. These buses also provide service to surrounding towns and shopping centers.

The amount of vehicular traffic through the study area disrupts pedestrian movement at crosswalks, and the many entry/exit points to the surface parking creates dangerous walking conditions as cars and people interact. Within the study area, the arrangement of surface parking creates a confusing hardscape where travel lanes, pedestrian paths and parking spaces blend into each other (a seen in Figure 79). South of the study area, in Amherst’s traditional center, parking is located behind the buildings and accessed through alleys or secondary roads; this creates an almost car-free sidewalk. Figure 79 also shows that there is ample surface parking within the town center, and according to a parking study conducted in 2008 by the Pioneer Valley Planning Commission, there is enough parking to accommodate intensifying land uses within the downtown.
2. **Pedestrian:**

Pedestrian experience in the study area varies as one moves from the residential areas to the commercial center. The major vehicular routes have sidewalks separated from the street by a grass median, while the secondary streets have narrower sidewalks or no sidewalks. Within the retail and commercial areas, pedestrian circulation is ill defined, even dangerous as paths cross driving lanes. Nonetheless, many people walk through the site. High school students parade through the area in droves almost every afternoon, heading towards such destinations as Starbucks, Antonio’s Pizza, Rao’s coffee shop and other places with seating and cheap food. Throughout the day and night there is continual foot traffic—college and high school students walking to the bus stop or local shops, townspeople shopping or dining out, and people walking or cycling to work.

Amherst center experiences a high amount of pedestrian traffic, with major pedestrian routes coalescing in the study area. Unfortunately, the study area is not pedestrian friendly because the zoning and land uses have created settlement patterns with scattered buildings connected by asphalt and the automobile. In the traditional town center, the pedestrian experience changes as wide sidewalks, street trees, seating areas, and building facades create an exciting, memorable place. It is important to realize that land use regulations and architectural standards are two critical elements that shape the pedestrian experience. On the following page, a series of three images will illustrate the perception of traveling along a 2000-foot length of road in different land uses. The images show that a mixed-use, walkable streetscape creates the perception of a shorter distance than walking along a strip commercial develop typical with conventional zoning.
Figure 81. Perception of 2000 feet along commercial strip development
(Source: Author)

Figure 82. Perception of 2000 feet along rural village center
(Source: Author)

Figure 83. Perception of 2000 feet along mixed-use town center
(Source: Author)
vii. Tree Cover and Open Space

The amount of tree cover in Amherst center is minimal, increasing the heat island effect and increasing the amount of runoff flowing directly into catch basins and town drain lines during even small amounts of precipitation. The scattered pockets of open space found in the town center exacerbate the hydrologic impact of the lack of tree cover; storm water does not have an opportunity to cool or filter out sediments before flowing into the drainage system. There are however, significant open spaces in and around town center, as seen in Figure 84, which provide an opportunity to create a green corridor that integrates vegetation, on-site storm water management, and off-street pedestrian connections into the study area and town center.

viii. Topography and Hydrology

Almost the entire study area has a slope between one and three percent; this reduces the amount of grading and leveling necessary to create universally accessible sidewalks and paths. Although the study area has a consistently level slope, it sits in a low point of the town center, such that storm water and utility systems drain towards the study area.

The study area is in the Tan Brook Watershed, a subwatershed of the Mill River which flows into the Connecticut River west of town center. The Tan Brook Watershed drains approximately 160 acres of mostly residential use. In the study area, however, the watershed has an urban character: very little pervious surface, not many trees, and
the water is conveyed underground in pipes. Ironically, Tan Brook, once an open-air stream, now runs through the study area in pipes to bring water quickly away from the town center. In various places along its path, Tan Brook is daylighted (as seen in Figure 85 on the previous page), revealing the high water table found in the northern half of the study area. The location of the study area in the Tan Brook Watershed provides an opportunity to explore on-site storm water management referenced earlier in this report.

**Figure 86. Study area slope analysis**
*Source: MassGIS*

**Figure 87. Study area surface flow and shaded relief**
*Source: MassGIS and Author*

**Figure 88. Tan Brook watershed**
*Source: MassGIS and Author*
A. Vision

The vision for this project is a design that revitalizes and allows expansion of Amherst Center by creating a more pedestrian-friendly, mixed-use area with affordable workforce housing and a vibrant street life of shops and plazas. Integrated with this vision is the idea that sustainable development principles—green roofs, on-site storm water management, L.E.E.D. building and site planning certification, walkability and other standards—will be a hallmark of the design. The revitalized town center will serve as a model for balancing housing diversity with local business opportunity, and the use of form-based code will inspire other communities that increased densities and mixed-use structures are critical for the success of any community center. The design also seeks to create a learning environment that builds upon the academic institutions present in Amherst. The transparency of sustainable development principles will be as paramount as the quality of design and formation of public space; residents, students, and visitors will be visually exposed to and made more aware of these techniques. It is hoped that the design can help redefine a new aesthetic that is appropriate in the 21st century to develop a sustainable community.

Figure 89. Vision-Principles-Benefits

- Curb trend of McMansions by concentrating housing in town center
- Reduce reliance on automobile and need to expand infrastructure
- Help preserve existing farmlands and open space
- Provide flexible commercial spaces that can meet market demands: restaurants, retail
- Create link between town center and university
- Increase housing affordability and housing opportunities
- Multi-generational community that will cater to aging populations
- Builds upon existing community character and town strengths
Inspiration for the design was drawn from existing places that embody many of the principles necessary for a pedestrian friendly, mixed-use sustainable development. Church Street in Burlington, Vermont, for example, was examined as the city transformed multiple blocks of a street once heavily traveled by cars into a pedestrian-only zone. The benefits have been numerous: reinvestment in the area, increased upper story housing opportunities, abundant ground floor retail and restaurant space that takes advantage of the pedestrian atmosphere, and national recognition as an exemplary city-center revitalization technique. The Rue de Petit Champlain, a pedestrian street in the historic district of Quebec City was also studied as this narrow space, only 25’ in width, is a vibrant mix of shops, plazas, museums and restaurants. Rue de Petit Champlain serves as a great example of how getting lots of people into a space and creating a pedestrian scale environment diminishes the height of the buildings lining the street. The street’s ratio of height to width is at least 4:1, yet the space does not feel cramped or claustrophobic because one’s attention is drawn across the street to the many shops and amenities.

Figure 90. Church Street, Burlington, VT
(Source: http://www.flickr.com)

Figure 91. Rue de Petit Champlain, Quebec City, Quebec
(Source: http://www.panoramio.com)
B. Design Process

In order to learn which elements of a form-based code would be most appropriate for the study area in Amherst center, different design scenarios that used varying dimensional and street standards were analyzed. As a place-specific application of general guidelines, it is imperative that form-based codes, especially ones that utilize the Transect Model, fit their surrounding scale and context. The process began by analyzing the Draft Mixed-Use Infill Ordinance and its corresponding design developed by Amherst’s consultants. Two more conceptual designs were applied to the study area, each using slightly altered dimensional and spatial elements to help determine which form-based code standards were most advantageous to developing a compact mixed use area. The design guidelines and standards exploited characteristics from Amherst’s existing zoning bylaw and made use of key components from the case studies (Saratoga Springs, NY and Northampton, MA). A final conceptual design was developed that combined successful elements from the form-based code models and proposed new elements that would help make the study area a truly sustainable town center.

i. Scenario I

Scenario I was developed by the Amherst consultants who helped the Town draft its new Master Plan. These consultants also drafted a Mixed-use Infill Ordinance and a corresponding 3-dimensional computer model to help visualize potential development within the study area. Their design does not include the entire study area of this project, but limited itself to a site that is bounded by West Cemetery on the South, Triangle Street to the north and East Pleasant Street to the west, as seen in Figure 92 on the following page.

The consultants organized the site according to a regulating plan that uses four lot types and two street types to guide placement of structures, open space and pathways. Implicit in the design was their assumption that the site was part of three transect zones that would be adopted by Amherst in their town center. The zones include a core, preserve and general zones that have corresponding dimensional standards and use regulations. The four lot and building types—blockfront building lot, civic space lot, liner building lot,
and live-work building lot—were chosen because they could increase the intensity and diversity of uses on the site. The blockfront building was envisioned to be a mixed-use structure lining the street with first floor commercial, retail and office space and residential uses upstairs. Civic space lots were designed to accommodate public spaces such as plazas, squares or storm water management elements. Liner buildings were shallow structures used to conceal a large parking garage setback from the street. Live-work buildings were to be mostly residential uses with small commercial venues integrated into the building’s dwelling units. Pray Street was retained and reorganized as a Type A street with “two ten foot lanes with on-street parking on both sides of the street and 13 foot sidewalks with street trees” (Form-based code report, Amherst Planning Dept.).

The Scenario I model shows maximum build-out massing and relationship of built forms to the street, public realm and to nearby structures. The design appears to ‘cut & paste’ the existing building form and size from the other buildings in Amherst center without
exploring a range of heights or massing that could be more appropriate to revitalize the downtown. This transect model actually creates more layers and complexities to redeveloping the site as each lot must be assigned a building designation, leading to a piecemeal development approach. The designation of a building type to each lot creates a rigid, inflexible plan; if a non-conforming structure were to be proposed for a particular lot, it would require rezoning that parcel. Such a process is not the streamlined, flexible development standards expected with form-based codes. The consultant’s draft ordinance also required such large minimum lot sizes and lot widths that it would prevent development of many existing lots as they have irregular shapes.

The difficulty of mixing building types on each lot is compounded by strict front, side and rear sidewalks which limits building placement on each lot—the strict standards are similar to conventional zoning methods rather than the range of dimensions characteristic of form-based codes. For instance, the consultants applied the average front and side setback of Amherst’s existing town center to the site without accommodating for irregular lot shapes, narrow right of ways, and public transportation stops. The front setback range of 0-10’ actually creates narrow sidewalks on the site because unlike the existing center, extremely narrow rights of way on East Pleasant Street and Triangle Street results in buildings that are almost flush with the street. This creates an unfriendly pedestrian environment. The minimum sidewalk width of 6-8’ brings pedestrian along busy streets without any planting buffers or without enough space for seating or gathering; the sidewalk is meant only to be used as a corridor and not enjoyed as a shopping or walking experience. The actual
sidewalk width could be considerably narrower as balconies, stoops and windows are allowed to protrude into this area.

This design scenario also fails to elevate the pedestrian above the automobile within the site itself. The reorganization of Pray Street, with on-street parking and as a corridor leading to interior surface parking actually impedes and interrupts pedestrian movement as much as the existing conditions; the car still dominates the site. Although Scenario I brings buildings closer to the street, the large amount of surface parking with limited sidewalk space forces pedestrians into a dangerous, unpleasant environment where they are constantly crossing streets or parking lots. Even the green spaces incorporated into the site are disconnected from shops and dwelling units by paved areas. In addition, the generous amount of civic space within the design may be irrelevant as Kendrick Park, a 3-acre open space, is underutilized and not integrated into the pedestrian experience.

Scenario I appears to fall short of developing a truly compact, mixed-use center. The amount of roadway, surface parking and civic space actually reduces the amount of building square feet so that relatively insignificant amount of retail or residential space is added to the site; it would be financially unfeasible to redevelop the site with Scenario I. This design also fails to include the area north of Triangle Street, an eyesore of one-story commercial buildings and surface parking that should be integrated into a redevelopment plan of Amherst center. Ultimately, the design keeps the automobile as the dominant mode of transportation and does not even provide a public transportation stop or create an environment where pedestrians can meander safely through the site. However, this design does use elements that could create a pedestrian-friendly environment, such as requiring at least 80 percent of the lot frontage to be built out. Yet this standard alone cannot create a pleasing space. The design also limits block length, but at a minimum of 1600’, it essentially creates superblocks that prevent pedestrians from easily walking to adjacent streets.
ii. *Scenario II*

*Scenario I* helped clarify which elements could be further examined to help make the study area a viable mixed-use center: increased building height, flexible front setbacks, pedestrian access to adjacent streets, and a reduction in surface parking. *Scenario II* explored these design standards by applying Saratoga Springs’ form-base code regulations to Amherst. Saratoga Springs has the same population and settlement patterns as Amherst, making their code relevant to study.

Saratoga Springs’ form-based code uses the more typical version of the Transect Model by creating zones that are not as fine scaled as the consultant’s model; the zones are applied to blocks and neighborhoods within Saratoga’s city center, not reaching such specificity as building lot type as in *Scenario I*. Saratoga Springs adopted three transect zones to help revitalize their city center: 1) T4-Urban Neighborhood, 2) T5-Neighborhood Center, and 3) T6-Urban Core. The intent of each district varies slightly, with the Urban Neighborhood focused on increasing a mix of housing types while the Neighborhood Center district emphasizes mixed-use structures with ground floor retail and commercial and upper story residential. Within the Urban Core, it is expected that the most dense business, cultural and entertainment concentrations can be accommodated. Dimensional standards of Saratoga Springs’ form-based code can be found in Figure 95 below.

<table>
<thead>
<tr>
<th></th>
<th>T-4</th>
<th>T-5</th>
<th>T-6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban</td>
<td>Neighborhood</td>
<td>Neighborhood</td>
</tr>
<tr>
<td>added 5/20/03, amended 6/15/04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory Standards</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frontage Build-Out</td>
<td>50% min.</td>
<td>/0% min.</td>
<td>80% min.</td>
</tr>
<tr>
<td>Build To-Line</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Buildings from Frontage Line</td>
<td>12 ft. to 18 ft.</td>
<td>0 ft. to 12 ft.</td>
<td>0 ft. to 12 ft.</td>
</tr>
<tr>
<td><strong>Side Setback</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Principal Building</td>
<td>12 ft. average</td>
<td>0 ft. minimum</td>
<td>0 ft. minimum</td>
</tr>
<tr>
<td>Back Building</td>
<td>6 ft. min. each side</td>
<td>0 ft. min. each side</td>
<td>0 ft. min. each side</td>
</tr>
<tr>
<td>Outbuilding</td>
<td>6 ft. min. each side</td>
<td>0 ft. min. each side</td>
<td>0 ft. min. each side</td>
</tr>
<tr>
<td><strong>Rear Setback</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Principal Building</td>
<td>24 ft. min.</td>
<td>0 ft. min.</td>
<td>0 ft. min.</td>
</tr>
<tr>
<td>Outbuilding</td>
<td>5 ft. min.</td>
<td>0 ft. min.</td>
<td>0 ft. min.</td>
</tr>
<tr>
<td><strong>Building Height</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 story minimum</td>
<td>40 ft. max. height</td>
<td>2 story minimum'</td>
<td>2 story minimum''</td>
</tr>
<tr>
<td>50 feet max. height</td>
<td></td>
<td>50 feet max. height</td>
<td>70 feet max. height</td>
</tr>
</tbody>
</table>

*Figure 95. Saratoga Springs form-based codes dimensional standards*
(Source: *City of Saratoga Springs, New York*)
Key elements of the code are a minimum building height of two stories with maximum heights ranging from 40 feet in the Urban Neighborhood district to 70 feet in the Urban Core. Saratoga’s code also uses a flexible front setback and a minimum frontage build out requirement that was applied to the study area. Although there are minimum side and rear setbacks, there is no maximum setback—this allows for generous space between buildings which could increase pedestrian connectivity to adjacent streets or it could disrupt the rhythm of facades and built form. Other key elements from Saratoga Spring’s form-based code include: no maximum lot coverage, no surface parking in the T5 and T6 zones, cross-parcel easements to encourage back alleys, and allowance for front stoops, balconies and awnings to extend 50 percent of the distance between the build-to-the line and the frontage line.

Applying this three-zone transect model to the study area results in buildings with extremely large footprints and heights that are not in proportion to the street widths of Amherst. Saratoga Springs has broad right of ways so that taller structures do not dominate the street by creating extreme shadows or the perception of narrow, canyon-like corridors. Allowing awnings and balconies to extend into the public realm narrows pedestrian sidewalks in Scenario II.

Figure 96. Scenario II plan and building footprints (Source: Author)

Figure 97. Scenario II perspective (Source: Author)
The building heights and front setback requirements are not appropriate for Amherst center, although, in Figure 98, one can see that the height of the buildings are not as tall as Town Hall, and could theoretically be allowed in the study area—no structure in the town center can be taller than Town Hall. *Scenario II* shows that the study area could be developed with buildings as tall as 70’ as long as the zoning requires wider sidewalks and has more flexible setback requirements. However, the generality of Saratoga’s code would need to be refined to address the irregular lot shapes and sizes within the study area. For instance, the minimum side setback of zero feet creates a continuous, impenetrable street wall that does not allow for pedestrian access between structures; one must walk around the entire block to reach the study area’s interior.

Figure 98. Scenario II maximum building height
(Source: Author)

Figure 99. Scenario II section 1 showing narrow sidewalks and inappropriate building heights
(Source: Author)

Figure 100. Scenario II section 2 showing large building mass and heights
(Source: Author)
**iii. Scenario III**

Scenario III builds upon the previous scenarios and also incorporates design elements from Northampton, Massachusetts. Although Northampton does not use form-based codes, their use of architectural design guidelines and progressive zoning has created a downtown that is nationally recognized as a pedestrian-friendly shopping environment.

Scenario III continues to use the transect zones established in Scenario II—Urban Neighborhood (T4), Neighborhood Center (T5) and Urban Core (T6)—but refines the dimensional standards by incorporating characteristics from Northampton’s zoning. For instance, a larger front setback range (10-18’) with a minimum sidewalk width of 9’ is used in all zones, and there is a minimum height requirement of three stories in all zones with the tallest structures in the Urban Core reaching five stories. Scenario III also uses maximum building and lot coverage to reduce the size of building footprints. For instance, in the Urban Core, structures can cover up to 75 percent of a lot with an additional 15 percent covered with impervious surface for total lot coverage of 90 percent.

![Figure 101. Scenario III plan and building footprints (Source: Author)](image)

![Figure 102. Scenario III perspective (Source: Author)](image)
The results of *Scenario III* are buildings that have more realistic footprints, wide comfortable sidewalks because of the front setback requirements, and building heights appropriate to the study area. The front setbacks are generous enough so that front awnings and balconies can extend up to 10’ from the building’s façade without pinching the sidewalk. Like the previous scenarios, this design concept has retained Pray Street as a two-way public street bisecting the core of the study area; this disrupts pedestrian movement by encouraging automobiles to cut through the study area. Form-based codes can address the built form in relation to the street and to other structures, yet it has difficulty addressing existing conditions such as irregular lot shapes and undesirable street layouts that can significantly diminish the quality of a place. *Scenario III*, however, does generate design standards that begin to increase pedestrian connectivity, even allowing for side alleys that create more opportunities to walk through the study area without walking alongside cars on the heavily traveled town streets.

Figure 103. Scenario III maximum building height
(Source: Author)

Figure 104. Scenario III section 1 showing narrow sidewalks and inappropriate building heights
(Source: Author)

Figure 105. Scenario III section 2 showing wide sidewalks and appropriate building heights
(Source: Author)
iv. Final Concept

Scenarios I-III illustrate that form-based codes have difficulty creating a truly pedestrian environment when there are irregular lot sizes and shapes; by its very nature, form-based code implies a level of uniformity that may be achieved in areas with more consistent lot sizes and development patterns than in the study area. In Saratoga Springs, the existing infrastructure and historic development of the city center created an area where form-based codes were the most appropriate tool necessary for a creative revitalization of downtown that respected the built form. In the Amherst study area, form-based codes may result in many desirable characteristics—wide sidewalks and continuous store facades with rhythmic patterns of entrances and windows—yet it has difficulty creating a pedestrian environment separate from the automobile, and it creates structures that reinforce the haphazard road alignment found in the study area. In order to develop a compact mixed-use, multi-generational center infused with green building techniques and a distinct pedestrian experience, the final design concept uses key elements from form-based codes as well as flexible design elements that could help the study area become an exemplary model for redeveloping town centers in the 21st century.

The Final Concept therefore uses a combination of form-based code and planned/flexible zoning with architectural controls, rather than an exclusively form-based approach. The first three design scenarios explored concepts that followed a strict form-based code to one that used a hybrid of conventional zoning and form-based code, illustrating that a sustainable development approach would be more successful if it integrated the various types of land use regulations. The case studies also indicate that as a stand alone element, form-based codes are most appropriate in areas with uniform settlement patterns and street layout, while in places similar to the study area, form-based codes have difficulty creating a pedestrian-friendly, mixed-use development that can revitalize a town center. The design process made clear however, that in order to achieve a minimum level of walkability and a vibrant street life of shops and plazas, that the existing zoning regulations would need to be overhauled and rewritten to incorporate the tremendous changes in our society and technology that have occurred since conventional zoning was adopted in the mid 20th century.
An objective of this project was to determine whether form-based codes are the most appropriate planning tool for the sustainable redevelopment of Amherst center. As the design process and case studies have illuminated, the successful revitalization of the study area would more probable if the design integrates form-based codes with certain aspects of traditional zoning. Form-based codes are a relatively new regulatory tool, especially in New England and Massachusetts, and this project focused on the transect model as it is currently a more prevalent type of form-based code used throughout the United States. Variations and alternative form-based approaches exist and have been implemented successfully, but to research and thoroughly document such codes was beyond the scope of this project.

The *Final Concept*, as seen in Figures 106 and 107, balances form-based code with zoning techniques to create a development that enhances Amherst town center. The range of housing and retail opportunities connected by a network of pedestrian paths creates an exciting place where the built form respects the massing and dimensions of existing structures in Amherst center but also incorporates green building techniques.

Figure 106. Final concept plan and building footprints *(Source: Author)*

Figure 107. Final design concept perspective *(Source: Author)*
The *Final Concept* continues to use three transect zones with flexible setbacks and building height requirements (as seen in Figure 108). The front setback range and required sidewalk width of 15’ (including a 6’ minimum planting strip/ storm water swale) used in conjunction with the varying building heights creates pedestrian-scaled streets and sidewalks. Even though there is a front setback range in the Urban Core (T6) and Neighborhood Center (T5) zones, the primary façade of each building must be within five feet of the average front setback of the adjacent buildings; this ensures that one building is not recessed so much from the street that it creates an unused cavity along the sidewalk. In addition to front setbacks, a forecourt up to 20’ deep and 50-75 percent of a building’s frontage is required at public transportation stops to create an enjoyable public plaza; the space is more than a bench along the street edge. There is also a flexible first floor height requirement of 15-20’ in the Urban Core and Neighborhood Center zones to encourage a range of commercial and retail activity (first floor residential uses are not allowed in these zones). The final concept also requires that 50-75 percent of the first floor façade be a transparent material with a bead wall 2-3 feet in height; this helps create visually continuity between indoors and outdoors and it allows for sunlight to penetrate into the building’s interior. Within this design concept it is also required that for every 100’ linear feet of building façade, there is a side alley that connects adjacent streets. This provides an opportunity for pedestrians to meander through the study area.

<table>
<thead>
<tr>
<th></th>
<th>Urban Neighborhood (T4)</th>
<th>Neighborhood Center (T5)</th>
<th>Urban Core (T6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontage Buildout</td>
<td>60% min.</td>
<td>80% min.</td>
<td>90% min.</td>
</tr>
<tr>
<td>Front Setback</td>
<td>15-20 ft.</td>
<td>5-15 ft.</td>
<td>10-15 ft.</td>
</tr>
<tr>
<td><strong>Side Setback</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main Building</td>
<td>0-20 ft.</td>
<td>0-12 ft.</td>
<td>0-10 ft.</td>
</tr>
<tr>
<td>Back Building</td>
<td>6 ft. min.</td>
<td>0 ft. min.</td>
<td>0 ft. min.</td>
</tr>
<tr>
<td>Out Building</td>
<td>6 ft. min.</td>
<td>0 ft. min.</td>
<td>0 ft. min.</td>
</tr>
<tr>
<td><strong>Rear Setback</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main Building</td>
<td>30 ft. min.</td>
<td>15-30 ft.</td>
<td>10-25 ft.</td>
</tr>
<tr>
<td>Out Building</td>
<td>5 ft. min.</td>
<td>5 ft. min.</td>
<td>0 ft. min.</td>
</tr>
<tr>
<td><strong>Building Height</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Height</td>
<td>2 Story</td>
<td>2 Story</td>
<td>3 Story</td>
</tr>
<tr>
<td>Maximum Height</td>
<td>3 Stories, 36 ft.</td>
<td>4 Stories, 51 ft.</td>
<td>5 Stories, 68 ft.</td>
</tr>
<tr>
<td>First Floor Height</td>
<td>12 ft. Max.</td>
<td>12-15 ft.</td>
<td>15-20 ft.</td>
</tr>
<tr>
<td>Upper Floor(s) Height</td>
<td>9-12 ft.</td>
<td>9-12 ft.</td>
<td>9-12 ft.</td>
</tr>
<tr>
<td>Back Building Maximum Height</td>
<td>1 Story</td>
<td>1 Story</td>
<td>1 Story</td>
</tr>
<tr>
<td>Out Building Maximum Height</td>
<td>1 1/2 Stories</td>
<td>1 1/2 Stories</td>
<td>1 1/2 Stories</td>
</tr>
<tr>
<td>Maximum Building Coverage</td>
<td>50%</td>
<td>65%</td>
<td>75%</td>
</tr>
<tr>
<td>Maximum Lot Coverage</td>
<td>60%</td>
<td>75%</td>
<td>90%</td>
</tr>
<tr>
<td>Lot Width</td>
<td>50 ft. min.</td>
<td>20 ft. min.</td>
<td>18 ft. min.</td>
</tr>
</tbody>
</table>

Figure 108. Final design concept dimensional standards
(Source: Author)
The final design uses a flexible floor height in the buildings to accommodate a variety of retail, commercial and residential uses. The maximum height of 5 stories (68 feet) in the Urban Core transect zone reaches the maximum height allowed in the town center as it reaches the roof peak of town hall. The minimum sidewalk width and front setback ensure that even with the building heights, the pedestrian experience is pleasant as the buildings do not loom over and dominate the public realm as they did in Scenario II, which had a maximum height of 70 feet but few provisions to create wide sidewalks. The images on this page illustrate that flexible dimensional standards enable a town center to increase building heights and offer upper floor residential uses without compromising the pedestrian experience on the street below.
1. Benefits of the Final Concept—Revitalize Downtown

The final concept is a comprehensive development that integrates sustainable development principles with form-based codes to produce a compact, mixed-use center that elevates the pedestrian above the automobile, increases housing opportunities for a range of incomes and household types, and provides abundant space for a variety of retail and commercial uses. This preferred scenario does not create a downtown II, but through appropriate scale and pedestrian connectivity, it links to the existing downtown to unify Amherst center with an identifiable, memorable form. As a thriving town center the downtown will need to expand, and by redeveloping the study area into the final concept there is sufficient space to expand and encourage a variety of uses.

If community members are cautious about such a project, it must be emphasized that citizen and professional organizations now enumerate characteristics necessary for a sustainable neighborhood. The final conceptual design of the Amherst study area incorporates many of these characteristics, using them to enhance the pedestrian experience when walking through Amherst Center, and to create a development that would thrive economically. Currently, the existing conditions of the study area are highly unsustainable and do not satisfy any of the American Planning Association’s guidelines for great streets and neighborhoods: there is little pedestrian connectivity in and around the study area, storm water is conveyed and channeled offsite, the automobile dominates the road, and there is nothing memorable or engaging in the study area. Form-based codes and a vision towards sustainable development, however, could transform this area of Amherst center into a nationally recognized destination.

Figure 112. Final design concept perspective showing built form necessary for sustainable development
(Source: Author)
We as a society can no longer afford to develop land as seen in the study area in the photographs below—superfluous surface parking speckled with one-story single-use structures. We can no longer afford to perpetuate this trend with conventional zoning and typical development patterns because the day of ‘cheap land and energy’ is over:

- Value of land prohibits single-use structures
- Automobile dependent society is changing
- Downtowns need pedestrian activity and a walkable environment
- Cost of resources encourages comprehensive developments

![Figure 113. Existing conditions of the study area showing unsustainable development methods (Source: Author)](image)

Many people continue to conflate home ownership and owning land with the American ideals of freedom and democracy, a modern-day myth that needs to be dispelled. It may be difficult to change centuries of sentiment and settlement patterns, yet if we wish to maintain the current standard of living in future years, big changes must occur. The cost of fuel and natural resources will soon reach unprecedented levels, encouraging compact, mixed-use developments that are anomalies if built today. Typical zoning, which establishes minimum standards and places the responsibility of design on the developer, cannot achieve the necessary results as evidenced by the existing conditions in the study area. Municipalities can take a proactive approach to plan their future by establishing land use techniques that can shape their town or city into a unique place that represents a community vision—form-based codes represent such a technique. The design competition sponsored by the International Association for Humane Habitat required that the design provided at least 500 dwelling units and 250 jobs on a site no larger than 25 acres. What at first seems too dense is actually a prerequisite to sustainable development.
2. Benefits of the Final Concept—Mixing Uses

In Amherst and most of Massachusetts, resistance to density and unfamiliar land use tools has persisted long enough, creating an almost insurmountable shortage of affordable housing and stratifying the community by age, income and race. The study area examined in this project provides an opportunity for Amherst to create a truly sustainable town center. The number of new housing units, approximately 510, would benefit from the economies of scale not found in many of the developments in Massachusetts, therefore increasing the opportunity for affordable housing. Furthermore, the gross density of almost 30 units per acre would be integrated with shops, restaurants, a grocery store and office space to create an economically viable downtown; the density of this development is necessary to have such a vibrant mixed-use town center. The amount of pedestrian connectivity to local amenities (parks, open spaces, schools, community landmarks, and civic institutions) and the availability of public transportation would reduce the need to drive and enliven the streets of Amherst’s downtown.

By creating mixed-use structures, the design offers short and long term benefits. In the short term, the design almost quadruples the study area’s total gross square footage. The addition of so much space brings people and a variety of shops into the downtown, strengthening Amherst’s town center so it can compete with the big box outlets proliferating along Route 9 in Hadley, just a few miles away. The proposed design approximately doubles the amount of retail space by adding specialty shops and flexible first floor space that can accommodate market niches identified by the Town as sectors ripe for growth and development: knowledge base, arts, creative industry, and tourism. The additional retail space can also build upon the college and high school students, strengthening Amherst’s reputation as a diverse college town.

Most importantly, the design increases residential square feet to accommodate approximately 510 additional dwelling units (based on an average square foot of 1,000 per dwelling unit). A major Central Business District redevelopment strategy is to increase housing and bring people into downtowns. Conventional zoning, however, typically limits this strategy by creating single-use zones that place residential
neighborhoods outside the town center and beyond a reasonable walking distance to shops and restaurants. In the final design concept, the residential units are integrated into the downtown, offering units that would be occupied by students, single professionals, young families, elderly couples—it would be a multi-generational development that brings necessary foot traffic to the town center, making it a truly vibrant, sustainable design. The types of housing are also placed in distinct districts of the study area, such that the senior cohousing is in the southern most neighborhood separated from the entertainment area by West Cemetery. Townhouses, occupied by families and young professionals, are located along the periphery of the study area, but are within a short walk of all the new amenities. The amount of housing in the town center would save Amherst in the long term by concentrating development in an area with existing infrastructure, especially water and sewer services, public transportation, and no new roads would need to be constructed. Amherst’s build out analysis determined that an additional 3,600 dwelling units could be constructed in town, mostly in areas with a minimum lot size between one and two acres. By concentrating developing in the town center, at least 700 acres of open space could be preserved to increase the trail network and natural resources in Amherst. Increased density in the town and village centers is absolutely essential to help preserve open space and balance development with conservation of natural resources.
Figure 115. Proposed uses by floor level (gross square feet)
- Separates uses and users vertically
- Increases housing and business opportunities
(Source: Author)

Figure 116. Proposed uses as a percentage of total square feet (1 million sq. ft.)
- Residential units bring necessary foot traffic to downtown
- Centralize parking in garage
(Source: Author)
3. Benefits of the Final Concept—Pedestrian Connectivity

The heart of the design is a pedestrian-only street that runs North-South in the study area’s interior, terminating in a grand plaza adjacent to a winter garden and food court. This pedestrian zone activates two facades of the buildings, creating an exciting pedestrian experience. The design relegates the car to the periphery by creating a 400-space parking garage that is accessed by narrow streets that do not intersect or disrupt the walking street. Pray Street has been replaced with plazas and rain gardens, encouraging the site’s many users to explore on foot. A 35,000 square foot grocery store has been located in the area north of Triangle Street, providing residents with a local alternative than driving to big box supermarkets located on the periphery of town. The design also includes a 400-seat theatre as a venue other than the local colleges and universities for artists and performances. The range of housing opportunities in the study area caters to college students, young families and even offers senior cohousing. The types of dwelling units range from live/work studios and one-bedroom apartments to 2-3 bedroom townhouses and apartments; there are no detached single-family units in the study area. The density of housing and mixed-use structures makes a truly walkable town center; one does not need a car to meet their daily needs or to go shopping or dining.

Figure 117. Pedestrian-only street highlighted in yellow (Source: Author)

Figure 118. Proposed uses and amenities within a walkable downtown (Source: Author)
The design also uses an upper story skyway that connects a proposed parking garage with the residential floors in the mixed-use structures. This element helps vertically separate the various users of the study area: high school and college students, shoppers and townspeople can meander through the study area on the ground plane, while residents have the opportunity to use the skyway as a semi-private network that connects with commercial and retail spaces, offices, and a roof garden accessed only by the skyway—this garden is an amenity just for residents. The design has organized uses vertically and horizontally, so that the first floor is predominantly retail and entertainment, while the upper floors are mostly residential uses.

Ultimately, the design would make Amherst center an exciting place for the pedestrian. The amount of connectivity to adjacent open spaces—West Cemetery and Kendrick Park—could help create a pedestrian-only network woven through the town center. At intersections where one must cross the street, traffic calming measures (bump outs with raised cross walks) would be used to slow traffic and increase pedestrian safety. Public transportation stops would no longer be a few benches along the sidewalk, but transformed into multi-modal public plazas that celebrate alternative modes of transportation. A centralized parking garage with smaller surface parking lots at strategic locations, such as near the grocery store and behind mixed use buildings on North Pleasant Street would actually increase the amount and availability of parking—cars would be relegated to the periphery without interrupting the pedestrian-only core. Opportunities to meander through the study area would also be maximized as alleyways and intimate pathways would circulate between buildings, connecting people to the nearby streets, open spaces, and pedestrian-only walking street at core of the design.
Figure 120. Traffic calming measures—raised crosswalks and bump outs—to increase pedestrian safety and connectivity
(Source: http://sunnyvale.ca.gov/) (http://www.pps.org/)

Figure 121. Pedestrian pathways connecting residents to surrounding neighborhoods and offering many opportunities to meander through the study area
(Source: Author)

Figure 122. Roadways have been eliminated from interior of study area and parking is centralized in a 400-space garage
(Source: Author)
4. Benefits of the Final Concept—Green Infrastructure

The final design concept would integrate sustainable development principles into the form-based code so that Amherst center would become a national leader in energy efficiency, walkability, housing opportunity, and economic revitalization. This step would ensure that buildings would be energy efficient, could be L.E.E.D. certified, and make use of solar passive energy. Structures would be sited to allow for maximum solar exposure and upper floors could be stepped back to allow for light and air to penetrate into building interiors and into adjacent structures; shadows would be minimized. Terracing the upper floors would also allow for rooftop terraces to make visible green roofs and storm water retention techniques—this would strengthen the design’s learning environment. Storm water retention swales would also be located along the street and in public plazas, integrating pedestrian movement with the flow of water, helping people see the hydrologic process. Green roofs would also be utilized to help reduce runoff from impervious surfaces and they would help reduce the temperature of storm water before it eventually reaches the groundwater.

The green infrastructure integrated into the study area would help defray the costs of maintaining and heating/cooling the buildings, and it would enhance the pedestrian experience by providing shade, color, and human scale elements to the design. As a development that uses new land use regulations, a new ‘green’ aesthetic could be introduced where solar panels, storm water retention swales and shading armature would become sculptural elements as extensions of the buildings and built form. By incorporating these elements into the initial designs, the increased costs of green building would be minimized and transparent, helping citizens learn about the steps necessary to develop sustainably.

Increasing the energy efficiency of the buildings would increase the economically viability of the town center, and by creating green corridors that connect with other parts of town, people will be able to walk or cycle to the new shops and restaurants without using their cars—the green infrastructure would help bolster the pedestrian networks necessary for a mixed-use center.
Figure 123. Storm water retention swales integrated with pedestrian walkways and parking lots

Figure 124. Green roofs—decrease heating/cooling costs and provide outdoor seating/walking

Figure 125. Final concept- green infrastructure of swales, trees, parks
(Source: Author)
**Arriving at the new gateway to the town center**

- Prominent structures and building placement signal town center
- Narrow traffic lanes slow cars and make pedestrian crossings safe
- Arriving at the new Entertainment District with a food court, theater and large-scale retail
Walking along the pedestrian-only street
- 2nd story skyway brings residents from garage to apartments and shops
- Intimate ‘pedestrian street’ lined with shops and restaurants
- Storm water swale and rain gardens integrated with walkway
Getting off the bus

- Multimodal zone is more than a bus stop, it is a public plaza
- Green infrastructure and pedestrian circulation are integrated
- Residents can use 2\textsuperscript{nd} story skyway directly from bus stop or parking garage
C. Conclusion and Research Implications

Many people may doubt the feasibility and practicality of this project, believing that such a design is too dense, expensive, or simply inappropriate for a small town center like Amherst, Massachusetts. Yet sprawling development patterns threaten local resources while the global impacts of consumerism are rippling through the economy as developing nations grow at exponential rates. The world’s population grew five fold during the 20th century, and if projections are correct, this growth rate will only increase during the next century. Global warming, environmental degradation, inequitable distribution of wealth and resources—these trends will continue unabated unless communities and governments act now.

In Massachusetts and the United States, land use regulations and policies need to be updated to reflect current technology and to integrate techniques necessary to achieve a sustainable future. Seemingly divergent fields and disciplines will need to cooperate in order to achieve this vision and curtail the detrimental effects of our current settlement patterns. Most importantly, planners, architects and landscape architects will play a pivotal role by providing dynamic solutions to the many challenges faced by rural and urban communities. Exploring form-based codes and a comprehensive development code are necessary steps to identify which elements of our existing land use system need to be changed to create communities that are compact, mixed-use and pedestrian-friendly. Striving to create such communities will also lead to techniques that can preserve open space, reduce demand on public infrastructure (roadways, storm drains, sewer), and increase use of renewable energy—and in the process, develop a sustainable system.

The goal of the design for Amherst center was to explore form-based codes to develop a mixed-use community where environmental, economic and social systems are integrated to revitalize the downtown. The many benefits of such a design greatly reduce the study area’s ecological footprint and by revealing such natural processes as storm water infiltration and solar access, community members can become aware of a new, sustainable design aesthetic that challenges traditional settlement patterns and built form. It is the position of the landscape architect and designer to continue challenging the status quo and strive for solutions not yet considered.
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