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Can Urban Growth Management Work in an Era of Political and Economic Change?

International Lessons From Israel

Amnon Frenkel and Daniel E. Orenstein

Problem: Urban growth management policy employs a range of tools to restrain urban sprawl, promote efficient land use, and preserve open space. Yet the efficacy of such policy is widely debated and challenged, necessitating reliable empirical evidence from case studies assessing the historical success (or failure) of such policy.

Purpose: We review Israeli national growth management policy over a 36-year period, recording long-term land development trends in order to assess the efficacy of policy.

Methods: We integrate a historical analysis of qualitative policy data and quantitative performance indicators of urban spatial development for a selected region of the country. We use a suite of spatial variables indicating amount, distribution, and configuration of built space along with other sprawl-relevant statistical data.

Results and conclusions: In the 1970s and 1980s, open space was preserved largely due to agricultural preservation policy, despite demographic and economic growth. During the 1990s, the initiation of growth management policy coincided with a profound proliferation of development and population movement to low-density suburbs. While statistical indicators from the past several years are equivocal, they suggest that policy is encouraging higher-density development and slowing the loss of open space.

Takeaway for practice: Urban growth management policy and its impact must be considered within the historical context in which it was implemented. Changes in land use policy in Israel reflect socioeconomic and political changes; when policy did not adapt to changes in society, the results were undesirable. Today, planning tools (e.g., minimum density limits, population size thresholds, urban growth boundaries, and land use fabrics) strike a balance between top-down planning objectives and bottom-up development pressures. The use of these tools within a statutory, national-level plan helps ensure consistency of implementation across regions.

Keywords: urban growth management, land use policy, urban sprawl, open space preservation, agricultural land

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Numerous countries have implemented urban growth management and open space preservation policies (Alterman, 1997; Bengston, Fletcher, & Nelson, 2004; Han, Lai, Dang, Tan, & Wu, 2009; Ingram, Carbonell, Hong, & Flint, 2009; Koomen, Dekkers, & van Dijk, 2008). The goals of such policies generally include a) protecting open space, natural areas, and farmland from development; b) avoiding low-density urban sprawl; c) increasing the use of public transportation; and d) promoting compact development (Frenkel, 2004b; Ingram et al. 2009). While the goals of these policies are often similar, their means of implementation vary broadly across time and space, as the unique socioeconomic, political, and environmental conditions in each place demand tailor-made policies that can achieve their goals while remaining socially and politically feasible.

There is a broad literature reviewing, comparing, and questioning the need for growth management policies, but methodologies for assessing

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their effectiveness are only beginning to develop, and assessments based on empirical data are rare. Bengston et al. (2004) identified several reasons for this. First, studies lack counterfactual knowledge, as they cannot assess what would have happened in the absence of growth management policy; and growth management policy is only one of several variables that impact land development patterns. Second, a policy's impacts on the landscape may not be immediately apparent. Third, policies are implemented at multiple spatial scales, and some may affect areas beyond their jurisdiction. Fourth, the goals of a given growth management policy are not always clearly articulated; thus, measuring the policy's success is difficult.

Other researchers have also discussed the difficulties in assessing the efficacy of urban growth management and open space preservation policies. Koomen et al. (2008) explained that "policy success and failure often only exist in the eyes of the beholder and therefore are difficult to measure objectively…evaluating can therefore be an ideological rather than a rational exercise" (p. 367). Song and Knapp (2004) justified analyzing policies in Portland, OR, as a package (rather than individually) because "growth management instruments in Portland are too numerous, too mutually interactive, and too difficult to date stamp to isolate the impacts of any one instrument" (p. 211). Ingram et al. (2009) also noted that policy performance indicators may reflect "the cumulative effects of past policies, technologies, and relative prices" (p. 134) and that it is "likely that some smart growth objectives reinforce each other, while others are antagonistic" (p. 134). Dror (1986), discussing policy in general, asserted that policy goals often change over time, reflecting political, economic, and ecological changes, and complicating the measurable impact of the policy.

Nonetheless, most of the existing literature on growth management policy assessment analyzes urban spatial growth patterns as a function of the given policy. Methods vary broadly in terms of a) spatial scale of analysis; b) scale of administrative authority; c) analysis of spatial data (e.g., indicators of urban spatial development); and d) specific policy or policies under examination. Ten empirically based assessments of urban growth management policies from around the world did not come to consensus regarding the efficacy of such policies. Some noted that policies are successful in producing urban development patterns that conform with the stated policy goals (Frenkel, 2004b; Koomen et al. 2008; Lee, Tian, Erickson, & Kulikowski, 1998; Nelson, 1999; Van Rij, Dekkers, & Koomen, 2008); others considered the policies unsuccessful (Han et al., 2009; Taylor, Brown, & Larsen, 2007), and some reported equivocal results (Ben-Zadok, 2005; Ingram et al., 2009; Millward, 2006).

Millward's (2006) qualitative work on comparative growth management policies in three countries, for example, led him to conclude that growth management policies, while perhaps necessary, often redirect, rather than halt, urban development. Ingram et al. (2009) used performance indicators to measure five smart growth policy goals in eight U.S. states over one decade. Their methods, from descriptive statistics to statistical models, varied according to the availability of data, which were drawn primarily from the U.S. Census Bureau. They concluded that no single state performed well in all five areas, but some were successful in their main objectives. Therefore, smart growth is indeed possible.

The potentially profound impact of urban sprawl (European Environment Agency, 2006; Ewing, 2008) and the contentiousness of the related policy debate emphasize the importance of continuing research on the efficacy of growth management policies. As the examples above show, a compelling assessment of urban growth management policies requires the application of both qualitative and quantitative research methodologies.

In this work, we ask the following question: How have patterns of urban spatial development reflected (or not reflected) the changing goals of growth management policy over a 36-year period in Israel? Israel's unique policy environment makes an interesting and internationally relevant case study for urban growth management policy assessment for several reasons. The country is characterized by the strong influence of top-down land use policy whereby planning principles and policies are formulated at the national level and issued as laws and directives for implementation at the local level. In this way, Israel can be grouped with other countries that share a relatively high degree of national-level strategic planning, like The Netherlands or Japan (Alterman, 2002), or some states in the United States (e.g., Oregon, Florida, New Jersey, and Maryland) where state-mandated growth management policies exist (Ben-Zadok, 2005; Ingram et al., 2009).

Israel combines high and rising population density with ecologically rich open space, much of which is under constant pressure to be developed (Orenstein & Hamburg, 2010; Tal, 2008). These qualities make Israel a potential case study for developing countries facing urban sprawl (Moreno, Oyeyinka, & Mboup, 2010) and that are considering growth management policy.

For developed and developing nations alike, Israel's implementation of National Outline Plan 35 (explained in detail below) is a superb example of national-level smart growth planning (Shachar, 1998). Comprehensive,

national-level planning combined (in the last 15 years) with clearly articulated urban growth management goals helps overcome at least two of the four conceptual challenges for this type of research raised by Bengston et al. (2004).

What follows is a historical overview of the urban growth management and open space preservation policies of Israel, divided into eras according to the predominant growth management policy paradigm at the time. We then focus on the northern section of the Tel Aviv metropolitan region, known as the Sharon region, to assess the physical impact of policy over time. This scale of analysis captures the dynamic of an urbanized region and its rural hinterland that are part of the main metropolitan area of Israel. Further, it allows us to assess the impact of changing land use policy at the level of the individual community (rural, suburban and exurban, and urban). The study region is characterized by high real estate demand, significant agricultural land reserves, and ecologically valuable ecosystems (Achiron-Frumkin et al., 2003). The region is, thus, indicative of much of Israel's central region, where 40% of the country's population resides.

We track multiple demographic and physical development indicators for the study area, documenting changes and assessing these changes as a function of urban growth management and open space preservation policy at the time. We conclude by considering the implications of the study for meeting urban growth management goals in Israel and abroad.

Historical Overview of Israeli Growth Management Policy

In this section, we provide a historical overview of Israeli land use policy with an emphasis on urban spatial growth management policy. For each era, we describe the prominent national-level policies related to urban development within the socioeconomic and political context of the era. While we describe three distinct eras, we reserve most of our consideration for the final era, when Israel was implementing a national-level development plan that explicitly dealt with urban sprawl and open space preservation. Table 1 summarizes this historical overview.

1950s–1970s: The Era of Agricultural Land Preservation

Land use policy during the first decade after Israel's establishment in 1948 was characterized by the exigencies of establishing and securing borders and the absorption of massive waves of immigrants from postwar Europe and the Middle East. Two paradigms dominated planning during this decade: dispersing the Jewish population to the frontier areas of the country (then, as now, the majority of the country's Jewish population was concentrated along the central Mediterranean coast) and encouraging collective, agricultural living. These paradigms were embodied in the Aryeh Sharon plan, the principal plan guiding national development at the time, and the National Plan for Population Distribution (Alterman, 2002). The demographic component of this paradigm has been termed "dispersed dispersal," which describes the desire to create many small communities dispersed throughout the country (Mazor, 1993).[1] The two paradigms led not only to the establishment of hundreds of small, agricultural communities and 30 new towns, primarily in the geographic periphery (Kellerman, 1993), but also to the establishment of myriad planning tools to protect agricultural land from development (Alterman, 1997).

Chief among these planning tools was Israel's 1965 Planning and Building Law, which established agricultural land preservation as a national objective and instructed planning authorities to integrate it into their review of all plans (Alterman, 1997; Hananel, 2010). National legislators also established the Committee for the Protection of Agricultural Land (CPAL), whose powers were equal to and beyond those of the National Planning Board, Israel's highest planning body. According to the mandate of CPAL, any proposed development on agricultural land required CPAL approval. Considering the 1965 Israel Lands Council (ILC; the government body that determines land policy) definition of agricultural land as all nonurban land, and the 1968 CPAL proclamation that agricultural land was all land with no preexisting building rights except for agricultural-related structures (Alterman, 1997), Israel had a de facto open space preservation policy decades before the actual term entered the public discourse. It has been emphasized by several land use scholars that the multitiered bureaucratic protection of farmland was very effective at preventing development on agricultural land (Alterman, 1997; Feitelson, 1999).

1980s: The Era of Loosening Development Restraints

In the following decade, policy was still characterized by farmland preservation. However, residential preferences in the country were changing. This was in part a reflection of shifting national ideologies and the replacement of the socialist and agrarian-oriented Labor government by the right-wing, free-market-oriented Likud government. Concurrently, the rural sector in Israel was facing a severe debt crisis (Hananel, 2010). These events resulted in a

Table 1. Characteristics of successive planning eras in Israel.

	Agricultural preservation	Loosening development constraints	Planning shocks and urban growth management	
			Planning shocks	Urban growth management
Time period	**1950s–1970s**	**1980s**	**1990s**	**1990s–present**
Broad societal characteristics	• Agrarian • Socialist • Communal • Influx of immigrants	• Market oriented • Individualistic • Agrarian crisis	• Influx of immigrants • Economic growth • Continuation of market orientation	• Increased environmental awareness and concern • Continued economic growth • Privatization of government services
Prominent planning paradigms	• Establish and secure borders • "Dispersed dispersal" • Agrarian settlement • Maximize use of agricultural land • Land is national resource	• Political–demographic concerns • Market orientation	• Provide housing and infrastructure to facilitate immigration waves • Alleviate debt crisis with privatization and sale of land	• "Dispersed concentration" • Protect open space • Increase urban densities • Prevent creation of new, noncontiguous settlement
Important planning documents	• Aryeh Sharon Plan • National Plan for Population Distribution • 1965 Planning and Building Law • Proclamations defining agricultural land • National sectoral outline plans	• National sectoral outline plans • District plan (Central region)	• ILC decisions for agricultural land sales • Israel 2020 • NOP 31	• NOP 35 • Completion/revisions of district plans
Decision making authority	• Top-down (national-level institutions) • Establishment of CPAL	• Increasingly bottom-up with entry of quasi-governmental agencies in absence of government policy • Erosion of CPAL's power	• Private–public partnerships; increased role of local authorities • New committees to speed up rate of construction	• Top-down directives, with significant discretionary powers at the local level
Outcome in Sharon region	• Population growth and urban development primarily in urban areas • Development in rural areas curtailed	• "Concentrated dispersal" • Population growth in local councils • Rise in building permits • Highest proportion of spatial development occurring in regional councils	• High population growth, especially in local and regional councils, growing proportion of population growth occurring in local and regional councils • High amount of spatial development, especially in Arab towns; highest proportion of spatial development occurring in regional councils • Initially high but declining amount of building permits • Increased amount of high-rise construction relative to single-family and duplex construction	

change in development policy priorities. Part of this shift manifested in greater support for exurban communities in the West Bank, and areas within Israel with a high proportion of Arab residents, for example, in the Galilee, and next to the Green Line pre-1967 border (Applebaum, Newman, & Margulies, 1989).

Until this period, private single-family and duplex housing was relatively rare outside of the agricultural, collective kibbutz, and moshav communities. In urban areas, residential dwellings consisted primarily of low-rise apartment blocks. Due to rising income levels and aspirations, demand for single-family and duplex homes in

exurban and suburban communities was also rising, placing bottom-up pressures on national planning agencies to rezone land for development. Further, despite national policies that encouraged Jewish settlement in the geographic peripheries, the central region continued to be the Jewish public's most desired destination for residential settlement. These spontaneous development trends (i.e., population growth and development concentrated in the center of the country, but at low building and population densities) were considered undesirable by professional planners and were termed "concentrated dispersal" (Mazor, 1993).

The aforementioned economic and political changes also led to erosion of the powers of CPAL. By the mid-1980s, the growing view was that government controls were hindering progress and individual fulfillment of residential goals; this translated into a desire to loosen CPAL's power (Alterman, 1997). These events catalyzed a fundamental change in attitudes and policy vis-à-vis land development.

1990s and 2000s: The Era of Planning Shocks and Urban Growth Management

The 1990s opened with three watershed events that fundamentally changed the urban map of Israel. First, the ILC began helping rural cooperative communities emerge from their economic crises by encouraging land sales to developers (Vitkon, 1996). A series of landmark decisions by the ILC in the early 1990s facilitated the sale of agricultural land for development purposes, sometimes at a high profit (Hananel, 2010; Vitkon, 1996). Subsequent government decisions further encouraged residential development in agricultural communities in order to discourage flight of the young generation to the cities.

Second was the massive wave of immigration from the former Soviet Union, which increased pressure to streamline decision making in order to speed up the process of land development. This immigration pressure also catalyzed the creation of Israel's first comprehensive national plan: National Outline Plan 31 for Immigrant Absorption and Development (NOP 31), approved in 1993 (Alterman, 1997). NOP 31 introduced the first statutory planning guidelines for open space preservation, albeit coupled with accelerated development to address the housing needs for immigrants (Alterman, 2002). While CPAL's authority and ability to prevent development of agricultural land was significantly weakened during this period, its mandate was also modified to include preservation of countryside land, suggesting a shift in the social importance given to farmland (Hananel, 2010).

A third major event, also precipitated by the wave of immigration, was the establishment of temporary planning committees to speed the approval process for building rights. Decisions made by these committees bypassed the established planning hierarchy, including CPAL, and led to a sharp increase in development of agricultural land.

During the same period, from 1988 to 1996, a large group of Israel's premier planners were putting together Israel 2020, a "Master Plan for Israel in the 21st Century" (Mazor, 1993). This document, while not statutory, established a new paradigm of urban growth management and open space preservation in Israeli land use planning. It also provided the foundation for National Outline Plan 35 for Construction, Development and Conservation (NOP 35).

NOP 35, made statutory in 2005, provided a legislative backbone in the form of detailed, legally binding directives to all relevant planning bodies for resisting low-density, dispersed development (Assif & Shachar, 2005). The plan, with a planning horizon to 2020, is to date the most authoritative and comprehensive document for determining future development patterns in Israel. Prominent among its objectives were dense development coupled with preservation of open space. The plan aimed for dispersed concentration, whereby, at the national scale, the population would be dispersed from the center to the peripheral areas of Galilee and Negev; but at the regional and local levels, population would be concentrated in urban centers.

NOP 35 introduced the concept of development fabrics, defined as planning regions with unique combinations of land use types. Each of NOP 35's five fabrics (urban, rural, mixed-use preservation, national preservation, and coastal) includes built space (residential, commercial, infrastructure, etc.) and open space, although in different proportions. Each fabric assignment is accompanied by a series of statutory decrees that address development or preservation specifications. Urban fabric borders are delineated as red lines, beyond which development should not occur, not unlike the urban growth boundary in Portland (Song & Knaap, 2004), the urban development boundary in Florida (Ben-Zadok, 2005), or the Countryside Line in the Waterloo Region of Canada (Millward, 2006). Communities located outside the urban fabric (i.e., in one of the other four fabrics) are assigned maximum population size thresholds. All communities, regardless of fabric, are required to ensure that all new development be contiguous to existing development and subject to average minimum building densities that vary according to community type.

Taken together, NOP 31, Israel 2020, and NOP 35 represent a history of 20 years of open space preservation

and prevention of urban sprawl in Israeli policy thinking. The new and predominant policy paradigm is embodied in these planning documents.

Research Framework

Study Site

In order to assess the impact of Israel's changing land use policy on the ground, we selected a specific region, the Sharon region, in which to measure a series of policy performance indicators. The Sharon region is the northern section of the Tel Aviv Metropolitan Area (see Figure 1), which is Israel's largest and most central metropolis, and the country's cultural and financial center. The Tel Aviv Metropolitan Area covers 1,518 square kilometers, and has a population of slightly over 3 million inhabitants, or approximately 40% of the country's population. The Sharon region constitutes 23% of the area and 13% of its population (Central Bureau of Statistics [CBS], 2010).

As in Israel in general, there are three types of localities in the selected region: city, local council, and regional council (CBS, 1997). Each has distinct spatial development and demographic characteristics. Cities consist of a single urban community and generally have a population over 20,000 (Ministry of the Interior, 2003). In the Sharon region, there are four cities, including Netanya, which is the major urban (primarily Jewish) center in the region, and three Arab towns. Local councils are communities with a population of over 2,000, whose residents generally do not work in agriculture. They are generally separated from the cities and other localities by open space and are often suburban, commuter communities. Regional councils consist of many small, distinct communities, and are geographically analogous to rural counties in the United States. Historically, these communities were primarily agrarian (the collective kibbutz or semi-collective moshav), but over the past three decades agriculture has significantly decreased in economic importance. With regard to NOP 35, most cities fall within the urban fabric, but local and regional councils can fall within any of the five fabrics (even though most are within mixed preservation).

Administratively, the Sharon region is the northern subdistrict (one of the four subdistricts) of the Central District in Israel, which, together with the Tel Aviv District, constitutes the Tel Aviv Metropolis. In Israeli planning hierarchy, each district must prepare a district outline plan, which is subject to the planning directives of the national tier. The Sharon region falls within the aegis of District Outline Plan 3/21. This plan's goals,

Figure 1. Study site.

analogous to those of national-level planning documents, include the preservation of large and continuous tracts of open space and, among them, land reserves for agriculture. This is to be achieved by increasing density in built areas and building adjacent to existing structures (Gridinger, 1997). The plan emphasizes that Netanya should be developed as the central city of the Sharon region and allows for the expansion of rural communities only with the permission of the district and national planning committees.

Growth Management Performance Indicators

In order to assess the impact of policy, specific policy objectives must be matched to performance indicators (Ingram et al., 2009). The measurable objectives derived from Israel's various growth management policies that were investigated in the Sharon region were:

- Prevention of urban development on agricultural land or open space.

- Prevention of noncontiguous leapfrog development and low-density suburban sprawl.
- Preservation of the character of rural communities (kibbutzim and moshavim).
- Prevention of urban development beyond the red line borders demarcating urban fabrics (i.e., urban growth boundaries).
- Increase of population densities in built areas.
- Reduction of socioeconomic gaps between communities and population sectors.
- Increase in the use of public transportation.

To assess the policy's success in meeting these objectives, we employed a series of indicators, each of which provides a measure (direct or indirect) of one or more of the objectives. Each indicator we selected needed to be a) commonly accepted in the literature as providing a reasonable measure of the target objective, and b) easily obtained from the data available to us. Our indicators appear in Table 2 and are described below.

To estimate the rate and extent of land development, we generated a time-series database of built land rasters using scanned and geo-referenced 1:50,000 scale survey maps produced by the Survey of Israel (see the Appendix for more on the methodology). Using these rasters, we quantified built land at temporal intervals conforming to the years of the decadal Israel census. To assess the level of noncontiguous development, we measured patchiness of built space. A higher number of discontiguous built patches implies a greater amount of leapfrog development, while a decreasing number of patches shows contiguity of new development and infill, implying policy success (Weitz & Moore, 1998).

Since growth management policy calls for increasing urban population densities, we measured population size and gross population density, defined as the number of people divided by the amount of built land in a given locality (Churchman, 1999).[2] Population data were derived from the decadal censuses conducted by the Israel CBS in 1972, 1983, 1995, and 2008, and analyzed for changes between censuses. Combining our estimates of built space with population size, we measured the percentage change in the amount of built space divided by the percentage change in population size. A value greater than 1 indicates that built space is growing proportionally more than population, which suggests sprawl (Hadly, 2000; Weitz, 1999).

We also examined trends in residential building approvals and building construction starts, including the distinction between high-rise buildings on the one hand and single-family and duplex homes on the other. These data, combined with an investigation of building heights, give insight into when, and at what residential unit density, development accelerated.

Sprawl is often considered to cause and to be caused by increased rates of motorization (Burchell et al., 1998; Ewing, Pendall, & Chen, 2002).[3] As such, growth management policy calls for increasing use of public transportation and a reduction in automobile dependency. As an indicator of transportation trends, we recorded the number of vehicles per household and, as an indirect indicator, the proportion of individuals in the labor force working outside their community. A larger proportion of population in suburban and rural communities working outside their locality is presumed to be correlated to higher amounts of commuting.[4]

Urban sprawl is also described in terms of socioeconomic phenomena that cause and/or result from particular urban spatial development patterns, such as increased socioeconomic segregation between urban and suburban localities (Squires & Kubrin, 2005). Therefore, we considered the socioeconomic ranking of each community and how it may have changed over time. Communities are ranked by the Israel Census Bureau based on 16 socioeconomic indicators that represent demography (e.g., dependency ratio), education (e.g., proportion of university graduates, average years of education), employment (e.g., unemployment rate, proportion of salaried employees earning minimum wage), and standard of living (e.g., income and motorization level). The highest score is 10, for the strongest communities; 1 represents the weakest (CBS, 1995b, 2008).

Policy Performance Indicator Results

Population Size and Growth

The Sharon region saw a significant amount of population growth during the research period (see Table 3). The population size in 1972 was 147,400; by 2008, it had grown 164% to 389,200 (CBS, 2010). The annual population growth rate for the region accelerated between the first period and the second, concurrent with the transition to the Era of Loosening Development Constraints. It declined in the third period, concurrent with the Era of Urban Growth Management.

Assessing each locality independently, however, we observed unique trends in changes in population growth rates. The rise in population growth rate between the first and second periods can be attributed to the local and regional councils (rural and suburban communities), where population growth rates greatly accelerated. This corresponds neatly to the periods of Loosening Development

Table 2. Growth management policy performance indicators.

Performance indicator	Units of measure	Data source
Population		
• Population size (region and locality)	Number of residents	Central Bureau of Statistics—Population Census (1972, 1983, 1995, 2008)
• Population growth (region and locality)	Percentage	Calculated from population size
• Proportional contribution of population size and growth by locality type	Percentage	Calculated from population size
Built space		
• Built space amount	Hectares	Measured from 1:50,000 thematic maps from Survey of Israel (see Appendix)
• Built space growth	Percentage	Calculated from built space amount
• Proportional contribution of growth in built space by locality type	Percentage	Calculated from built space amount
• Building rights granted	Amount	Unpublished report provided by the Planning Administration, Ministry of Interior
• Building starts	Amount	Central Bureau of Statistics—Building starts and building completions
• Patchiness of built space	Number of patches	Measured from 1:50,000 thematic maps from Survey of Israel (see Appendix)
Density		
• Gross population density	Persons per hectare	Calculated from population size and built space data
• Percentage change in amount of built space divided by percentage change in population size	Ratio	Calculated from population size and built space data
• Single-family and duplex versus high-rise building starts	Amount	Central Bureau of Statistics—Building starts and building completions
Socioeconomic gaps		
• Socioeconomic rankings of localities	Ordinal rank	Central Bureau of Statistics—Local Authorities in Israel Reports (1995, 2008)
• Changes in socioeconomic rankings	Difference in rank between years	Calculated from data above
Transportation patterns		
• Vehicles per household	Ratio	Central Bureau of Statistics—1995 and 2008 Population Census
• Percentage labor force working outside of home community	Percentage	Central Bureau of Statistics—1995 and 2008 Population Census

Constraints and Planning Shocks, both in the early 1990s (see Table 1). Urban population growth rates, meanwhile, were relatively stable. Urban localities were the major contributors to the region-wide decline in annual population growth rate between the second and third periods. During this same period, population growth rates in regional councils increased, and in local councils, they plateaued at a relatively high rate.

An excellent indicator of demographic dynamics of the region is how much each locality type contributed to the overall increase in population during each period (see Figure 2). During the first period, cities contributed 92% of the additional population. By the final period, that percentage had dropped to slightly over 50%. During this final period, the four locality types contributed fairly equally to the region's population growth, with approximately 30% in Netanya, 30% in the local councils, and the remainder split between the Arab towns and the regional councils. Over the study period, there was a clear trend toward suburbanization, with a greater amount of population growth attributed to low-density communities in the local and regional councils.

Table 3. Population of the Sharon region by temporal period and locality type.

	Population size (1000s)				Mean annual growth rate (%)		
Locality	**1972**	**1983**	**1995**	**2008**	**1972–1983**	**1983–1995**	**1995–2008**
Netanya	71.1	102.3	146.1	179.0	3.3	3.0	1.6
Arab towns	25.6	36.1	52.2	75.7	3.1	3.1	2.9
Local councils	18.3	19.1	35.8	68.7	0.4	5.2	5.0
Regional councils	32.4	35.1	44.5	65.8	0.7	2.0	3.0
Sharon region (total)	147.4	192.6	278.6	389.2	2.4	3.1	2.6

Built Area, Amount, Configuration, and Construction Patterns

We observed two prominent trends in the data on built space (see Table 4). First, there was a significant acceleration in the growth rate of built space during the final period (1995–2008) relative to the previous two periods, a trend observed across all locality types. Second, between 55% and 70% of all new development in each period occurred in the local and regional councils, where development was particularly low density.

These data suggest that despite the introduction of growth management policies in the 1990s, accelerated land development was nonetheless occurring. The explanation may be the lag time between when land was approved for development and when the development actually occurred (which is also an indicator of the momentum of past policies). Much of the land that was eventually developed after the establishment of the growth management paradigm in the mid-1990s may have been approved during the previous Planning Shocks period.

In order to elucidate the possible impact of this lag, we collected data on approval of residential building rights (approved units)[5] and building starts[6] for the period from 1990 to 2008 (see Figure 3).While the number of approved residential units for the region fluctuated greatly, there was a general downward trend (see five-year running average) following the peaks of the early and mid-1990s. The first peak in 1992 corresponded with the establishment of the special planning committees for speeding construction noted earlier. Note that the peak in building starts occured only in 1995–1996, a time lag of three to four years. The downward trend in building rights is what we would expect given that paradigms were shifting from responding to the planning shocks of the early 1990s to the subsequent advent of growth management. Building starts declined not only because of the decline in building rights granted, but also because of the decline in demand, which in turn was due to both a decline in immigration and an economic recession.

With regard to the patchiness of built space, Netanya and the local councils underwent a process of in-fill, where

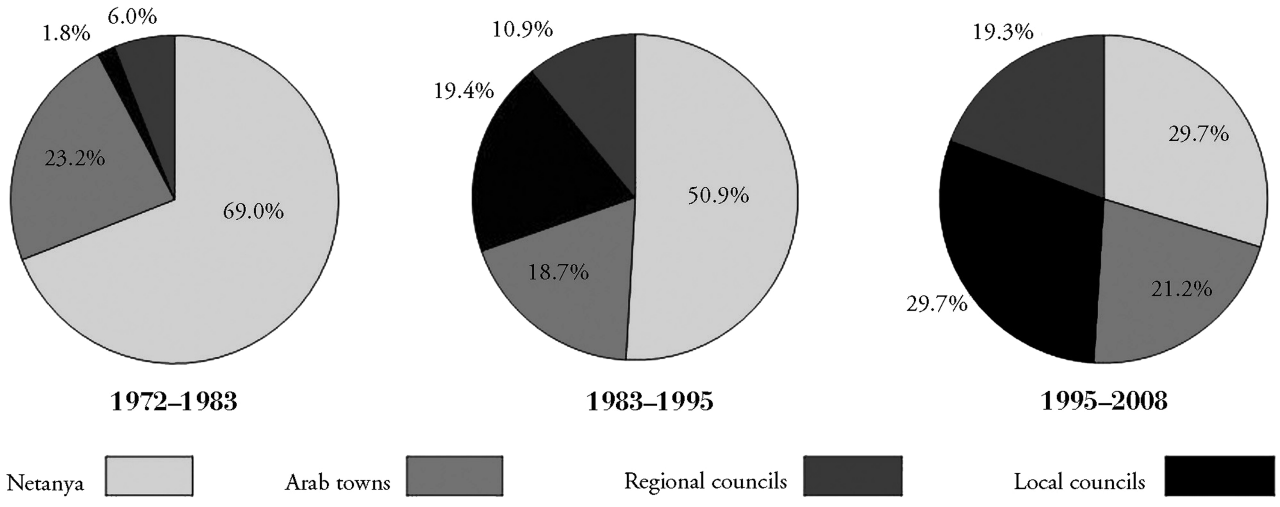

Figure 2. The proportional contribution of each locality type to the additional overall population of the Sharon region.

Table 4. Total area of locality types within the Sharon region, amount of land built, and additional land built in each time period.

Locality (total area in ha)	Built (ha)				Mean annualized growth rate (%)			Proportion of total growth in region (%)		
	1972	1983	1995	2008	1972–1983	1983–1995	1995–2008	1972–1983	1983–1995	1995–2008
Netanya (3,032)	1,271	1,434	1,449	1,949	1.1	0.1	2.3	29.3	3.9	13.7
Arab towns (3,880)	533	619	719	1,556	1.4	1.2	5.9	15.5	26.2	22.9
Local councils (4,564)	968	1,016	1,057	1,735	0.4	0.3	3.8	8.6	10.8	18.5
Regional councils (23,387)	3,489	3,745	3,971	5,626	0.6	0.5	2.7	46.0	59.3	45.2
Sharon region[a] (34,932)	6,261	6,817	7,198	10,858	0.8	0.4	3.2	100.0	100.0	100.0

Note: a. Slight errors (<0.2%) due to artifacts in spatial data processing.

the total number of noncontiguous development patches declined in Netanya and did not change in local councils (see Table 5). In Netanya, as in other urban areas, this may be a function of the dwindling land reserves available for development (Orenstein & Hamburg, 2010). In Arab towns and regional councils, the process is reversed, with a growing number of noncontiguous built patches. In the case of regional councils, this is a clear indication of leapfrog development, something that policy is supposed to address.

It must be noted, however, that the land within Arab towns is largely privately owned, and the community has faced severe and discriminatory restrictions on its spatial development. Khamaisi (1995, 2006) argued that the structure of these communities (e.g., residents living in extended family units on private property), the lack of a market for land, and the general lack of planning and infrastructure, has created a perception that national urban growth guidelines are irrelevant to and insensitive of Arab community needs. With densities in Arab towns rising and developable land

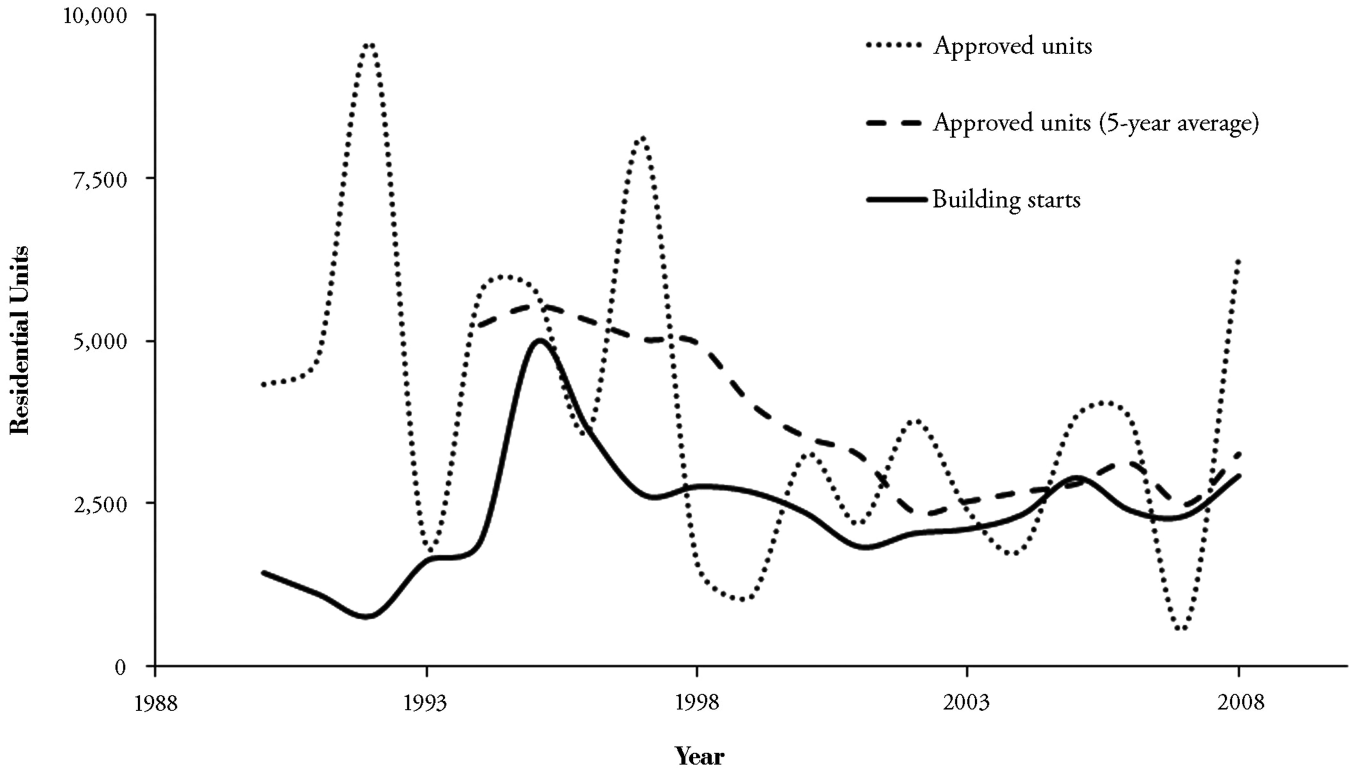

Figure 3. Building approvals and building starts (in residential units) in the Sharon region, 1990–2008.

Table 5. Spatial indicators characterizing the distribution and configuration of built space in the Sharon region, 1972–2008.

Spatial indicator	Built space patchiness							% Change built space/ % change population size		
Year	1972	1983		1995		2008		1983	1995	2008
Unit	# patches	# patches	% change	# patches	% change	# patches	% change	value	value	value
Netanya	11	8	–27.3	8	0.0	7	–12.5	0.29	0.02	1.53
Arab towns	5	5	0.0	6	20.0	13	117.0	0.39	0.36	2.59
Local councils	20	20	0.0	18	–10.0	18	0.0	1.13	0.05	0.70
Regional councils	74	81	9.5	84	3.7	109	29.8	0.88	0.23	0.87
Sharon region	88	90	2.3	93	3.3	107	15.1	0.29	0.13	1.28

scarce, privately owned agricultural land is being developed along the edges of towns. Portions of this land were unfrozen for development during the second era of Loosening Development Constraints, and other portions have been developed without official approval. When such land is detached from the town core, a pattern of leapfrog development occurs, a trend observed in our data.

Population Density and Built Space

Population density trends (see Figure 4) reveal a large baseline difference in densities between locality types. Density is high in Netanya (as expected) and relatively high in the Arab towns. Except during the early period, Netanya has consistently had the highest density. In 1972, Netanya was more than twice as dense as local councils and almost 4.5 times as dense as regional councils. By 1983, density in Netanya had risen to more than four times the density of the local councils and 7.5 times the density of the regional councils. By 1995, density in all four locality types rose. In 2008, density fell in Netanya and the Arab towns, but continued to rise in local and regional councils. Nonetheless, in 2008 density in Netanya continued to be more than twice that of the local councils and almost eight times that of the regional councils.

The percentage change in the amount of built space divided by the percentage change in population size (see Table 5) suggests trends similar to those suggested by density data. In particular, high-density localities (Netanya, Arab towns) were, in the final period of 1995–2008, apparently experiencing more sprawl, while the other locality types were becoming more compact, as indicated by higher densities. But this, too, requires further examination.

According to our data, the density of Netanya had, by 2008, fallen relative to its highest value in 1995. The slight depopulation during the 1995–2008 period is likely due to the aging population in the urban core not being supplemented by young families, who prefer either the new urban neighborhoods or the communities in the other localities. The median age in Netanya did indeed rise from 33 to 34 during this period, and the average household size decreased from 3.1 persons per household in 1995 to 3.0 in 2008 (CBS, 2010). On the other hand, most new residential construction projects in this city and others, especially those approved since 2005, have been in high-density neighborhoods (see below and Figure 5). Thus, even though high-density development currently predominates, other demographic processes are having a greater impact and leading to lower overall density (see also Frenkel, 2004a).

Nonetheless, the decline in density in urban areas calls into question the effectiveness of the various growth management policies of the Era of Growth Management. One density-related indicator that can help assess the potential impact of growth management policies is the proportion of new multistory residential buildings to new single-family and duplex buildings. In this case, there was a considerable decline in the proportion of single-family and duplex residential units (from more than 75% in 1999 to less than 50% in 2008; see Figure 5). Concurrently, there was a significant rise in the proportion of new buildings that are five stories or more (from a low of 3% in 1997 to a high of more than 50% in 2005). These figures suggest that in terms of residential unit density, growth management strategies have indeed played a role in guiding development toward high-rise apartments and away from private homes and duplexes, which use more land per capita at the expense of open space.

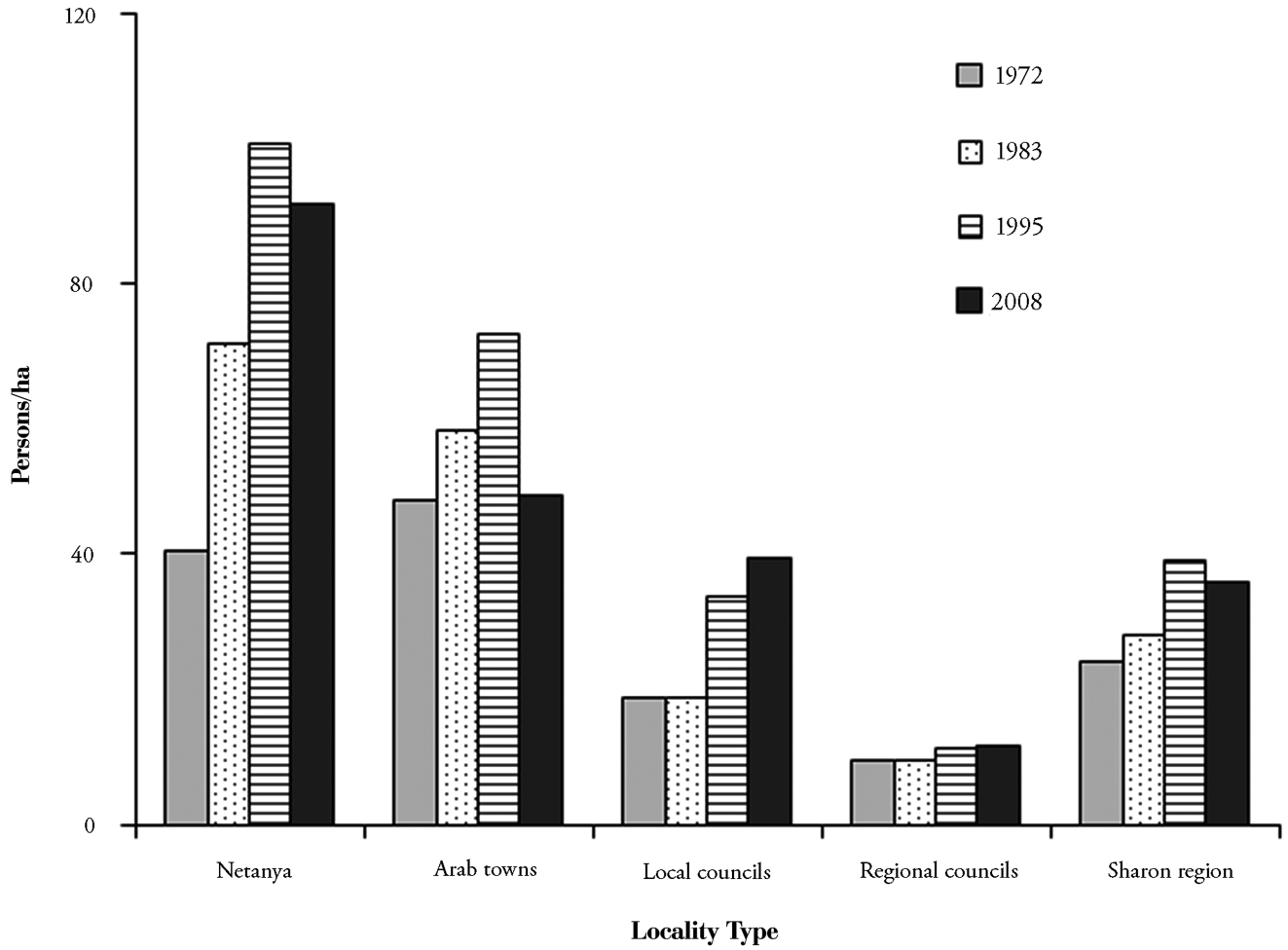

Figure 4. Population density by locality in the Sharon region, 1972–2008.

Socioeconomic and Transportation Data

Socioeconomic and transportation data for 1995 and 2008 are displayed in Table 6. Economic cluster data show that the regional and local councils had the strongest economic standing in both years. Local councils showed the greatest rise in economic standing, while the Arab towns, which were the weakest in 1995, fell further behind in 2008. Netanya's economic ranking was unchanged. The data suggest that gaps in economic well-being existed in 1995 and had widened further by 2008.

Demographic data may provide some explanation for these trends. In both Netanya and the Arab towns, average household size fell between 1995 and 2008 (3.1–3.0 and 4.7–4.0, respectively). In both the local and regional councils, on the other hand, average household size increased (3.6–3.7 and 2.5–2.8, respectively). This suggests that families with children, likely with a relatively high socioeconomic standing, were moving to the suburban communities.

Vehicle ownership rose across all localities between 1995 and 2008, with the greatest rise in regional councils (85.7%) and Arab towns (83.3%). Rates of ownership were and remain highest in local and regional councils. Likewise, the highest percentage of individuals in the labor force working outside of their community was in the regional and local councils. In Netanya, and even more so in the Arab towns, the percentage of individuals working outside the community dropped appreciably between 1995 and 2008. A small rise was noted in the local councils.

Conclusions and Discussion

Is Urban Growth Management Policy in Israel Working?

The empirical data presented in this study provide compelling evidence indicating where policy has been successful and where it has been less so. Table 7 summarizes the urban growth management objectives and assesses their level of success for each of the three planning eras in Israel. Our appraisal of success or failure at meeting the planning

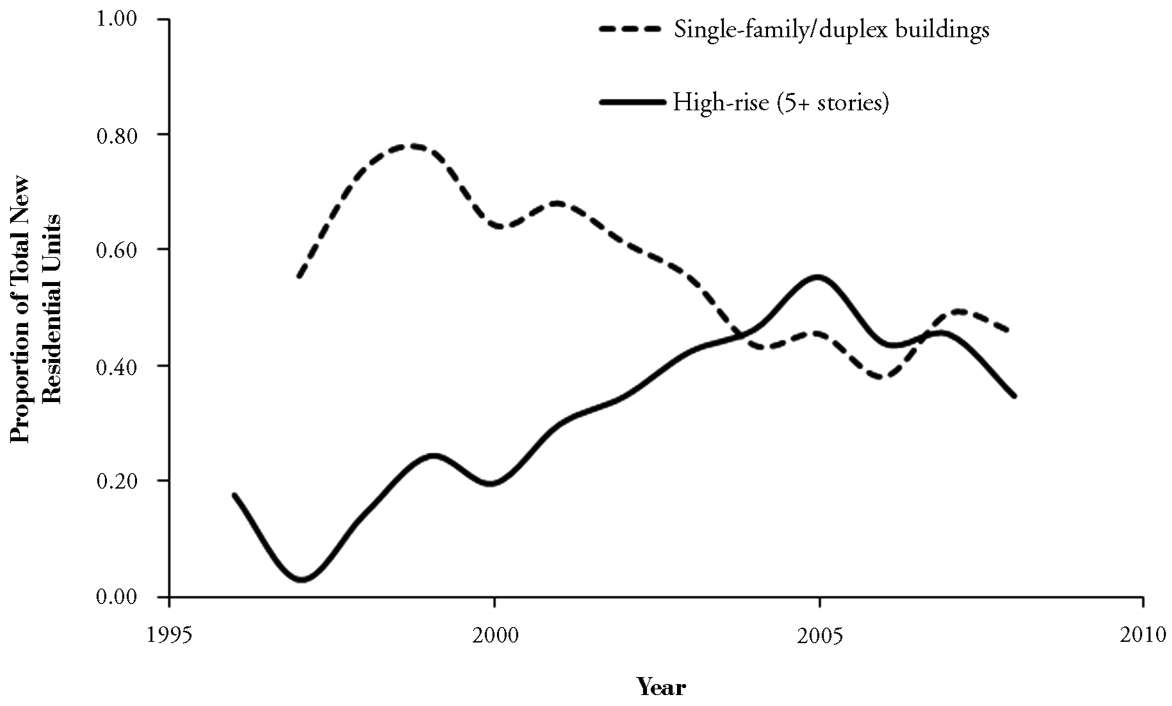

Figure 5. Proportional contribution of single-family/duplex buildings and high-rise buildings to the new housing stock in the Sharon region, 1996–2008.

objectives is based on our interpretation of the diverse performance indicators in the aggregate.

During the Era of Agricultural Preservation, two driving objectives of policy were dispersed dispersal of population and preservation of agricultural land. For the Sharon region, which is a geographically central and not a peripheral region, the implications of such policy would be slow population growth, particularly in the rural and suburban localities. In fact, during this period the rate of land development was relatively slow, there was little leapfrog development, and population densities in all localities rose. While the performance indicators suggest that urban growth management was particularly effective during this period (see Table 7), we are reminded that growth management was expressed only in terms of agricultural land preservation. The strength of this singular policy objective and a strong top-down planning regime that lasted until the 1980s were clearly reflected in urban spatial development patterns. Open space was protected from development, and baseline (1972) population densities either held steady or increased.

During the Era of Loosening Development Constraints, bottom-up-pressures and government policy increasingly responsive to those pressures caused population growth

Table 6. Socioeconomic indicators for localities in the Sharon region, 1995 and 2008.

	Economic cluster (10 = *strongest*, 1 = *weakest*)			Number of vehicles per household			Individuals in the labor force (age 15+) working outside of the community (%)		
Locality	**1995**	**2008**	**% change**	**1995**	**2008**	**% change**	**1995**	**2008**	**% change**
Netanya	6.0	6.0	0.0	0.5	0.8	60.0	47.9	43.2	–9.8
Arab towns	3.4	3.1	–8.8	0.6	1.1	83.3	67.0	54.7	–18.4
Local councils	6.6	7.0	6.1	0.9	1.4	55.6	78.4	80.9	3.2
Regional councils	8.5	8.2	–3.5	0.7	1.3	85.7	N/A	72.5	N/A
Sharon region	5.9	5.9	0.0	0.6	1.0	66.7	57.6	57.1	–0.9

Source: Central Bureau of Statistics (1995a, 2008).

Table 7. Assessment of success in meeting planning objectives according to eras.

Planning objectives	Performance indicators	Planning eras: Agricultural Preservation	Planning eras: Loosening Development Constraints	Planning eras: Planning Shocks and Urban Growth Management
Prevention of urban development on agricultural land and/or open space	Built space amount Built space growth Proportional contribution of growth in built space Percentage change in amount of built space divided by percentage change in population size	Evidence of policy **success**	Evidence of policy **failure**	Evidence of policy **failure**
Prevention of noncontiguous "leapfrog" development and low-density suburban sprawl	Patchiness of built space Gross population density Percentage change in amount of built space divided by percentage change in population size High-rise versus single-family and duplex homes	Evidence of policy **success**	Mixed results	Mixed results
Preservation of the rural character of rural communities	Population size Population growth Proportional contribution of population size and growth	Evidence of policy **success**	Evidence of policy **failure**	Evidence of policy **failure**
Prevention of urban development outside of urban fabrics	Reports	N/A	N/A	Evidence of policy **success**
Increase of population densities in built areas	Gross population density Single-family and duplex versus high-rise building starts	Evidence of policy **success**	Evidence of policy **success**	Evidence of policy **success**
Reducing socioeconomic gaps between communities and population sectors	Socioeconomic rankings of localities and changes in rank Changes in rank over time	N/A	N/A	Evidence of policy **failure**
Increase use of public transportation	Vehicles per household Percentage labor force working outside of home community	N/A	N/A	Mixed results

rates in the rural and suburban communities to accelerate. An increasingly larger portion of the total new population in the region was in the local and regional councils, suggesting that these rural and suburban communities were growing at the expense of the city of Netanya, where the growth rate somewhat slowed. The formerly effective agricultural preservation policy was not standing up to the pressures generated during this era. On the other hand, population densities rose across all locality types, and leapfrog development generally did not occur.

Institutional processes were set in motion that led to rapid expansion of development at a time when a new growth management paradigm began to prevail. These trends generated momentum that carried over into the Era of Urban Growth Management. Although clear objectives of urban growth management were articulated and eventually legislated during this period, many of the performance indicators suggest that these objectives were not met (see Table 7). There was a pulse of development across locality types, and rural and suburban communities were

contributing a larger share of population growth and new development in the region. We attribute this pulse in development and rapid population growth in the nonurban localities to momentum generated in the previous era. The pulse in development prior to the enactment of NOP 35 might also be accounted for by the desire to take advantage of development opportunities before they disappeared, as Robinson, Newell, and Marzluff (2005) have observed in other locales.

The Era of Urban Growth Management is exemplified by Israel 2020 and NOP 35. According to the assessment indicators, the preliminary success of the growth management policy is equivocal (see Table 7). On the negative side, the aforementioned pulse in development occurred during this era. Further, economic cluster data suggest that overall, socioeconomic gaps widened during this period, primarily due to a decline in the economic ranking of Arab towns and a rise in the economic ranking of suburban communities, despite policy objectives. Some of the demographic targets set by NOP 35 in 1995 for the Sharon region for 2020 were already surpassed or were close to being surpassed as of 2007. For example, NOP 35 set the 2020 population goal for the region at 443,000, 84% of which would live in the urban fabric and 13% in the mixed-use fabric. In 2007, the region's population was already 379,000, or 86% of the predicted growth until 2020. The most significant rise in population was in the mixed-use preservation fabric (i.e., the population growth noted in the local and regional councils), where population doubled to account for 21% of the region's population (rather than falling to 13% as the NOP directed).

Yet, there are also several trends that suggest that growth management tools are having a positive effect. Population densities in regional and local councils are rising, as guided by NOP 35. Moreover, building density within the urban fabric was found by the committee responsible for periodic assessment of the plan to be much higher than the minimum threshold density set by NOP 35 (Cohen, Kaplan, & Torual, 2011). This is supported by the data showing the ratio of high-rise versus single-family and duplex construction (see Figure 5). With regard to open space preservation, development within the urban fabric did not grow beyond the red-line boundaries set out by NOP 35. The population growth and development in the mixed-use preservation fabric, although rising beyond the desired proportion of regional growth, is still below the population limits set by NOP 35.

With regard to transportation objectives, we see reason for optimism as well. Despite the rise in number of vehicles per household across all locality types, the number of workers commuting outside of their community declined in the urban areas. While there was a rise in percentage of individuals working outside their community in the local councils, it was rather small.

The agricultural land preservation policy of the first era was successful in meeting growth management goals primarily because of the socioeconomic and political context of the time. This policy was enacted at a time when there was significantly lower economic prosperity and less market pressure for development, and when the country's socialist, top-down decision-making hierarchy was generally accepted by the population. There were few growth management tools in use, and government agencies could simply decide when and where to unfreeze agricultural land for development. Although effective, this simplistic policy would not work in today's neoliberal system, where market pressures for development are much greater. The Era of Loosening Development Constraints and the trends initiated during that period exemplify how the earlier policy fared under the new socioeconomic and political regime.

The tools introduced through NOP 35 in the late 1990s were better adapted for the neoliberal political environment, where bottom-up economic and demographic pressures were increasing. Today, there is a demand for a diversified set of policy objectives with operational means to achieve those objectives, like those articulated in Israel 2020 and NOP 35. These documents provide guidelines for spatial development. Within these guidelines, a locality can develop as it sees fit.

Nonetheless, when there is a significant gap between policy goals and bottom-up pressures, policy goals are more difficult to achieve. Just as our results show for the short-term, bottom-up pressures over the long term may continue to allow only partial success in meeting policy goals as society seeks to balance its changing urban development and open space preservation needs.

Implications for Policy and Science

Although no policy package will be good for all places (Ingram et al., 2009), the Israel case study provides some lessons and potentially transferable tools. In Israel, as elsewhere, bottom-up pressures (among them, impact of population growth, economic pressure to develop, changes in public tastes regarding housing preferences, and conflicts between individual and public interests with regard to open space preservation) are numerous. Market forces, particularly public desire for suburban lifestyles (Wilson &

Song, 2011), continue to challenge the urban growth management goals of increasing urban densities and protecting open space from development. The significance of such forces has been noted elsewhere by both opponents (Gordon & Richardson, 1997) and supporters (Couch & Karecha, 2006) of antisprawl policies.

Numerous studies suggest that tight development controls with high population density targets often have the unintended effect of increasing development in areas beyond urban growth boundaries, as was the case in Portland (Nelson & Moore, 1993) and Beijing (Han et al., 2009). Through comprehensive national planning, as exemplified by NOP 35, these unintended consequences can be addressed. For example, inside the urban fabric, minimum average building density requirements apply, but population can grow unconstrained. Outside the urban fabric, minimum average building density requirements apply, but so do population size thresholds. Consequently, if and when communities in these fabrics reach their population size thresholds, population growth pressure will be directed toward urban areas, and not the opposite (at least so long as the policy remains unchanged). The application of a diversity of planning tools across all regions thus prevents the undesired effects of urban growth boundaries. In the United States, this case study would support the strengthening of statewide planning initiatives insofar as they can provide broad, statewide criteria for development and can implement tools to help ensure consistency and avoid deflection of development from region to region.

A second international lesson drawn from Israel's growth management policy experience is the delicate balancing of top-down requirements and bottom-up needs (see Porter [1993] for a discussion of such tensions in the United States). Israel's comprehensive, top-down policy sets clear and obtainable rules for development (e.g., division of land into fabrics, contiguous development, maximum population size thresholds for rural communities, minimum building densities). However, local-level administrators have the flexibility to decide how these rules are implemented within their jurisdictions. For instance, neighborhoods can be developed at various densities, so long as the overall average density is achieved. In addition, development can occur anywhere so long as it is contiguous with existing development and meets density requirements (and does not conflict with other land use designations such as forests and nature reserves). Additional flexibility mechanisms with regard to minimum building densities provide a degree of sensitivity to diverse socioeconomic and cultural needs.

We also draw two methodological lessons from this study. Our case study region includes four unique types of communities, each with its own historical development pattern, that exist side-by-side in this region. Each is also treated differently by NOP 35. We are appropriately reminded by Cutsinger and Galster (2006) that several dimensions of research are necessary to understand urban spatial patterns. Communities can display a diversity of sprawl-like development patterns but not necessarily all of them; it is therefore imperative to define the specific spatial or demographic characteristics being measured. An intimate familiarity with the individual communities and their development trajectories is also necessary, lest we be misled by quantitative data.

Also with regard to methodology, we believe that the choice of Israel as a case study resolves some of the challenges in assessment of urban growth management policies pointed out by Bengston et al. (2004). The challenge of scale is addressed, for Israel has national top-down policies that give directives to lower-level administrative bodies and ensure national consistency in implementation. The challenge of lack of clarity in goals is also addressed: NOP 35 is explicit and articulate in its goals and strategies. However, the lack of counterfactual knowledge remains, and the impact of policy momentum (taking a long period of time to manifest change on the landscape) is apparent throughout this study. These problems can be partially addressed by examining policy over a prolonged time period and measuring trajectories of change in performance indicators.

To conclude, despite mixed results, we see no convincing reason that urban development patterns would have fared better in the absence of growth management policy. We concur with planner Terry Moore, who, in 1978, asked the fundamental planning question: "Is planning more likely to promote public welfare than not planning?" (p. 388). For Moore, the answer was affirmative when dealing with a public good, as with open space. In a more philosophical spirit, we offer a quote from Roman philosopher Seneca: "When a man does not know what harbour he is making for, no wind is the right wind" (Seneca, 1962).

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Notes

1. The term "dispersed dispersal" is later contrasted to "concentrated dispersal" of the second era and "dispersed concentration" in the third era. The first word in each term refers to settlement at the national scale, emphasizing either dispersal of settlement to the peripheries or concentration of development in the center of the country. The second word refers to local-scale development, either many small, scattered communities or a few urban centers (Mazor, 1993).

2. Population density change can be misleading and, thus, should not be considered in the absence of other indicators or without more intimate knowledge of population dynamics. For instance, in dense urban areas undergoing population aging and high mortality, population density may fall even in the absence of urban spatial growth. While in most cases in Israel population density decline is generally due to low-density development, we revisit this conundrum in the results section.
3. See Ewing and Cervero (2010) for more equivocal conclusions.
4. An important caveat regarding these data and regional councils: These data were collected at the scale of the individual community, whereas our scale of analysis is the locality. Recalling that regional councils are comprised of several communities, we aggregated these data to the locality scale. Therefore, the results do not suggest that all workers work outside the regional council; some of them may work outside their home community within the regional council. Nonetheless, the data do represent the proportion of workers commuting to work.
5. Data obtained from internal document provided by the Planning Administration of the Israel Ministry of Interior.
6. Data provided via special request to the Israel Central Bureau of Statistics.

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Appendix: Methodology for Estimates of Built Area

In order to estimate the historic expansion of built space, we collected 1:50,000-scale maps of the Sharon region dating from 1972 through 2008 (the most recent maps available). The Sharon region is contained in three map series that are each updated independently at irregular intervals (between three to eight years). We aggregated the available maps into four temporal sets: the most up-to-date maps corresponding to census years. As of 2010, the Survey of Israel had not updated the central map of the region since 2003, so we supplemented our data with a GIS layer of built space from 2007 prepared by a consultancy firm for a government assessment of NOP 35.

To create our built space layer, built structures on the maps were digitized as points. Other human structures, such as roads, cemeteries, and parking lots were not considered. The point files were converted into structure density raster grids with 100 m resolution (each pixel equal to a hectare). To define built space pixels, we used a 100 m search radius and a threshold density value of 35 structures per km^2. These parameters produced maps of built space that captured areas of concentrated development but did not include single, isolated structures. The built space map was further refined using a smoothing filter (majority, radius of 1 pixel), which eliminated individual isolated built pixels in open areas and open pixels in built areas. A more thorough review of this methodology is provided elsewhere, including its general application (Orenstein & Hamburg, 2010), an assessment of its strengths and weaknesses relative to a remote sensing methodology based on satellite imagery (Orenstein, Bradley, Albert, Mustard, & Hamburg, 2011), and comparisons to other GIS methods using different data sources or using the same data source, but using an automated algorithm to estimate built space (Frenkel, Orenstein, & Jahshan, 2010).