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'Green' Building as an Urban Branding Tool: The Israeli Example

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ABSTRACT

Over the last two decades, greenhouse gas abatement through energy conservation has become a major goal in developed countries. This challenges the building sector to become more environmentally responsible and resource-efficient, especially since it represents a large potential source of energy savings. In recognition of the benefits of green building, an increasing number of countries are devising green strategies for both public and private sector construction. Studies have examined the construction cost "premium" involved in achieving green certification, suggesting that the additional costs are relatively low, around 2% on average. Evidence indicates, however, that "green premia" in terms of rental and sales prices of properties in certified green buildings are systematically higher than 2%. Thus, making 'green' buildings affordable to sectors of the population which "need" it the most, will likely depend on government funding.

The present study looks at how green building is being utilized–purposefully or inadvertently–as a tool for the promotion of social and economic goals. We examine how green building, under the banner of sustainability, may in fact be fostering inequality in Israel–through a process we describe as "eco-gentrification".

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Introduction

Over the last two decades, greenhouse gas abatement through energy conservation has become a major goal in developed countries. In the U.S., residential and commercial buildings consume about 40% of all energy for their ongoing operation, and additional energy is embodied in their physical construction. Increasing attention has thus been focused on how to make buildings and the built environment more sustainable, by curtailing their energy demand and thus reducing their greenhouse gas emissions.

This challenges the building sector to become more environmentally responsible and resource-efficient, especially since it represents a large potential source of energy savings [1]. An array of policy instruments has been devised worldwide, to reduce the energy demand of buildings, including mandatory regulations. These instruments include building codes, fiscal measures such as taxation and incentives, and programs focused on public leadership and education [2]. In Israel, a standard to certify buildings with "reduced environmental impact"–IS 5281–was established in 2005 but adopted as a voluntary measure and only marginally implemented [3,4]. Since 2008, eighteen of the largest cities in Israel have joined the International Council for Local Environmental Initiatives' (ICLEI) Cities for Climate Protection Program (CCP), and signed the Forum 15 Convention, committing them to reducing their Greenhouse Gas (GHG) emissions by 2020 to 20% below their levels in 2000. In June 2013, those cities decided to gradually turn the green building standard into a mandatory measure.

In recognition of the benefits of green building, an increasing number of countries are devising green strategies for both public and private sector construction. However, making 'green' buildings affordable to sectors of the population which "need" it the most, will likely depend on government funding.

The present study looks at how green building is being utilized–purposefully or inadvertently–as a tool for the promotion of social and economic goals. We examine how green building, under the banner of sustainability, may in fact be fostering inequality in Israel – through a process we describe as "eco-gentrification".

Green building in Israel

"Green building" refers to "the use of environmentally preferable practices and materials in the design, location, construction, and operation of buildings. It applies to both renovation and retrofitting of existing buildings and construction of new ones, residential or commercial, public or private" [5].

In addition to design and construction (which directly affect the use of energy, water, and materials), green building extends to other issues such as planning for reduced reliance on private cars. The introduction of neighborhood-level green building standards has further extended the scope of sustainability topics and stakeholders, including municipal authorities whose role is on the increase.

To promote 'green' building implementation, broad spectra of policy instruments and programs have been enacted worldwide by governments and other decision-makers. In the literature on such policy tools, a distinction is generally made between regulatory, economic and informative/educational instruments [6].

Prominent among these are a number of 'green' building rating systems and energy efficiency standards for buildings, developed

around the world. The British rating system BREEAM (Building Research Establishment Environmental Assessment Method), established in 1990, was exported and served as basis for the American LEED (Leadership in Energy and Environmental Design) and the Australian Energy Star. These rating systems assign credits to buildings submitted for certification in categories such as energy efficiency, water use efficiency, sustainable site selection, materials and resource use, and indoor environmental quality. In recent years, a few organizations have gone beyond building-level environmental assessments and have initiated additional schemes relating to the neighborhood scale. Both "BREEAM Communities" and "LEED-ND" (Neighborhood Design), for example, were launched in 2009.

In Israel, a standard requiring minimum levels of thermal insulation in buildings (SI 1045, first issued in 1979) was adopted in 1986 as a legally binding building regulation. However, the effectiveness of this standard in improving building energy efficiency has been limited over the years by its modest requirements, as well as by the low level of its enforcement [3]. In 2005, a voluntary standard known as SI 5281: "Buildings with Reduced Environmental Impacts–Green Building" was launched under the sponsorship of the Israel Ministry of Environmental Protection. Applicable to all new or refurbished residential or office buildings, SI 5281 offers a Green Building Label accredited by the Israel Standards Institute (ISI) and based on the accumulation of credits in a number of categories, as described. Also, in 2005 the ISI published SI 5282: "Energy Rating for Buildings", later on approved as part of the energy requirements of SI 5281 for residential buildings. In 2007, it was adopted for office buildings as well. Like the green building standard, SI 5282 is a voluntary mechanism and therefore has been considered by many as an insufficient policy instrument for achieving meaningful improvement in building energy efficiency at the national level [3].

In 2011, the Green Building Standard (SI 5281, with SI 5282 as basis for the energy requirements) underwent a comprehensive revision and expansion, involving numerous stakeholders. This process increased the visibility of green building within the construction industry, and implementation of the standard has been further accelerated since Jun 2013, when it was adopted as mandatory by the Forum 15 municipalities that joined the ICLEI initiative for addressing climate change at the urban level [4].

Thus, green building standards, in Israel as in other countries, are increasingly being adopted as mandatory by the authorities. Furthermore, a set of principles for the assessment of sustainable neighborhoods was developed by the Israeli Green Building Council (ILGBC) and other actors in 2013 [4]. The assessment tool called 'Neighborhoods 360' designed in 2016 by the ILGBC and the Israeli Ministry of Housing, includes three main categories: 'Infrastructures and Construction, Public and Open Spaces, Efficient Use of Resources'. The first pilot projects, launched in 2016, are ongoing and no case studies are yet available for assessment.

With momentum building at the national level for an expansion of green building practice, we consider the economic and social implications of this "new" trend–in light of the acute shortage of affordable housing which Israel has faced in recent years. Studies have examined the construction cost "premium" involved in achieving green certification, suggesting that the additional costs are relatively low, around 2% on average [7,8]. Evidence indicates, however, that "green premia" in terms of rental and sales prices of properties in certified green buildings are systematically higher than 2%. For example, according to Muldavin, a green office building was rented in the U.S.A. at about 6% more than a similar non-green building, sold at about 11% more and had a slightly higher occupancy rate (by 0.2% to 18%) [9]. Thus, the "green value" of real estate has become important in developed countries.

In Israel, green building projects have been largely targeted to the middle to upper classes and mainly located in large well-to-do municipalities in metropolitan areas (such as Kfar Saba, Ra'anana, and Herzliya, all three in the Gush Dan Area, around Tel Aviv). Thus, the benefits of Sustainable Urban Development have become concentrated in middle class residential areas.

There is a certain irony to this situation, considering that living in green housing may reduce energy consumption–and bills. For example, according to Turner and Frankel, LEED buildings show energy use 25-30% lower than the national average. Reducing operating expenses through green measures is widely seen as a way to increase the long-term viability of development, as tenants benefit from lower utility bills, in addition to enjoying indirect economic benefits such as improved indoor air quality and long-term occupant health. According to Weisthal, energy savings for air conditioning in thermally improved buildings in Israel could reach 50%, simply by employing design measures incorporated in existing energy efficiency programs (i.e. in the framework of SI 5281 and the allied building energy rating system, SI 5282) [10]. Thus while improved energy efficiency in green building could represent, on the face of it, a promising solution for low income households, 'green' housing in Israel may not be affordable to them.

Methodology

Case studies, locations and 'green' building assessment frameworks

Case studies are appropriate when a study focuses on a current topic, the researcher has little control over events and we ask how or why a phenomenon has happened [11]. The case study method is used in ethnography, surveys, quantitative modelling etc, and values the use of multiple sources of evidence to foster reliability and improve understanding [12]. Case studies can be used to test theories, or use theory to deepen our understanding, as we have tried to do in the present study [13]. As case studies, we have looked at a number of 'green' neighborhoods:

- The Tel Aviv metropolis - Tel Aviv 3700 (A LEED ND planned neighborhood including SI 5281 buildings)
- Municipalities in peripheral regions: (1) Yavneh 'green' neighborhoods (SI 5281 certification for buildings) (2) Dimona (A 'green' neighborhood without formal certification).

Location of the three case study cities
Map: Machline, 2016.

Data collection
The fieldwork for this study was conducted from September 2013 to September 2017. As outlined, it focused on four case studies including interviews and participant observation in key professional events, as well as analysis of documents from a variety of sources (policy-making bodies, NGOs, interest groups, expert reports and the media).

Written documents analysis and participant observation
The analysis aimed to (1) identify the key policy tools designed to promote green building; (2) gather evaluations of their application through analysis of documents, including professional policy reports, central and local government action plans, professional NGO reports, statements of opinion, newspaper articles, municipal council meeting protocols and academic studies; and (3) collect information on how contractors/ municipalities market green building projects. Direct participant-observation took place at meetings, conferences and workshops related to the field and to specific case studies.

In depth interviews
Interviews were conducted with key figures in green building, selected by the positions they hold in the field. Nineteen in-depth semi-structured interviews were carried out as follows:

- Head of Environmental Planning - Sharon region Environmental Unit
- SII Head of the 'green' building unit
- Head of the Tel Aviv municipality planning unit
- Tel Aviv municipality 'green' building consulting firm
- Yavneh municipality, 'green' building consulting firm
- Head of Yavneh municipality engineering unit
- Representative of the Residents Council-Yavneh 'green' neighborhoods
- Dimona municipality, Demographic Growth Unit
- Dimona municipality, Engineering unit
- Shahar neighborhood, Building company, Sales department representative
- Ministry of Interior representative
- SII official in charge of the standard revision
- SII 'green' building consulting firm
- MoEP Green Building Director

Surveys
Socio-economic data on the population of 'green' neighborhoods was compiled, to find out whether gentrification has occurred, and interviews were conducted to inquire about the effect of living in 'green' buildings on energy consumption and housing operation costs.

In the Yavneh 'green' neighborhood, a survey compared the socio-economic characteristics of local residents with those of the rest of the city's residents. Data on 'green' building occupancy were also compiled, to find out whether gentrification is occurring. Different measures are used to identify the social changes occurring with gentrification: commonly used indicators include increases in residents with higher education degrees, professional occupations, owner-occupied housing and home values [14]. This survey also aimed to determine whether SI 5281 water and electricity saving goals were reached. About 200 residents completed a self-filling survey.

In the Dimona 'green' neighborhood, socio-economic data on the local population were collected, for comparison with the rest of the city, to determine whether 'green' neighborhood residents have more formal education and higher economic status, and to examine their motivations for buying an apartment in the neighborhood. All current residents answered the survey (30 households).

The Tel Aviv case study
TEL AVIV 3700: 'Green' and Affordable housing?
In 2008, together with the other Forum 15 cities, the Tel Aviv-Jaffa municipality signed the Cities for Climate Protection Initiative, which stipulates reducing greenhouse gas emissions by 20% by the year 2020–and 'green' building according to SI 5281 has been gradually institutionalized in the planning process since January 2013. As long as the standard was strictly on a voluntary basis, it was not used to certify any residential building in Tel Aviv–since instead of relying on SI 5281, the municipality had adopted its own guidelines for green building.

In contrast with its past decisions for approving projects, the Tel Aviv municipality has recently declared that 'affordable housing' should be part of all new development plans. According to the Head of the Engineering Department this new policy is due to the social protest in the summer of 2011, where housing affordability was one of the main demands. Thus, the TA 3700 project aims to combine 'affordable' and 'green' housing.

The location of the Telaviv 3700 project

Tel Aviv 3700 is a mixed-use development project covering 1,900 dunams of land along a five kilometer stretch of the Mediterranean coast–from the Sede Dov Airport (to be removed in coming years) in northern Tel Aviv, to the southern border of Herzlyah Pituah. The project is part of a city plan which the Tel Aviv municipality has been developing since 2004, and is to include about 12,000 housing units, office space, hotels, commercial areas, parks, communal areas and a beach promenade.

The development plan was approved in October 2013, and the detailed master plan-in December 2016. To promote the project, the Tel Aviv municipality divided the area into five planning zones, with construction scheduled to proceed from north to south.

The master plan calls building 11,500-13,000 housing units, including 2,160 units defined as 'affordable housing' and 1,000-4,000 'small' apartments. The plan also specifies commercial buildings (147,000 sq.m.), office space (68,000 sq.m.), hotels (60,000 sq.m.) and open spaces totaling 200 dunams.

Along the west side of the development, an ecological beach park is planned, 'preserving and strengthening natural values and making them accessible to the public, to generate a contrast with the active urban neighborhood'. A comprehensive ecological survey was conducted in 2014 by a multidisciplinary team, to ensure the conservation of the cliff running along the beach and determine the right balance between conservation and urban development. The project development plan has been approved by the local, district and national committees, as a condition for approval of each of the five plans.

To integrate 'green' building in the neighborhood planning, the Leadership in Energy and Environmental Design for Neighborhood Development (LEED ND) rating system was selected. It is the most recognized tool for evaluating 'sustainable' neighborhood design in North America. The LEED ND rating system, developed by the U.S. Green Building Council (USGBC), incorporates "green building" principles into its criteria, rewarding high-density, compact development containing a variety of unit sizes and building types, as well as access to diverse land uses [15].

Prereq 3	**Connected and Open Community**	**Required**
Credit 1	Walkable Streets	
Credit 2	Compact Development	
Credit 3	Mixed Use Neighborhood Centers	
Credit 4	Mixed Income Diverse Communities	
Credit 5	Reduced Parking Footprint	
Credit 6	Street Network	
Credit 7	Transit Facilities	
Credit 8	Transportation Demand Management	
Credit 9	Access to Civic and Public Spaces	
Credit 10	Access to Recreation Facilities	
Credit 11	Visitability and Universal Design	
Credit 12	Community Outreach and Involvement	
Credit 13	Local Food Production	
Credit 14	Tree Lined and Shaded Streets	
Credit 15	Neighborhood Schools	
Green Infrastructure and Buildings		**29 Points**
Prereq 1	Certified Green Building	
Prereq 2	Minimum Building Energy Efficiency	
Prereq 3	Minimum Building Water Efficiency	
Prereq 4	Construction Activity Pollution Prevention	
Credit 1	Certified Green Building	
Credit 2	Building Energy Efficiency	
Credit 3	Building Water Efficiency	
Credit 4	Water Efficient Landscaping	
Credit 5	Existing Building Use	
Credit 6	Historic Preservation and Adaptive Reuse	
Credit 7	Minimized Site Disturbance in Design and Construction	
Credit 8	Stormwater Management	
Credit 9	Heat Island Reduction	
Credit 10	Solar Orientation	
Credit 11	On-Site Renewable Energy Sources	
Credit 12	District Heating & Cooling	
Credit 13	Infrastructure Energy Efficiency	
Credit 14	Wastewater Management	
Credit 15	Recycled Content Infrastructure	
Credit 16	Solid Waste Management Infrastructure	
Credit 17	Light Pollution Reduction	
Innovation & design process		6 points
Credit 1 Innovation and Exemplary Performance	Innovation and Exemplary Performance	
Credit 2 LEED Accredited Professional	LEED Accredited Professional	
Regional Priority Credit		**4 points**
Credit 1	Regional Priority	4
THE LEED ND RATING SYSTEM–CATEGORIES, CREDITS AND POINTS		

Source: U.S. Green Building Council

According to the Head of the Engineering Unit, the Israeli "Sustainable neighborhood" framework was not advanced enough to be considered.[…] So we adopted the LEED ND and not the British BREAM, as some Israeli consulting firms are accredited to give the LEED ND […] Thus an environmental consulting firm was hired to help the municipality meet the standard requirements […] This is the first time in Israel that such a plan has been developed […] In Tel Aviv we are rich enough to hire the best advisors."

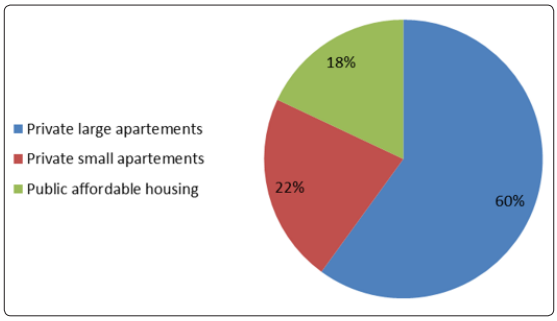
The LEED ND scheme (Table 1) incorporates five categories: (1) Smart location and linkage; (2) Neighborhood Pattern and Design; (3) Green Infrastructure and Buildings; (4) Innovation and Design Process; and (5) Regional Priority Credit. The five categories include mandatory and optional credits worth a total of 110 possible points, and a minimum of 40 points must be earned for certification. There are four certification levels according to the accumulated points: Certified (40-49), Silver (50-59), Gold (60-79) and Platinum (80+).

The Tel Aviv 3700 plan addressed the following environmental principles:

- Preserving the existing resources of the site–Proximity to the sea: elaboration of a preservation plan and use of recycled materials for infrastructures.
- Run-off management–the standard is intended to provide a comprehensive solution to manage rainfall and reduce flooding risks (for example: pools/ local reservoirs, etc.).
- Emphasizing community life by encouraging pedestrian activity and reducing motorized traffic–Compactness of the complex, optimal connectivity to public areas and buildings at all levels, encouraging the use of the railways and public transportation, pre-planning a continuous system of cycling paths, shaded public spaces and combating the urban heat island effect.
- Energy savings–management and production of energy at the local level from renewable sources, and use of natural gas facilities. Raising the buildings' energy efficiency rating to A and above and perhaps applying for the SI 5282 certification.

We focused on the residential buildings planned for the complex, to examine whether the goal of building housing which is both 'green' and 'affordable' has been addressed.

The municipality has a declared goal of integrating various kinds of housing in the neighborhood, to attract a heterogeneous population and ensure social mix. For this purpose, the plan includes a portion of small apartments (of about 60 sq.m. each) which will constitute about 40% of the housing stock in both the private and the public sector market. Overall, the average apartment size has been limited to 120 sq.m., to 'avoid the proliferation of huge luxury penthouses' (Municipality of Tel Aviv, Head of the Engineering Department, 2017).



Housing Distribution in TA 3700 Neighborhood
Source: Tel Aviv municipality, Engineering Unit, 2017.

Affordable housing location
Source: Tel Aviv municipality engineering unit, 2017.

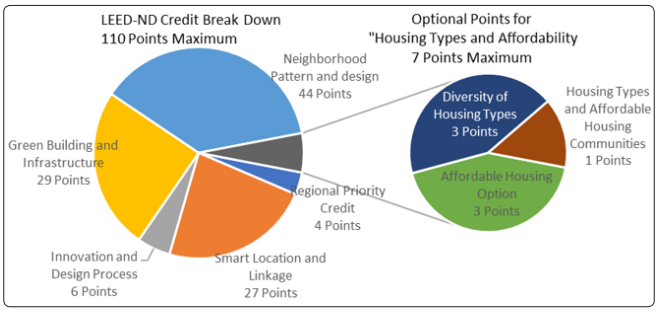
The 'social housing' (i.e. smaller apartments) are to be dispersed in the neighborhood, but not mixed with private dwellings at the building scale. They will include no parking spaces, and their planned location along the main road or close to public institutions (such as the Education Campus) is considered less attractive, due to the noise: "We had to be realistic; we could not build the affordable apartments in the most attractive locations, because (a project attempting this) would not happen!".

On the other hand, residents of the neighborhood–including the 'affordable' housing tenants–should be within walking distance of most services. Among the total public rental social housing units (2,160), 1,360 will be owned by the municipality and 800 by the State. These social units will be funded by private developers receiving the land for free from the State or the municipality, and for the first 20 years will collect rent from the tenants–after which the apartments will be ceded to the municipality, who will collect the rent from then on. It is stipulated that the rent will be 30% lower than market price, and a given household may stay in the apartment for up to five years, in order to 'enable as many people as possible to enjoy affordable housing'. Regarding eligibility, households currently owning an apartment cannot apply–but the maximum income has not yet been defined. However, there will be a *minimum* income threshold which stipulates that households for whom the monthly rent represents more than 30% of their monthly income will be unable to apply for public social housing. The 30% level correlates with a reference income based on the 7th socio-economic population cluster (which is the average population cluster in Tel Aviv, whereas North Tel Aviv is mainly populated by the 8th, 9th and 10th clusters). According to the Head of the Engineering Departmet, the aim is to allow the middle class (7th cluster) into the neighborhood: "This affordable housing is not intended for poor people, it is not public social housing […] The rents will be around 5000 NIS, so they should not represent more than 30% of the household incomes of the middle class […] But if the government wants, it can also provide public social housing from its 800 units… it is the duty of the State to build housing for low income people, not ours […] The only thing we can do is building environmentally certified apartments, while trying to limit speculation. Maybe we are wrong, but at least we are trying […] The State owns 70% of the land, so they could build public social housing, and some NGOs even try to convince it to do so–but we do not have enough power".

It thus seems that while an unprecedented effort is being made to promote in Tel Aviv 'green' building that is accessible to a larger cross-section of the population, the 'affordable' housing in the TA 3700 project will be directed to the middle and upper-middle class, thus excluding poorer households. Since the neighborhood

aims to receive the LEED ND certification, we could ask whether that framework includes clauses relating to social diversity or affordability for low-income populations, like in the French 'eco-quartier' framework [16].

In the LEED ND 'Neighborhood Pattern and Design' category (see Figure. 2) there are seven optional points dedicated to affordable housing in the sub-category entitled 'Mixed Income Diverse Communities' (formerly known as 'Housing Types and Affordability'–see Figure.33). According to Garde, however, the LEED ND certification provides very little incentive or reward for the provision of affordable housing. More recently, Szibbo found that in 60% of the LEED ND projects in the US, there is no affordable housing [17].



The Leed ND (V3) Credit Distribution, Showing In Details Those Points Related To 'Housing Types And Affordability' (Rwnamed 'Mixed Income Diverse Communities' In v4)
Source: Szibbo [17].

The TA 3700 project follows the LEED ND guidelines that stipulate:
"Include a proportion of new rental and/or for-sale dwelling units priced for households earning less than the area median income (AMI). Rental units must be maintained at affordable levels for a minimum of 15 years. Existing dwelling units are exempt from requirement calculations. To receive up to a maximum of three points, the project must meet any combination of thresholds in Table 4.

Table 4: Table From Leed ND Guildelines Defining Thresholds For Affordable Housing Source: LEED ND, 2016

Rental dwelling units				For-sale dwelling units			
Priced up to 60% AMI		Priced up to 80% AMI		Priced up to 100% AMI		Priced up to 120% AMI	
Percentage of total rental units	Points	Percentage of total rental units	Points	Percentage of total for-sale units	Points	Percentage of total for-sale units	Points
5	1	10	1	5	1	8	1
10	2	15	2	10	2	12	2
15	3	25	3	15	3	-	-

AMI=area median income

Thus, while the LEED ND certification includes a small incentive to provide rental units priced to accommodate below-average income, it stops far short of requiring affordable housing. Accordingly, the Tel Aviv municipality can build a LEED ND neighborhood without accommodating low-income populations. Even the initiative to include apartments for the middle class (7th cluster) was not due to LEED ND certification requirements, but rather to a municipal decision following the 2011 social protest over the lack of affordable housing (see introduction):
"Before the social protest we planned only 360 affordable units in TA 3700, the other 1000 were to be affordable housing due to smaller size apartments, and thus cheaper (the master plan stipulates at least 20%) […] If we planned a neighborhood at present, we would not do that.

Peripheral areas case studies
The following two case studies are in Yavneh and Dimona, outside of the Tel Aviv metropolitan area. Both were established as development towns, urban settlements that were newly built or significantly expanded by the State. A total of 28 such towns were established, mainly in the 1950s, to settle immigrants. Development towns were originally designed for a mixed ethnic population, but it was the newly arrived Mizrahi Jews from low socioeconomic background–mainly those already residing in temporary immigrant camps–who had little option but to stay in the peripheral locations where the camps has been set up.

Most development towns quickly became dominated by low-income immigrant populations, mainly from North Africa. The combination of their peripheral location, cultural segregation and economic dependency led the development towns to remain the least developed sector in Israeli Jewish society [18]. According to Israel's Central Bureau of Statistics, these towns still form the vast majority of Israel's poor localities. However, the socioeconomic ranking of the development towns closer to the central Tel Aviv region is just below average, while more peripheral towns are in the bottom 20 percent, indicating a strong link between location and prosperity. This link is confirmed by a study which ranked all 118 Israeli Jewish urban localities according to their aggregate quality of life indicators. Eighteen of the last 20 ranked localities were development towns, 17 of them located in the country's northern or southern peripheries.

We analyzed 'green' building policies and practices in two development towns. The first is Yavneh, whose proximity to Tel Aviv (20 km) made the settlement of middle class households possible since the late 1970s. Thus a 'green' neighborhood development project including SI 5281 buildings was a step in the long gentrification process that began several decades ago. Our second case study, Dimona (in the remote eastern Negev) is still among the lowest socio-economic Jewish towns. A 'green' neighborhood is being developed in Dimona, and marketed as 'built according to Israeli green standards'. However, the stakeholders

involved decided not to seek formal 'green' certification under SI 5281, as they perceived that doing so would threaten the very implementation of the project.

The case of Yavne: 'Green' neighborhood or 'greentrification'?
Yavneh is a city in the Central District of Israel. In March 2016 it numbered 45,059 inhabitants (socio-economic cluster 6). Its population is young: about 36% are in the 0-21 age group, and 64% are below 40.

Yavneh is located 20 km south of Tel Aviv- Jaffa, 15 km northeast of Ashdod, and 7 km east of the Mediterranean. Yavneh was established in 1948 as a transit camp for Jewish immigrants from Arab countries, Iran and Europe. The first neighborhood was built in 1949. In the first phase, its dwellers subsisted on small trade, labor in farming and industry, and some agriculture in their backyards. Living standards were low, housing often substandard, and social welfare cases numerous. Its small population of 1,600 in 1953 grew to 10,100 in 1970, and by the mid-1990s to 25,600– further rising to 31,700 in 2002 and occupying 30 sq. km. Yavneh received the status of urban municipality in 1986.

In the sixties, several enterprises moved from the Tel Aviv area to Yavneh. Its industries include leather, textiles, and metallurgy. With its location near the southern fringe of the Tel Aviv metropolitan area, Yavne was a stagnating backward city until the mid-1970s. Its Mayor, Meir Shitrit, elected in 1974, opted to develop it as a low-density satellite of Tel Aviv. He initiated a project of single-family dwellings for medium-income households, opening a new range of opportunities for Yavneh [19].

The housing project was followed by an upgrade of the school system and attracted a group of army officers and their families as a core of households ready to build their houses in the once-depressed immigrant town. The growth relied upon the short commuting distance to Tel Aviv. This rapid transformation was not without problems, however, bringing social polarization and rising land and housing prices [19].

Yavneh eventually became the site of Neot Rabin at the beginning of the 2000's, one of Israel's first 'green neighborhoods.' While another 'green' neighborhood was planned in Kfar Saba in 1996, Yavneh's initiative was the first to include 'green' certified residential buildings (SI 5281, 2005 version). Yavneh does not belong to Forum 15, and thus the standard is not mandatory, even today.

'Green' Neighborhood location
Source: Yavneh municipality, 2015.

Yavneh's 'green' neighborhood was designed in two stages. The first project of 2,900 housing units was approved in 2002, and the second, with 1,335 additional units, in 2010.

While the Yavneh project may be thought of as Israel's 'first certified green neighborhood' due the SI 5281 certification of its buildings rather than to overall design, the municipality also employed an environmental consultant, to set general sustainability guidelines.

According to the Head of the Engineering Unit of Yavneh municipality, planning a 'green' neighborhood was a wish of the mayor and "it has been planned and constructed with an emphasis on environmental components […] There was a need for planned green neighborhoods in Israel, due to problems caused by high-density development, the intensive use of infrastructures and the desire to raise the standards of living, while reducing home and maintenance costs".

According to the Head of the Engineering Unit, the planning of the green neighborhood was carried out in cooperation with the project's architect, the mayor, the municipal engineer, the developer's representatives, and professional consultants dealing with environment, infrastructure, water and waste issues. "The biggest obstacle to green neighborhood construction comes from the larger capital costs (between 2 and 10%) due to the use of expensive technologies and materials [...] These costs fall mainly on developers and on the local authority [...] Meanwhile, those who benefit most are the residents who live in a better quality environment, and in a building where heating and cooling costs are lower (by 30%), thanks to investment in insulation".

According to the same official: 'green' building is considered to be of higher quality, and in greater demand in the Israeli market, than conventional building.[…] The perception of green neighborhoods as prestigious, causes many local authorities to encourage them, in the hope of attracting families with higher socioeconomic standards, which will also pay more to dwell in such an area.' "Strict standard requirements have been applied at every stage of the construction process; close supervision has been necessary to verify that the developers complied with all neighborhood requirements and environmental regulations. We did not need to check if the SI 5281 standard was efficient, since the Ministry of Environment Protection already did that, and we trust them".

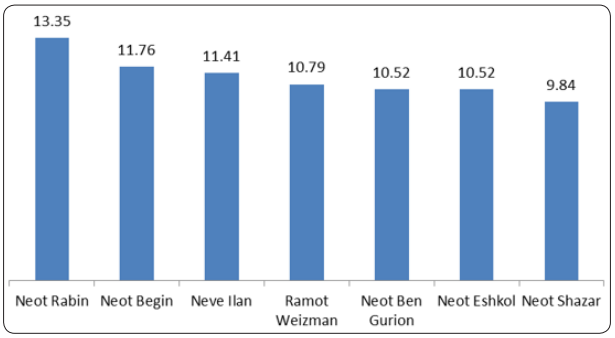
To improve thermal comfort in buildings, all residential units were designed in accordance with Israeli standards–compulsory (SI 1045) and voluntary (SI 5281)–for thermal insulation of building walls and windows. However, the neighborhood layout was already planned when the project was submitted for certification and the apartment buildings were not oriented properly. Thus, passive cooling and heating are limited, and the buildings received only 55 points of the 2005 standard version, barely enough for qualification (55 points is the minimum score needed for IS 5281 certification).

The last part of the 'green' neighborhood plan was designed in 2010 and includes 1,335 residential units on 1606 dunams. There are building rights for 26,950 sq.m. for commerce and offices, about 89 dunams for public buildings, 9.5 for sports and recreational activities and, over 630 for a coastal park forest. The municipality decided that this part of the 'green neighborhood' will be built according to the LEED ND system, and the residential buildings according to LEED as well–in contrast with other 'green' neighborhoods in Israel, designed to comply with the local

green building standard (SI 5281). According to the Head of the Engineering Unit (2017), "the LEED standard is more efficient and better known, which will make it easier to sell the apartments".

As mentioned, in the LEED ND standard there are several credits encouraging affordable housing but no mandatory requirement. At the same time, 538 housing units in the new section of Neot Rabin will be subsidized by the State. This is due to a government housing program called *Mechir La'Mishtaken*, whereby the Israel Lands Authority and the Ministry of Housing auction off land at a discount to developers willing to guarantee lower-priced apartments to eligible purchasers. Any single or married Israeli over the age of 35 who has not owned an apartment in the last 6 years, is eligible. In other words, about one quarter of the apartments in this LEED ND neighborhood will have a reduced price by about 1 million NIS (22% below market price).

As of 2016, 89 residential buildings (with a total of 3,200 apartments) in the 'green' neighborhood of Neot Rabin had received the SI 5281 certification. Thanks to the project, Yavneh's population, which was 34,000 in 2012, has reached 46,000–an increase of 35%. A full quarter of Yavneh's habitants currently live in the 'green' neighborhood.



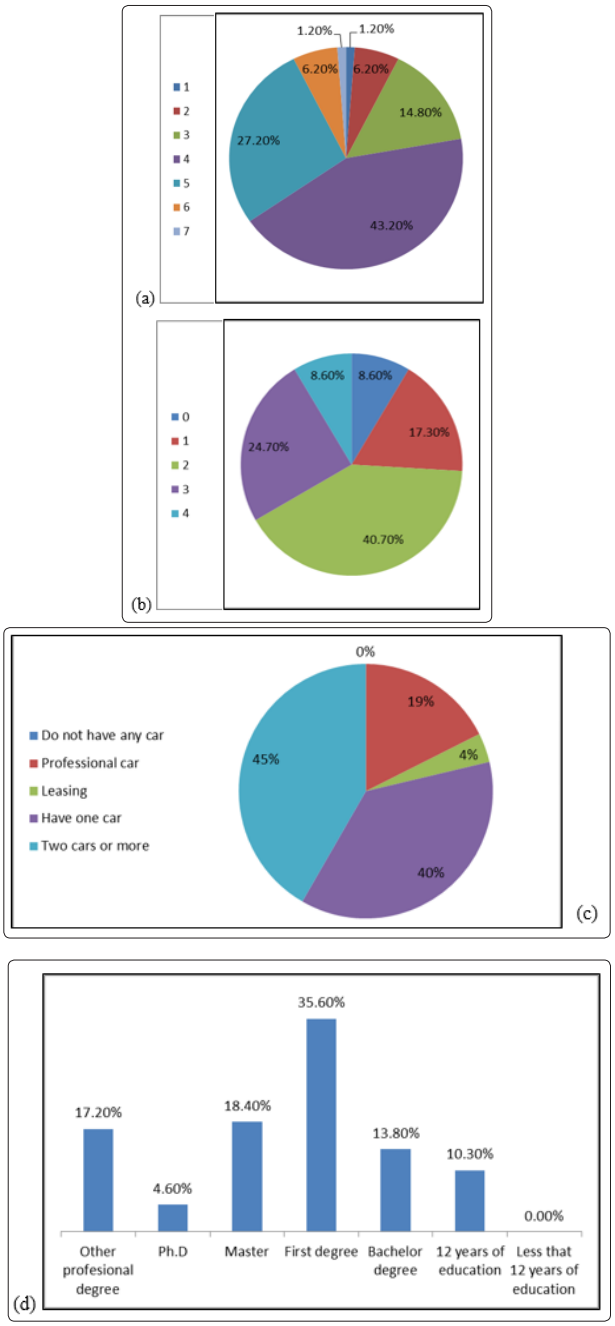
Average Apartment Sales Price (In Thousands NIS/SQ.M.) In 2012 In Yavneh's Neighborhoods, Including Neot Rabin (The 'Grren' Neighborhood).
Source: Yavneh Municipality.

To calculate the 'green' premium in Yavneh, we compared the sales price per square meter of apartments in Neot Rabin (the 'green' neighborhood) with those in the adjacent 'Neot Begin' neighborhood –built a few years earlier (in 2004), which also consists of multi-family apartment buildings, but without 'green' certification (See Figure. *). According to this comparison, the 2012 'green' premium in Yavneh is estimated at 13.5%, even though prices in Neot Begin grew by 42% between 2004 and 2010 (according to Tax Authority data). These results may indicate that the 'green' neighborhood tends to make surrounding neighborhoods more attractive, driving up real estate prices.

As mentioned, however, one quarter of the apartments in the last sector of Neot Rabin (designed according to LEED ND) will be discounted by 22% due to the *Mechir La'Mishtaken* program. This is in sharp contrast with current trends in the center of the country, as few *Mechir La'Mishtaken* apartments are available in major cities: none in Tel-Aviv, Netanya, Ashdod, or Herzliya. In Jerusalem, about 500 apartments are available in Ramat Shlomo (an ultra-orthodox Jewish neighborhood where prices are already more affordable than in other parts of Jerusalem). Apartments are available for those willing to move to peripheral towns like Rosh Ha'ayin, Charish, or Afula located respectively at a distance of 30, 70, 90 km (with 1,700 apartments) – but in most high-demand cities there are none (see http://www.ynet.co.il/articles/0,7340,L-4843203,00.html).

Thus, while the program does allow those willing to move to the periphery more affordable housing, one may ask: Weren't prices already affordable in Charish or Afula? Are Israelis living in the Tel-Aviv area going to move to Afula, to obtain a 200,000 NIS discount on an apartment?
Post occupancy survey.

The following data were collected among 187 residents that moved to the Neot Rabin 'green' neighborhood of Yavneh between 2012 and 2016. The majority (74%) settled in 2013- 2015, and most (93%) purchased new apartments (5% bought them second-hand).

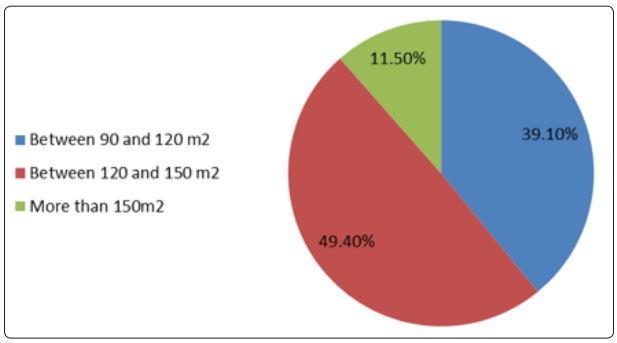


Socio-economic data for neot rabin. A) number of persons per households; b) number of children under 18 years old per household; c) educational level in the 'green' neighborhood; d) number of cars per household.

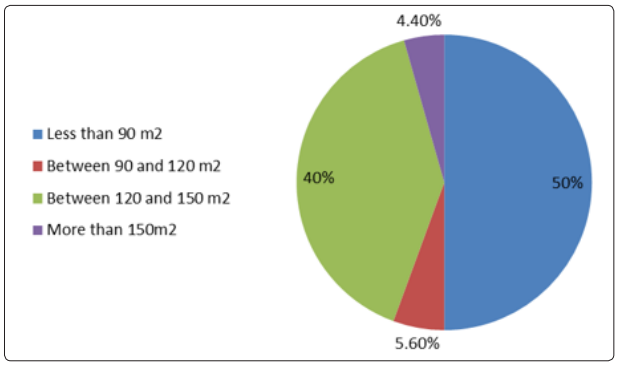
Source: original survey data, 2017.

Comparing this socio-economic data (See Fig.) to the 2008 population census of the Israeli Central Bureau of Statistics (before the building of the 'green' neighborhood), Neot Rabin is a gentrifying neighborhood: (1) Less than 7% of Yavneh residents have an academic degree, versus 50% in the 'green' neighborhood. (2) Only 72% of Yavneh's households have at least one car, while in Neot Rabin, almost half population has two cars or more. (3) Average apartment size is larger in Neot Rabin than in Yavneh. (4) Average apartment price is 13,300 NIS/sq.m. in Neot Rabin versus 10,800 NIS/sq.m. in other Yavneh neighborhoods.

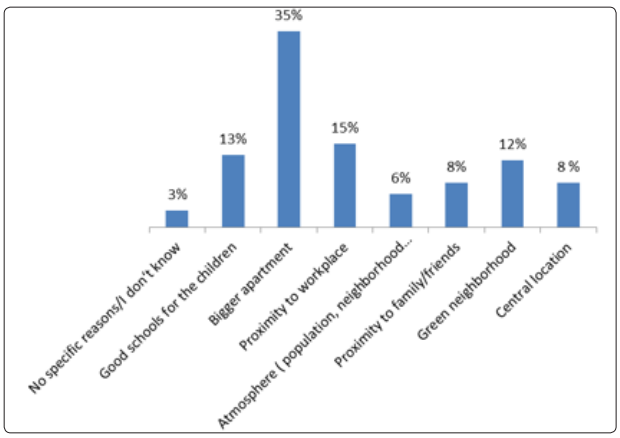
All apartments in Neot Rabin have been built according to the SI 5281 standard (2005 version, 55 points), and received the 'green' label from the SII. We asked the interviewees if they knew that their apartment had 'green' certification, and half the sample (47%) answered that they did not.



Apartment sizes in Neot Rabin
Source: original survey data, 2017



Previous apartment size of Neot Rabin residents
Source: original survey data, 2017



Residents' main reason for moving to the Neot Rabin 'green' neighborhood
Source: original survey data, 2017.

According to the survey, only 12% of the sample declared that they selected that neighborhood because of its 'green' elements. The main motivation was moving to a larger apartment. When we asked residents previously living in a similar size apartment, only 30% declared that their energy consumption has decreased since they moved to a 'green' apartment.

Meanwhile a computer energy simulation done by the project's environmental consulting firm has shown that buildings designed to meet the revised version of the standard may have a 20-25% lower energy demand than conventional buildings. However, a similar computer simulation, conducted for the present study using Energy UI software, showed an improvement of 7% compared to a baseline building which meets the minimum requirements of the mandatory SI 1045 standard.

One source of discrepancy in the estimation of certified buildings' energy performance is that so far, most buildings have been built according to the earlier (2005) version of the standard, which does not necessarily require them to be more energy efficient than construction meeting the mandatory standard (SI 1045) for thermal insulation. According to (???), most buildings in Yavneh's other neighborhoods do not even meet the requirements of SI 1045. Regarding water expenses, only 3% claimed that their bills decreased since they moved to the 'green' neighborhood.

According to the developer's environmental consultant, the residents do not use the air conditioner water collector system to save water, and the solar panels are not even connected to the electricity grid. "The building residents' committee considers that maintenance costs would be too high compared to the water/electricity saving potential, and thus the access to the roof and the water collection system has been locked". After further investigation among building residents. "We do not use the photovoltaic panels to produce electricity, since none of us is interested in opening a private company (to manage the logistics of a communal system) […] Regarding the water collector system, the building company provided a pump with insufficient power, and thus the water was not used. It was not profitable due to its electricity demand, and we did not want to invest in a better pump."

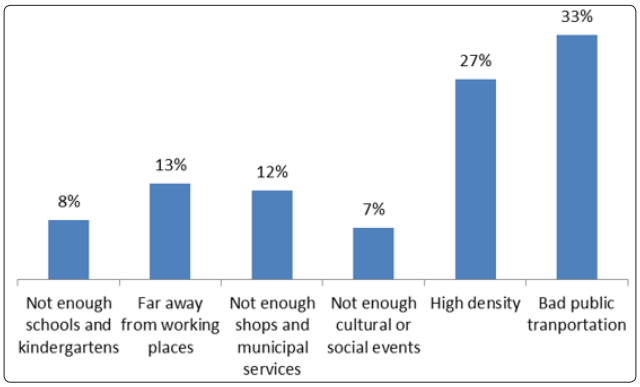
Furthermore, a representative of the Residents Council expressed doubts about the pneumatic recycling system–which aside from eliminating collection vehicles within the neighborhood, "is not greener than a regular waste collection system […] Wet and dry wastes are not separated, and are sent to the regular dump site and treated as in any other Yavneh neighborhood […] Our expensive pneumatic waste system is just more esthetic and comfortable".

Regarding the issue of health and well-being, SI 5281 text states that "Tenants in buildings designed correctly are healthier and more relaxed" and the head of the 'green' building unit in the SII declared that the standard "has the potential to reduce workers sickness vacancy and reduce the social insurance budget dedicated to that purpose". Thus, we asked the residents of Neot Rabin if they their working sickness vacancy had noticeably decreased since they moved to environmentally certified apartments. Only 12% answered that it had, while most interviewees complained of an increase in respiratory problems, due to smoke inhalation from surrounding illegal waste burning.

One clearly apparent 'green' aspect in Neot Rabin is its large number of open spaces – and for this reason, higher municipal taxes than in other districts of Yavneh. Comparative show that Neot Rabin residents have been charged 52 NIS/sq.m., whereas

the tax in Yavneh's other neighborhoods ranges between 39 and 49 NIS/sq.m.

Despite its abundance of open space, the Yavneh 'green' neighborhood did not undergo certification by any eco-district standard at the urban planning (as opposed to individual building) level. In countries where it exists, green certification at the neighborhood level tends to emphasize reduced use of private cars as the foremost goal–since 25% of fossil fuel-related CO2 emissions globally, and over 30% in OECD countries, can be attributed to transportation. For example, in LEED ND, the category 'Neighborhood pattern and design'–dealing with displacements, accessibility, soft transportation development, and local services to reduce the use of private cars–accounts for 44 points and is thus the main requirement for certification. However, the main means of transportation in Yavneh's 'green' neighborhood remains the private car.



Responses to the question "What do you dislike in your neighborhood?"
Source: Original survey data, 2017.

According to the survey sample (Figure 44), a large portion of Neot Rabin residents are dissatisfied by what they see as inadequate public transportation. Due to lack of local retail shops, public services (such as schools), and sources of employment (with no tertiary buildings) within the core of the neighborhood, most daily travel has to be by car. This can explain why more than 60% of households in the sample own (or have the use of) at least two cars. Thus, Neot Rabin would be ineligible for LEED ND, or similar 'green neighborhood,' certification.

The case of Dimona

Dimona is located in the Negev desert, 36 km to the south of Beer-Sheva and 35 km west of the Dead Sea, above the Arava valley in the Southern District of Israel. In 2015 its population was 33,258.

Dimona was one of the ten development towns created in the Negev in the 1950s under the leadership of Israel's first Prime Minister, David Ben-Gurion. Dimona was conceived in 1953, and settled in 1955, mostly by new immigrants from North Africa, but with a sizable Indian Jewish community (about 7,500 residents). The local population often lacked the education and skills necessary for high-level employment. Furthermore, veteran Israelis were typically absent from the new towns, preferring the coastal cities or kibbutzim (communal agricultural settlements). This limited the development of the town. Housing conditions were rudimentary, due to financial hardship of the immigrants and of the State. Temporary immigrant camps were constructed initially, and in place of these early shelters, government housing corporations typically constructed multi-story apartment blocks. In 1980, public housing accounted for 95% of the total housing stock in Dimona.

With its relative proximity to Beer-Sheva, Dimona played an important role in the development of local resources in the Negev region, but its distance from the center of the country was an important disadvantage. Unemployment was gradually reduced thanks to government-assisted industrialization. The labor-intensive textile industry was seen by policy makers as most suitable for Negev development towns, and by the early 1970s it employed 40% of the region's industrial manpower [19]. Many plants closed in the 1980s, as taxes on textile imports were reduced. At the same time, development of the natural resources of the Negev, notably the potash deposits of the Dead Sea (and later the phosphate rock of the northern and central Negev) progressed. About a third of the city's population works in industrial plants (chemical plants like the Dead Sea Works, and high-tech companies). In spite of a gradual decrease in the 1980s, the city's population began to grow once again with the large-scale immigration from the former Soviet Union in the 1990s.

Many workers were made redundant in recent years, generating a 10% unemployment rate. However, Dimona took part in Israel's solar energy transformation, as Luz II, Ltd. constructed a large experimental thermal solar array at the Rotem Industrial Complex, outside of the city. With dozens of mirrors focusing the sun's rays on a tower, that in turn heats water to create steam and generate electricity, the installation is being billed as the 'highest performance, lowest cost thermal solar system in the world,' and the company hopes to implement the technology in new solar plants, to be built in California.

In 2008, a master plan for Dimona's new 'Shahar' neighborhood was approved. The project is located at a 1,200 dunam site in the northeast part of the city, on land which was formerly a municipal garbage dump. The program includes 3,412 residential units (approximately 15,000 residents by 2025), five schools, and ten kindergartens, at a total development cost of NIS 500 million. According to the deputy mayor of Dimona, the aim is a to attract "a more affluent population from the center of the country, but also to host families from miltary units that have moved to the region […] and to retain Dimona's youngsters […] The Ministry of Housing has entrusted the construction of infrastructure to a public developer, assuming that no private company would invest in the 'unattractive peripheries'.

The land was divided into lots and the developer published a call for private tenders to take charge of building and marketing the housing units. The plan includes housing construction as follows:

- 547 units for low apartment buildings (4 units per dunam)
- 1,977 units in apartments building
- 119 cottages
- 364 garden and roof apartments
- 209 private houses
- 200 housing units for the elderly

So far, each of the 200 lots for private houses was leased from the Israeli Land Authority for 250,000 NIS (including infrastructure development). According to the Demographic Growth Unit of the Dimona municipality, about 70% of the lots have been purchased by Dimona's younger generation. The next stage is to include 584 housing units in apartment buildings, divided in six lots. The Ministry of Housing decided that they will be built under the '*Mehir la'Mishtaken*' framework, thus priced below market-price. The Ministry stipulated that the selling price will be between 5,300 and 6,200 NIS/sq.m. for apartments of between 60 and 150

sq.m. According to program regulations, half the apartments are intended for Dimona's residents and the other half for outsiders.

The engineering unit of the Dimona municipality was not involved in planning the neighborhood but may have affected local planning committee decisions. The Ministry of the Interior employed an architect to design the master plan and the public developer established building requirements in the call for tenders.

The inclusion of 'sustainable' elements in planning originated in a government decision (in 2011) committing public developers to 'sustainable development strategies' and thus employing an environmental consultant to define 'green' objectives . The decision to market the project as a 'green neighborhood,' according to the consultant, was the developer's idea: "It was thought that the neighborhood's location on a reclaimed waste dump site, and the use of recycled waste in the building of infrastructure, makes it 'green' […] but maybe it should not be called a 'green neighborhood' as no green standard is involved".

The use of the Israeli green building standard (SI 5281), advised by the consultant, was rejected by the developer and the local planning committee as "it would raise building prices and no contractor would invest in Dimona […] We are not in Tel Aviv, we do not sell the apartments for 2 million NIS, especially for *Mehir la'Mishtaken* where the State caps prices […] When a developer's profit is 40,000 NIS per apartment, he is not going to pay 30,000 NIS to the Israeli Standards Institute and 10,000 NIS to a 'green' building consultant, to get the certification'.

According to the environmental consultant, the only remaining option for including 'green' building was to integrate elements 'that would not raise building costs'. Thus, the consultant convinced the developer to build according to the mandatory standard for thermal insulation (SI 1045) 'even though the municipal engineering unit was unable to verify its implementation (the public developer paid a private consultant to verify compliance). The consultant declared that the buildings would reach between 35 and 40 points if they were submitted for the SI 5281 standard (less than the 55 points required for certification). Since no 'green' standard is involved in the neighborhood or building design, one may ask why this project is marketed as 'green'.

According to the building company sales department, the apartments 'have been built according to the Israeli green building standards'. In response to the question of what is 'green' in the design of the apartments, it was stated that the project employs 'double glazing and a buried electricity system'.

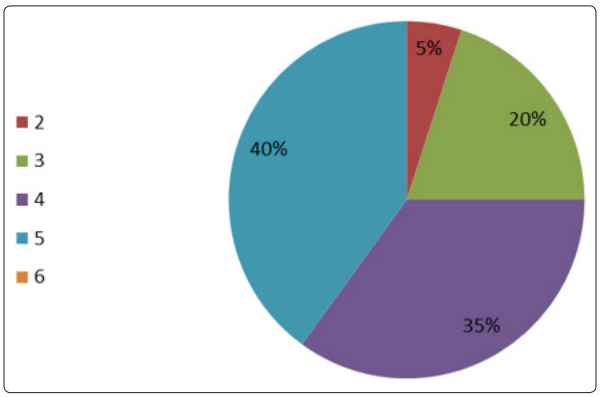
The exploitation of environmental issues is not new to the advertising industry, but until recently, it was mostly limited to ads by energy companies. In the last decade, however, 'green' advertisements have multiplied. Gillespie attributes this to the considerable increase in public awareness of ecological issues, such as land conservation, recycling, and energy/water consumption. According to Gillespie, developers and building companies have found it beneficial to tell their potential consumers that they were ''going green'' even when they were not. The result has been labeled ''greenwash,'' defined by Gillespie as ''advertising or marketing misleading the public by stressing the supposed environmental credentials of a person, company or product when these are unsubstantiated or irrelevant''.

In Israel, more and more building projects, residential complexes, and neighborhoods are being advertised as 'green'. These ads are often accompanied by a ''green'' descriptor, as in 'Green Yavneh', or 'My home in Green Kfar-Saba, and building projects commonly have green names, such as 'EcoTower' and, 'Green Hill'.

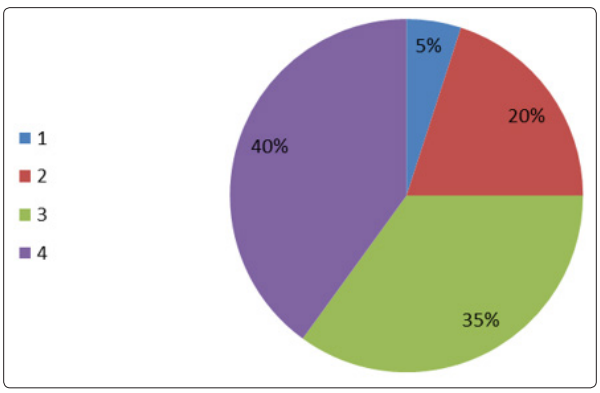
An increasing number of cities claim to be 'green' and keeping their 'green promises' (which in Hebrew denotes 'sustainable'), as advertised by the cities of Kfar Saba and Netanya. The city of Hod Ha'sharon boasts its winning the title of 'Green City'; its slogan is 'A green community town'; a building company markets the prestigious 'Avisror Heights: overseeing a breathtaking view and enjoying a lovely breeze', in 'Green Yavneh'. In these ads, cities promise cleanliness, park development, rivers, green building practices, and bicycle trails.

Meanwhile in the Negev periphery, in low socio-economic status towns like Dimona, the 'official green status' of the SI 5281 standard seems unaffordable – and requiring it could preclude project implementation. So far, only 30 households (since April 2017) have settled in the first completed Shahar neighborhood project, in two-story apartment buildings (not defined as affordable housing). In addition, 200 lots for private houses have been leased (for 250,000 NIS). The Israeli Lands Authority stated that half the lots were meant for Dimona residents and the other half for outsiders. However, according to the Demographic Growth Unit of the Dimona local council, outside buyers seldom build a house in the Shahar neighborhood, and half the lots meant for them, have been resold to Dimona residents for about 500,000 NIS on average.

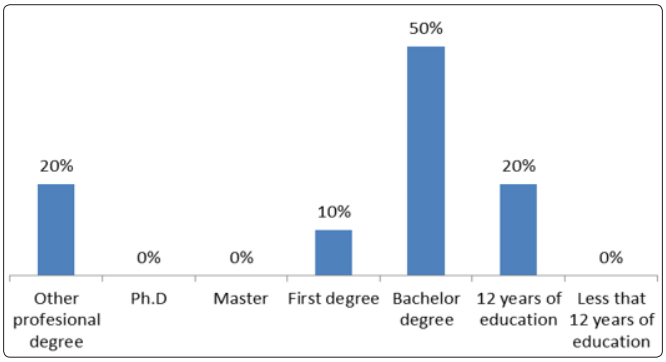
We collected socio-economic data on the current residents of the Shahar neighborhood (30 households, see Figs. 47, 48, 49).



Household size (number of residents) in the Shahar neighborhood
Source: Original survey data, 2017.



Number of children between 0-18 years per household in the Shahar neighborhood
Source: Original survey data, 2017.



Educational level in the Shahar neighborhood
Source: Original survey data, 2017.

All apartments are of 120 sq.m. (four rooms), and 100% of the respondents declared that they save no electricity or water, even though they live in the 'green' neighborhood. The main reasons for moving were getting a larger apartment (50%), living among a 'better population' (40%) and for 10% of the sample 'dwelling in a green neighborhood'. According to the Demographic Growth Unit (Personal communication, 2017), only five households (out of 200) that purchased a lot attended the 'green' building workshop organized by a professional consultant, and the main reason for this lack of interest toward 'green' building concepts was the belief that they would drive up construction costs.

Half the sample own (or have the use) of two cars, and the other half have one. At this early stage (with only 30 apartments lived in) there is no public transportation, no school and no shops, services or work places within walking distance of the neighborhood.

Comparing the Shahar residents' socio-economic data with those of Dimona overall in 2008, we can see that the former evince gentrifying characteristics: (1) In 2008, 10% of Dimona's residents had less than eight years of education, while in the Shahar neighborhood, 50% had a bachelor degree; (2) More than 50% of Dimona residents lived in apartments of less than three rooms, versus four rooms on average in the Shahar neighborhood; (3) Less than 50% of Dimona residents owned a car, while in the Shahar neighborhood all households have one; (4) Higher apartment prices: compared to another new building project in Dimona, prices are higher by 7% in the Shahar neighborhood.

Dimona's 'green' neighborhood illustrates that in Israel remote, low socio-economic localities have no certified 'green' apartments. However, the 'green' premium still exists, and the neighborhood hosts local middle-class residents seeking a housing upgrade.

In both Yavneh and Dimona, stakeholders have shown an interest in developing 'green' building and 'green' neighborhoods, to attract a wealthier population. In both cases, developments marketed as 'green' offer higher apartment prices without reducing costs (i.e. for electricity or water). While 'green' marketing is omnipresent, only in Yavneh have the developers and the municipality considered building according to the SI 5281 standard even it costs slightly more. In Dimona, while the neighborhood is marketed as meeting 'green building standards,' no apartments have been built according to recognized standards, out of fear that doing so would prevent project implementation. Meanwhile, compared to another new building project in Dimona, prices are higher by 7% in the Shahar neighborhood. At the same time, due to 'green' oriented planning, the apartments have respected the mandatory insulation standard SI 1045, an important improvement for Dimona where most construction fails to respect it.

Discussion: 'Green' neighborhoods and affordability

The 'green' neighborhood project TA 3700 is essentially directed to the middle and upper middle classes. The Tel Aviv 3700 master plan was developed over the years 2000-2015, and in the past two years, five teams of architects have been working on the detailed planning of the neighborhood's five sub-divisions. One of the aims of the overall plan was to avoid single-use zoning. In TA 3700 commercial buildings are mandatory along the main streets, and the main guidelines call for mixed uses, high density streets, public transportation development together with pedestrian and cycling paths, a pneumatic waste system, use of natural gas, and a decrease in the number of cars from 2 to 1.5 per apartment. The neighborhood maintains continuity with the city center through its traffic linkage (along Ibn Gvirol Street) and the apartment buildings will range from 2 and 15 stories tall. While the neighborhood's prime location (in northern Tel Aviv, adjoining the seafront) provided an impetus to offer affordable housing, the municipality (which has rights to the land through its partial ownership) did undertake such an effort. The units will belong to the private developer building them, who will not be charged for the land and will collect rent for 20-25 years before the apartments revert to the municipality. A total of 1,360 units will be owned by the municipality and 800 by the State. The units designated as 'affordable' housing are meant for the middle class (as the rental fee will represent 30% of the average net income in the 7th socio-economic cluster) and there are no apartments intended for lower income groups (due to the stipulation that households for whom the monthly rent of around 5,000 NIS represents more than 30% of their net income are not eligible). Rental of the apartments by a given tenant will be limited to a maximum of five years, possibly limiting the extent to which an 'affordable community' can evolve over time. While these buildings are to be submitted for 'green' certification together with the rest of the project (which may dampen their stigmatization as 'affordable housing'), they will be located in less attractive areas (e.g. along the noisy main street).

Finally, to the extent that lower income groups (clusters 6 and below) are only able to rent in the private sector, the TA 3700 initiative will not impede the larger, ongoing trend–whereby these groups are priced out of Tel Aviv.

In Israeli 'green' neighborhoods there is no policy mandate for affordable housing. In Yavneh and Dimona, "green" apartment prices are higher than those of other new buildings and the municipalities acknowledge that they targeted middle class residents. In Yavneh, both housing prices and socio-economic data show that the 'green' neighborhood does indeed serve middle and upper middle-class residents, as intended. While building according to the SI 5281 standard was possible in Yavneh, this was not the case in Dimona. It seems that in peripheral locations, where real estate prices are low, builders are unwilling to apply the standard. The new national plan for affordable housing (*Mehir La'Mishtaken*, which offers apartments 20% below market prices) is to be implemented in both 'green' neighborhoods, but only in Yavneh are the subsidized units to be built according to the SI 5281 standard.

According to a representative of the Israeli Standards Institute (ISI) in charge of the SI 5281 certification development, MK Yael Cohen Paran initiated a debate on giving up the SI 5281 standard and adopting the LEED certification instead, while identifying the main barriers to 'green' building. On the one hand, the Israeli consulting firms in charge of LEED certification claimed that SI 5281 is inefficient and unrealistic. On the other hand, the ISI and

researchers from the Technion (Israel Institute of Technology) involved in the standard's development showed that it fits better with the Israeli specificities. Following a Knesset debate in April 2017, it was decided to retain the Israeli standard (SI 5281).

Conclusion

The evidence offered above suggests that there is still a lack of housing in Israel which can be considered both green and broadly affordable, and there are no established 'green' neighborhoods that evince significant social diversity. Certified 'green' homes are essentially unavailable to lower income populations, and absent from their neighborhoods. Most 'green' apartments were built according to the 'one star' level, which means that they are not necessarily more energy efficient than those meeting the mandatory insulation standard (1045) [4].

Also, there is no official definition of a 'green' neighborhood: a municipality or developer may use the 'green' label to market a real estate project, regardless of its environmental sustainability in measurable terms. Environmentally certified homes are thus used by local authorities to attract well-to-do residents, promoting "greentrification".

We have shown in our three case studies (Tel Aviv, Yavneh and Dimona), that 'green' building is being used as a gentrification tool, to attract middle class households to previously poor neighborhoods. While in centrally located and economically strong municipalities this involves green certification, and in peripheral locations such certification is not implemented – and the term 'green' is mainly a branding tool used to attract local residents who can afford a housing upgrade. In the most attractive locations, where gentrification is already occurring with housing refurbishment, developers hardly need 'green' certification, and are attracting the well-to-do without it. In locations where apartment prices and developers' profits are relatively low, it is not profitable to comply with the standard, due to the extra administrative and monitoring fees and procedures. Thus, only in potentially 'gentrifying' locations it seems that a 'green' building standard is seen as an attractive asset for the middle class. 'Green' building is most prominently used as a gentrification tool in neighborhoods that are in well-to-do municipalities but which are not seen as attractive by themselves. At the same time, since the mandatory insulation standard (1045) is usually not respected due to a lack of enforcement, the inspection involved in the 'green' building standard does ensure compliance with the 1045 requirements and thus represents a potential improvement in practice [20].

'Green' building certification and assessment at the neighborhood scale is a new field in Israel. Two projects (one in Tel Aviv and one in Yavneh) have been planned according to the American LEED ND, and an Israeli framework for green neighborhood design ('Neighborhoods 360') has also been initiated. Since green building initiatives can make apartments even less affordable than they already were, it appears that the new green neighborhood scale assessment poses the risk of magnifying gentrification – a scenario which should be carefully considered as these initiatives are advanced [1-9].

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