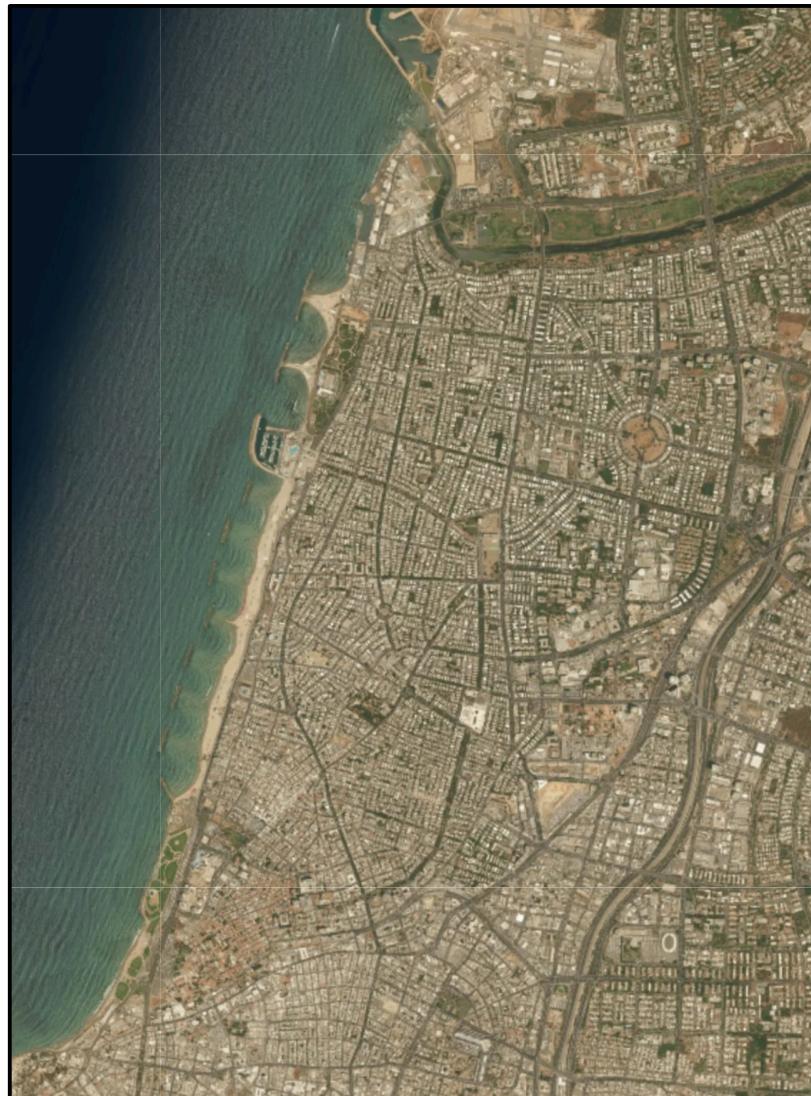


Tel-Aviv city center Rezoning Evaluation



Tel-Aviv City Center (source: Google Earth)

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Abstract

This research aims to evaluate the economic feasibility of a new incentive-based ordinance for the city center of Tel-Aviv, precinct 3, analyzed on the parcel level using GIS data. This study also assesses the future floor-area ratio (FAR) to be generated by the rezoning, as well as the number of housing units to be added across the precinct, according to the plan's anticipated utilization. The analysis showed a significant share of precinct 3 to have no economic justification for utilizing the new ordinance, leaving more than 75% of the precinct's old buildings to crumble and deteriorate, and changing the well distinguished coherency of the urban scape of the center of Tel-Aviv. This study suggests a new approach of policy evaluation for urban planning, using spatial data at the granularity level of the individual building and big data computational capabilities in order to lever planning and to assure ordinances serve and reflect their objectives.

Introduction

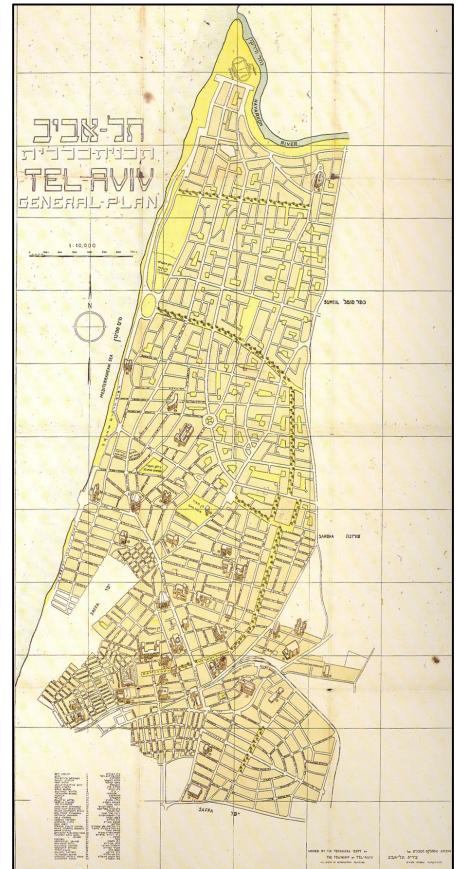
Research motivation and objective

Tel Aviv city had recently (January 2018) approved a new zoning ordinance for one of its most desirable areas, precinct no.3, also known as "*The old North*" neighborhood. Mostly built in the 1930's, precinct 3 is one of the four precincts of Tel Aviv city center (precincts 3, 4, 5 and 6) and is known with its distinguished built environment of Bauhaus buildings and "Garden City" urban landscape. The precinct also contains a meaningful part of the "White City" zone, declared a world heritage site by UNESCO at 2003. The rezoning ordinance, *Plan 3616a*, aims to upgrade non-historical buildings and to increase the housing stock of the city center, while preserving its unique urban scape qualities. In practice, the plan incentivizes developers to renew buildings by offering additional floor space. Since its first phases through approval, the plan was publicly criticized by developers, planners and residents, claiming that although allegedly increasing the supply of land, on the individual building level it is still too restrictive to economically allow its utilization. This research analyzes spatial data on the granularity of parcels in order to identify whether the additional floor area given by the new ordinance provides a strong enough incentive to assure the renewal of its buildings.

History of Tel-Aviv's zoning

"Geddes Plan" (1925) and "The White City" UNESCO declaration (2003)

The typical ‘Tel-Aviv house’ and its resulting urban scape are the products of the convergence between the plan prepared for Tel-Aviv in 1925 by Patrick Geddes, ‘Bauhaus’ architecture practice brought to Palestine by European architects, and social, economic and political realities regulating the developing city during the British Mandate [1]. Geddes Plan depicted a “Garden City” environment, that follows low density and height restrictions for buildings, particularly in the residential areas. The “typical building” was defined as of a parcel sized $560m^2$, 3-4 stories, and setbacks from the lot lines in order to generate a continuous “pace” of the buildings. In 2003, UNESCO declared the city center of Tel-Aviv, mostly built according to Geddes’s guidelines, a world heritage site. Tel-Aviv’s precincts 3 and 5 contain most of the “White City” zone. Following the declaration, a preservation plan for the city had been approved in 2008, designating about 1,000 buildings in the city center for preservation, most of them are located within the “White City”.



Geddes Plan, 1925

National Zoning Ordinance no. 38 (2005)

Being Israel located on the Syrian-African Rift, it is prone to experiencing earthquakes. National Zoning Ordinance no.38 was created to strengthen and upgrade residential buildings built before 1980, in order to increase their dwellers’ safety in case of an earthquake. The plan is incentive based; developers get additional floor area in exchange for improvements, or even larger addition of floor area for demolishing and rebuilding the building. The dwellers benefit from all of the above for free and get improved/new apartments. Municipalities specify the amount of incentives to be given, according to their local housing market demand. Since its approval in 2005, National Zoning Ordinance no.38 had become a lever for urban renewal.

Zoning Ordinance no. 3616a for Precinct 3, Tel-Aviv (2018)

“Precinct 3 Plan” is one out of four plans being prepared for Tel-Aviv city center, precincts 3, 4, 5 and 6, and the first and only one to be approved by the time this study was conducted. The new ordinance applies to residential buildings built in 1980 or before, including residential buildings with a commercial ground floor, and is not valid for preservation-designated buildings. Covering an area of 243.1 hectare, about 60% of it is within the “White City” zone area, the rezoning sets guidelines for additional allowed floor area in exchange for improvements and / or rebuilding of existing buildings, and by this aims to act as an urban renewal lever while preserving the spatial qualities and characteristics of Tel-Aviv’s urban scape. Also, the plan arranges the many overlapping historical zoning ordinance of the precinct into one, and incorporates the National Ordinance no.38 incentives and UNESCO’s requirements regarding the “White City” zone. In actual fact, the plan creates 800,000m² floor space and 8,000 housing units to be added to the precinct, predicted for 50% utilization, an addition to about 36,000 housing units exist today.

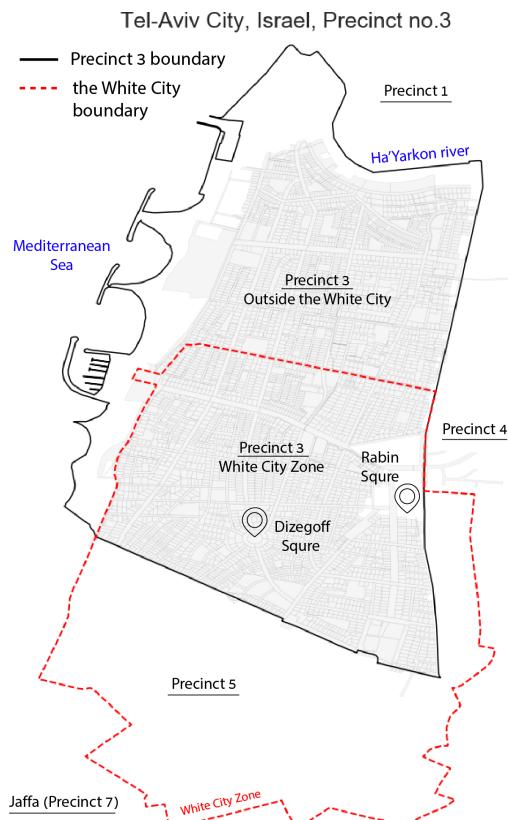


Fig.1 Precinct 3

Scope of Analysis

This study assumes an equal high demand for land for all precinct 3 area, meaning a full utilization of allowed floor area in every renewal project to be built.

The research takes into account residential buildings only, and evaluates the economic feasibility of the demolition + new construction part of ordinance 3616a, excluding building improvements and construction additions possibilities. Parcels designated for historic preservation were excluded from the analysis, being the rezoning not applied to them. Also, new buildings (built after 1980), not eligible for the new ordinance guidelines, were excluded from the analysis as well.

Being this research conducted months only after the rezoning ordinance was approved, its analysis is predictive, using existing physical parameters of the buildings and parcels of precinct 3, and assessing their future characteristics by relying on the new ordinance guidelines.

Feasibility threshold was defined as having a ratio of at most 50%-50% between existing floor area and allowed floor area according to the new ordinance, this due to the obligation of the developer to give back to the dwellers the existing floor area within the new construction. Big parcels ($750m^2$ or bigger) and small parcels ($500m^2$ or smaller) allow / require ratio of 55% in the favor of the dwellers or the developer, respectively.

Data

Data for this research were obtained through two sources:

i. [GIS Tel-Aviv](#)

The primary source of this analysis. Shapefiles containing spatial and qualitative data of the parcels and buildings in the rezoning boundaries were downloaded, as well as historic preservation designated buildings and the “White City” boundaries. Data attributes to be used were parcel ID and area (m^2), address, building footprint (m^2), number of floors and building type. Floor area and Floor-Area ratio were calculated according to these variables.

ii. [Zoning Ordinance no. 3616a documentation](#) (Hebrew content only)

Allowed and/or future built environment characteristics were calculated or assessed relying on the new zoning ordinance, considering guidelines for new constructions only. Parcels unification options were not analyzed in this study. The plan’s guidelines and limitations were arranged in Table.1:

Tel-Aviv City // Precinct no. 3 rezoning (plan no. 3616a)											
Sub-area	commercial street?	lot size (m^2)	allowed								
			front	side	back	footprint	#floors	FA	FAR	density coefficient	#units
Outside the "White City" boundaries	Yes		(4-6)	2.5	4.5	N/A	7.65	footprint * #floors	FA / lot size	65	FA / density
	No		4	2.5	4.5	N/A	6.65	footprint * #floors	FA / lot size	80	FA / density
Within the "White City" boundaries	Yes		4	2.5	4.5	N/A	6.65	footprint * #floors	FA / lot size	65	FA / density
	No	500 <=	4	3	5	N/A	6.65	footprint * #floors	FA / lot size	80	FA / density
		< 500	4	2.5	4.5	N/A	5.65	footprint * #floors	FA / lot size	80	FA / density
I/O	Yes/No	≥ 750	(5-6)	3*	5*	55%	**	footprint * #floors	FA / lot size	65 / 80	FA / density

Table.1 Precinct 3 rezoning guidelines. The ordinance differentiates between parcels within the White City zone and outside of it, allowing one additional story outside the historical site (0.65 story is due to additional setbacks required for the highest floor). Setbacks from parcel's boundaries (front, side, and back) determine the allowed footprint and are more rigidly limited for very small parcels ($<500m^2$) inside the White City zone. For parcels of $750m^2$ or more, the footprint is limited to 55% within the setbacks. Also, density coefficient, a proxy for the average size of unit and according to which the number of housing units allowed in a parcel is calculated, is smaller in commercial streets than in non-commercial ones, allowing more and smaller units in main roads.

Methodology

The entire analysis and the code used to generate it are available in an iPython notebook, shared on GitHub:

https://github.com/danachermesh/Tel-Aviv_RezoningFeasibility/blob/master/Tel-Aviv_RezoningEvaluation.ipynb.

1. Data Cleaning and Munging

First, parcels and buildings shapefiles were spatially joined in order to assign buildings to parcels, divided to parcels within the White City Zone and outside of it, for the further calculations. About 60% of precinct 3 parcels are in the White City Zone. Historic preservation designated buildings' shapefile was joined in order to drop them from the analysis. Then, buildings of types 'public use buildings' and 'under construction' were excluded, as well as buildings with more than 4 stories or less than 3 stories, assuming the formers to be new buildings and the latter to be temporal / other special, non-residential building type, both not eligible for the rezoning. Finally, due to different guidelines to commercial streets by the new ordinance, parcels located in these streets were separated to different datasets. Overall, 2,161 parcels were found valid for this analysis, about half of the precinct's parcels.

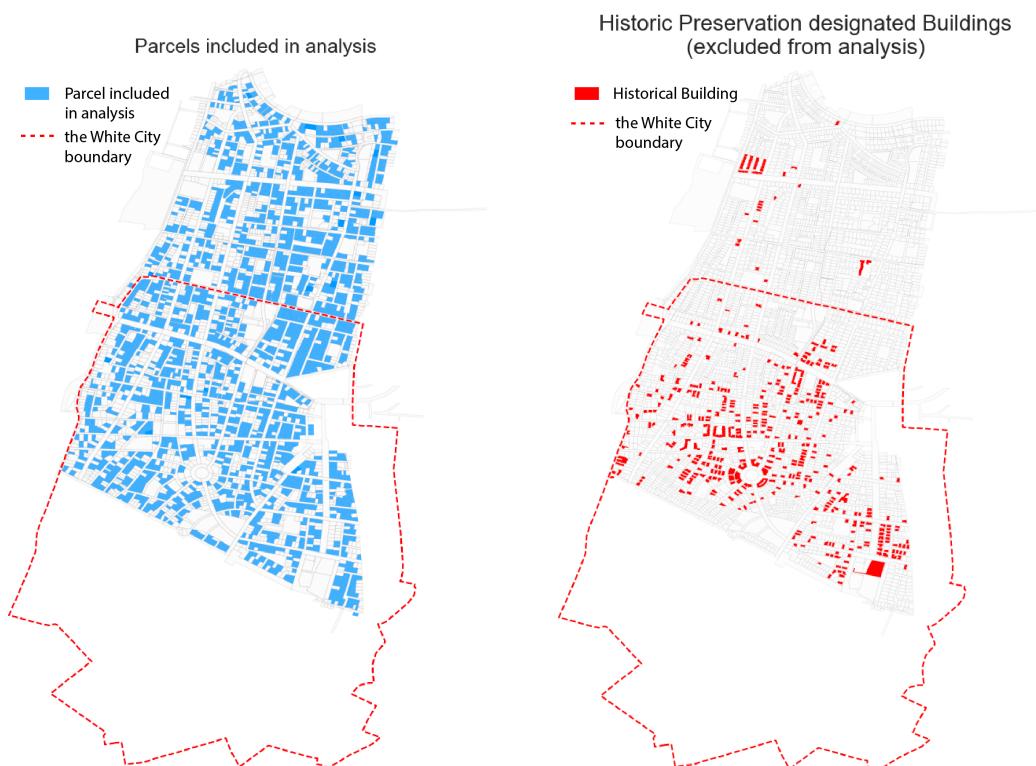


Fig.2 (left): 2,161 Potential to renewal parcels according to rezoning ordinance, 1,307 (~60%) within the White City zone and 856 buildings outside its boundaries.

Fig.3 (right): buildings designated for historic preservation, excluded from the analysis. 17% of the precinct's buildings within the White Zone and 3% of buildings outside of it.

2. Current built environment

Floor area was calculated by multiplying building's footprint by its number of floors. *Floor-Area ratio* (FAR) was then calculated, dividing the floor area by the parcel's area. The number of *existing housing units* was calculated by assuming 4 units per story, an assumption based on the typical Tel-Aviv-building's shape and content. *Density coefficient* of 65 and 80 was assigned to commercial and non-commercial streets respectively, according to the ordinance.

3. Future built environment

The assumption is that being precinct 3 a highly desired area in the city, a full utilization of allowed floor area is expected for each building to be built.

According to the rezoning ordinance no. 3616a, calculations were conducted to assess future built area (see Table.1). The allowed number of floors is based on whether the parcel is within or outside the "White City" zone, whether it is located in commercial street, and for the "White City" zone, whether its area is larger or smaller than 500m². As regards to *allowed footprint*, the required setbacks from the parcel's boundaries usually outcome with footprint ranged between 42%-56% of the parcel's area, appearing almost random. Thus, for this analysis, footprints percentages of parcels smaller than 750m² were randomly chosen between this range. The maximum of 55% footprint of the parcel's area was assigned to parcels larger than 750m². Allowed footprint results were multiplied by the allowed number of floors to define *allowed Floor Area* for each parcel. *Allowed FAR* was finally calculated as well. *Allowed housing units* were assessed by dividing the *new floor area* by the *density coefficient*, then subtracting 4 units, due to the obligated givebacks to the dwellers.

4. Feasibility

Economic feasibility threshold was defined as being the current floor area 50% or less than the allowed floor area, considering the givebacks of the current floor space to the dwellers. This rule-of-thumb also takes into account costs of demolition, licensing's costs, construction costs and housing costs for the temporally evacuated dwellers, as well as the higher value of land for the additional, newly built floor area. Exceptions to this threshold are big parcels (defined as parcel area equals 750m² or bigger) and small parcels (500m² or smaller), allowing / requiring ratio of 55% in the favor of the dwellers or the developer, respectively. The ratio of the current and allowed floor area for each parcel was calculated, then assigned to a binary outcome of 1=*feasible* or 0=*not feasible* according to the feasibility threshold.

Results

The majority of the buildings in precinct 3 are currently built with FAR ranged between 1.3-2, generating the continuous, coherent urban landscape of Tel-Aviv, as can be seen in Fig.4. The frequency distribution of the current FAR across the precinct, within and outside the “White City” zone, is shown in Fig.5, revealing no significant difference between the FAR distribution within the “White City” zone and outside of it:

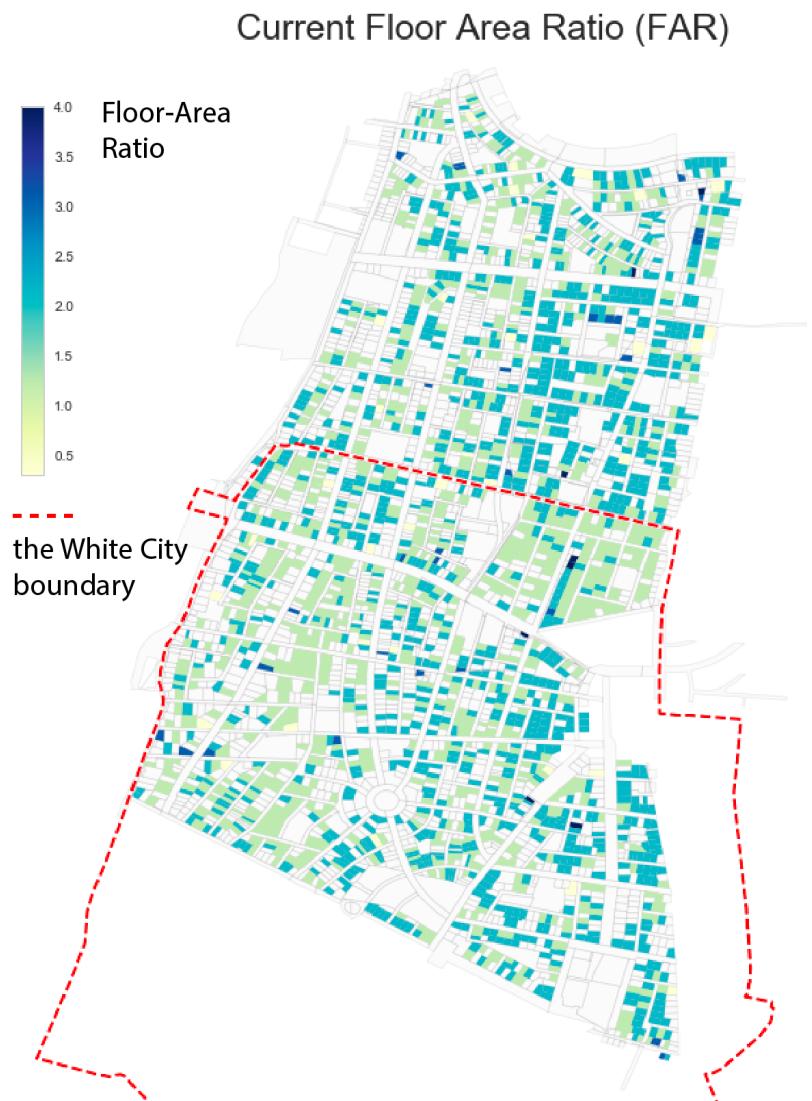


Fig.4 Current FAR precinct 3 >>

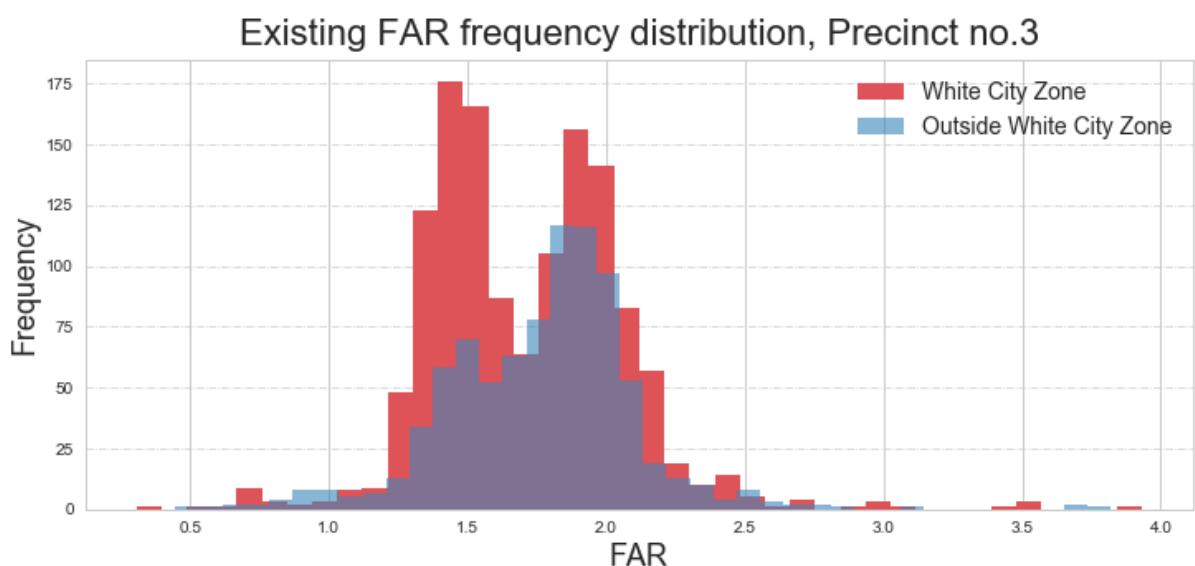


Fig.5 Frequency distribution of current FAR, precinct 3; Within and outside the “White City”.

Fig.6 and Fig.7 are a map and a frequency distribution of allowed FAR, assuming full utilization of the rezoning ordinance to all eligible parcels. A dramatic change of the well-distinguished, unique urban landscape of the precinct towards wider distribution of FAR across the precinct is shown, mostly noticeable between the “White City” Zone and outside of it.

Allowed Floor Area Ratio (FAR) according to Precinct no.3 rezoning

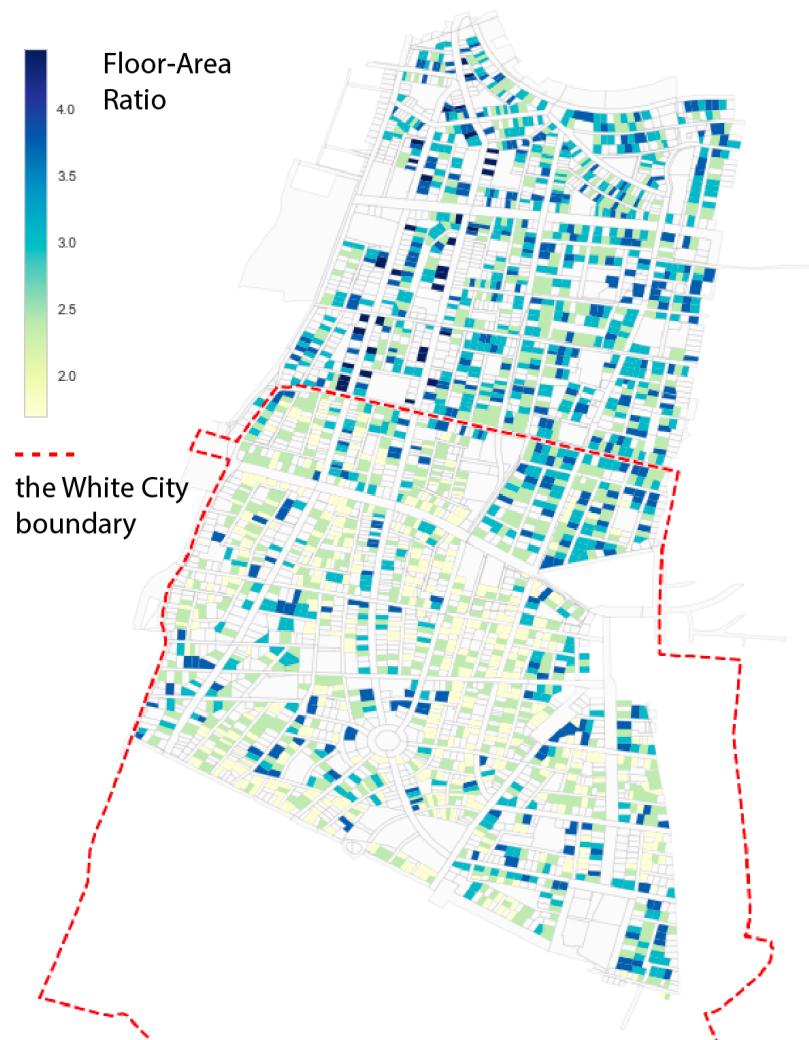


Fig.6 Allowed FAR, rezoning fully utilized across the precinct. The northern part, outside the “White City” zone, gains significantly higher FAR >>

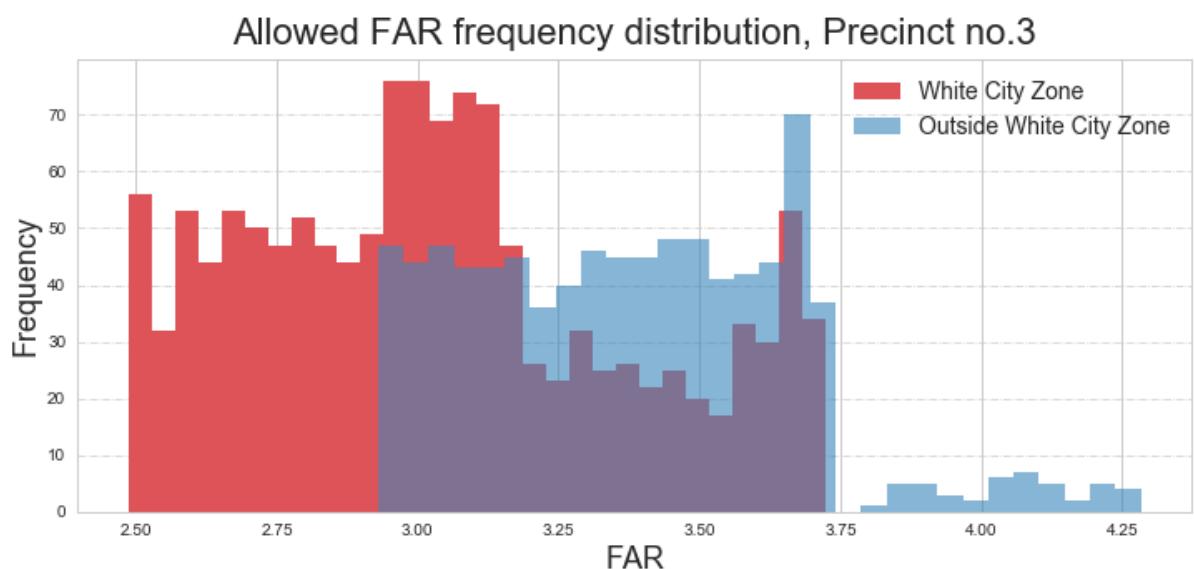


Fig.7 Frequency distribution of allowed FAR, if rezoning fully utilized across the precinct; FAR outside the “White City” zone (blue) show higher results, while the “White City” zone (red) stays relatively closer to current FAR’s. Overall, FAR distribution is widening.

The feasibility results were staggering; according to the assumptions led this analysis, **only 521 parcels** (out of 2161 parcels analyzed, a share of **24%**) were found profitable enough to utilize the new ordinance. The feasible and not feasible parcels are shown in Fig.8:

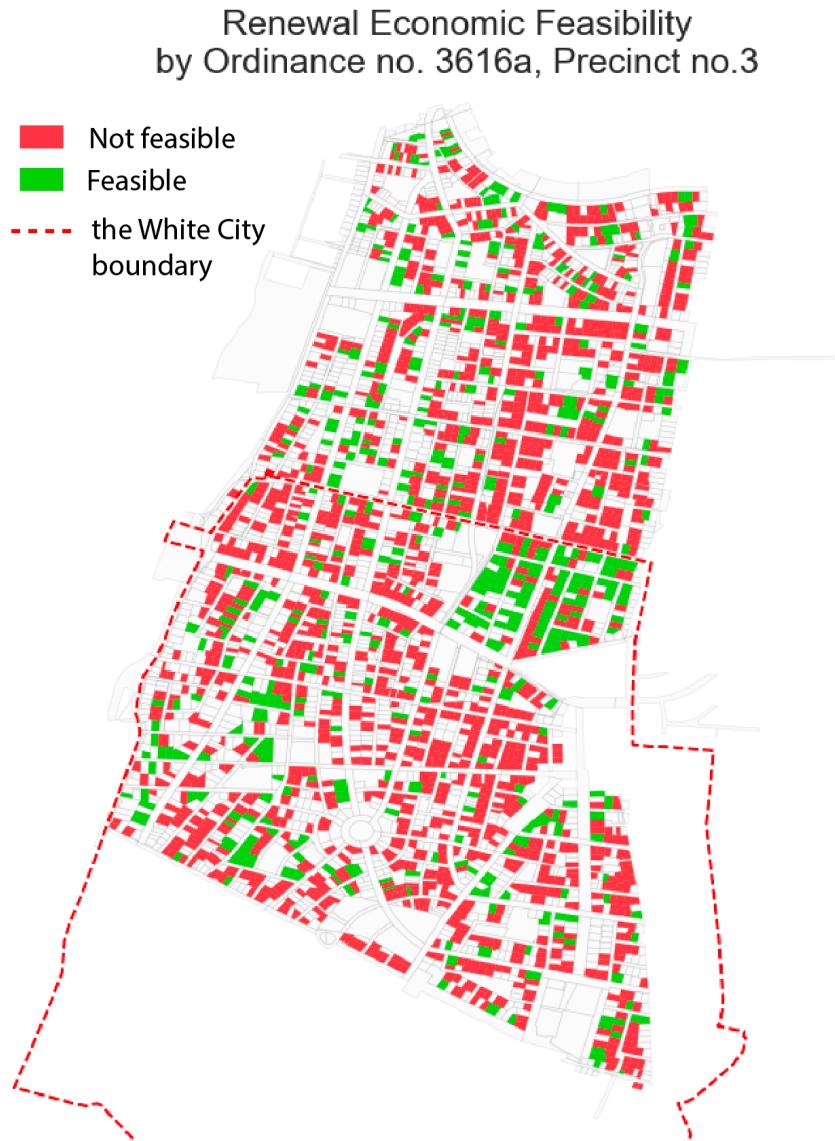


Fig.8 Economic Feasibility for renewal by the new zoning ordinance. 1640 (76%) parcels were found to be not feasible (red color). Only 521 parcels (24%) were found feasible enough for utilizing their rezoning possibilities (green color).

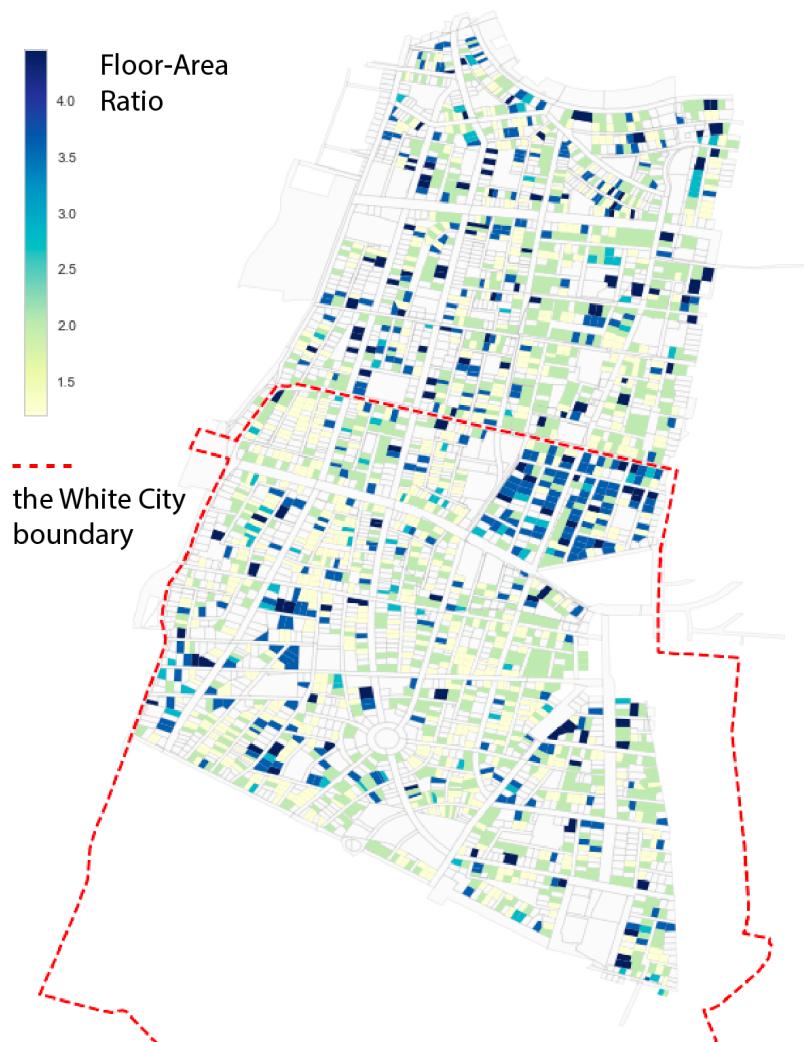
Considering the 471 parcels in the precinct that are designated for historic preservation and thus not eligible for the new plan, it appears that the rezoning, although aims to generate additional floor area, leaves **about 80% of the precinct's buildings** to deteriorate and crumble. Fig.9 maps the anticipated FAR according to the feasibility results, meaning plotting the *allowed FAR* for parcels that were found *feasible*, and the *current FAR* for parcels that were found *not feasible* for the rezoning utilization. Fig.10 shows the frequency distribution of the anticipated FAR across the precinct, following the same methodology.

Fig.9 Anticipated FAR according to feasibility results. 521 parcels (24%) assumed to be renewed thus show their allowed FAR guided by the rezoning ordinance, while the rest 76% show their current FAR.

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Neither the map nor the histogram follow any common sense of urban structure. The anticipated urban realm according to the new ordinance, considering feasibility threshold for a project to be conducted, is a mixture of many old and relatively small amount of new buildings, non-coherent and completely different than today's urban scape of Tel-Aviv city center. According to these results, 3,390 housing units are anticipated to be added to the precinct, 15% less than the plan's prediction of 4,000 units.

Predicted FAR according to Feasibility



Predicted FAR frequency distribution according to Feasibility, Precinct no.3

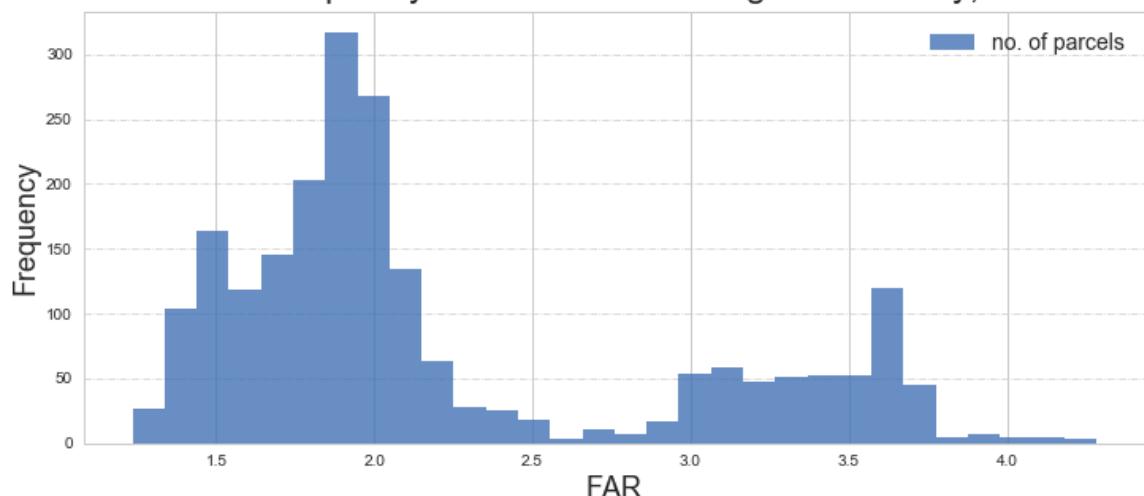


Fig.10 Frequency distribution of anticipated FAR, rezoning utilized only for parcels that were found feasible according to the new ordinance.

Discussion and Implications

This study evaluated the rezoning ordinance of precinct 3 of Tel-Aviv city center by assessing its economic feasibility per parcel and depicting the future built environment to be generated according to its anticipated utilization. The analysis showed a significant share of more than 75% of precinct 3 to have no economic justification for utilizing the new ordinance, practically meaning leaving this meaningful precinct to deteriorate. 3,390 housing units are predicted to be added thanks to the rezoning, 40% of its allowance and 15% less than its declared goal of 4,000 units. Also, it was shown that if fully utilized, the urban scape of Tel-Aviv city center will change dramatically towards an opposite-gradient of densities, keeping lower FAR in the “White City” zone (close to the city center), and generating higher FAR outside of it.

These results raise questions regarding the objectives of the new ordinance and whether the plan actually directs the city and its urban realm towards them. Will the plan’s guidelines truly preserve the quality of the landscape of the city center of Tel-Aviv? And is the plan a real lever for urban renewal, considering its incentives are profitable enough for utilization of only less than a quarter of the precinct’s buildings? These two questions, leading and motivating this study, should inform the local planners and make them reassess this plan and the future ordinances that are under different planning phases these days in Tel-Aviv. Also, this research should raise a discourse regarding master plans and policy analysis, and the way big data tools and techniques can be applied to urban planning, leveraging it by allowing qualitative and granular spatial analysis.

Future Research

In order to address the problem of its feasibility, ordinance no. 3616a allows an optional *parcels unification* of two small parcels ($500m^2$ or less), using their shared side-face to build one building on both lots to create a higher footprint for each of them. This possibility makes the new ordinance as a whole more feasible. A future research is needed in order to assess what share of the parcels is anticipated to be redeveloped considering this possibility.

Moreover, a similar zoning is about to be approved for precinct 4 (“*The new North*” neighborhood, eastern to precinct 3), giving much higher incentives mainly due to the fact that precinct 4 does not contain the “White City” zone. This plan is considered very profitable. Having these two-adjacent precincts a similar, continuous urban scape today, it will be interesting to assess the future urban scape the different ordinances would actually generate, considering their economic feasibility and anticipated utilization.

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