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Geodesigning Our Future

Urban Development Dynamics in Israel

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Editor

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Chapter 1
Introduction

Shlomit Flint Ashery

Abstract Due to mounting social and environmental pressures, the demand for efficient and secure urban and rural land uses has noticeably increased (Ewert et al. in Sustainability 12:8098, 2020). Thus, planners and policymakers are called upon to work with diverse policy and management structures, as well as NGOs, private business actors, issue-oriented interest groups, locally based citizen groups and ordinary citizens. They must also confront shifting and sometimes conflicting territorial interests within the national, regional or local context (Milanovic in Global inequality: a new approach for the age of globalization. Harvard University Press, 2016). Many times, decision-makers tend to focus on specific issues, e.g. climate forecasts, overlooking the mutually entangled socio-economic and political effects (Tollefson in Nature, 2022). It is becoming clear that there are no "one-size-fits-all solutions" for regions and cities because of the very specific local conditions (location, population density, financial and human resources, and stakeholder interests). Moreover, scientists and decision-makers need to support the communities' autonomy, since the effectiveness of the planning strategy depends on community participation (Pisor et al. in Nat Clim Change 12(3):213–215, 2022). Therefore, regional and local communities must have the ability to understand the local impacts of candidate solutions and modify them as needed (Flint Ashery and Steinlauf-Millo in Urban informatics and future cities. Springer, 2021; Flint Ashery and Steinlauf-Millo in Micro-segregated cities. An international comparison of segregation in dense cities. Springer-Verlag Berlin Heidelberg, 2022), while developing their own vision for their future. In terms of hierarchical planning systems and decision-making processes, these policy and management structures can be broadly classified into the "top-down" planning approach, whereas NGOs, private business actors, issue-oriented interest groups, locality-based citizens groups and ordinary citizens constitute the "bottom-up" approach, although these distinctions are often not absolute. In both instances, the stakeholders must negotiate since consensus is crucial to the long-term resiliency of the decision-making process. This book, therefore, brings together researchers across various fields to explore scenario-driven designs and resolve negotiations across different locations.

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Keywords Social and environmental pressures · Urban and rural land uses · Interest groups · Communities autonomy · Future planning · Geodesign · Spatial negotiation

1.1 Introduction

In the last few decades, there has been exponential growth and interest in scenario-driven geodesign, a sustainable planning approach rooted in the history of planning practice (Steinitz 2012; Geertman 2017; Pettit et al. 2020). It provides a framework and set of tools for exploring issues from a transdisciplinary perspective and for resolving conflicts between differing points of view and has led to the development of several commercial and open-source software tools, including GDH. GDH is a digital web-based workflow based on a systems approach. It is designed to foster collaboration and negotiation among professionals and their clients and among teams of professionals. It has a simple user interface which uses ubiquitous web technology and communication systems. It easily incorporates existing and diverse data structures for both its inputs and outputs, and it enables users to collaborate in person and/or over the Internet in real time to produce designs and assess them. Since planning is inherently future-oriented in its application, the implementation and clout of a coherent and cohesive digital planning process may be able to provide the needed mitigation and adaptation measures. GDH can act as the basis for proactive processes through the minimization of response time between crisis and reaction. It provides interactive and engaging methods for wide categories of stakeholders and can consume open-data standards (adopted by Open Geospatial Consortium (OGC) and are consistent with the EU INSPIRE Directive). It requires territory assessment, transparency of decision, generation of alternatives, consultations and participation, among other requirements. The software enables teams to create and share their activities and the unique method walks them through a process where a consensus on the way forward is built. It is often used as a mediation tool to resolve difficult differences between stakeholders. Generally, this type of work is done manually and is extremely time-consuming and needs many meetings and deliberations along with technical analysis work.

Studies have shown that integrating newer negotiation mechanisms into an existing decision-making system (Asad and Le Dantec 2019) needs to be fluid and engaging while at the same time fitting the slower pace of administrative mechanisms used by decision-makers (Wilson et al. 2019). Despite the opportunities for negotiation designed for planning, most digital platforms mirror traditional "one-way provision of information" methods. Geodesign, however, uses modern digital tools facilitating a bottom-up negotiation approach to help ensure the inclusiveness and equality of stakeholders. The focus of the presented studies is on effective outreach and uptake, providing data and comparing processes, and seeking possible solutions

that can be implemented. The aim is to enhance the way digital technologies modulate local planning in a range of scales to improve transparency in decision-making (Campagna 2020), and promote the equitable sharing of burdens and benefits.

Negotiation is one of the most important methods for breaking down barriers between conflicting interests and can be crucial in cases where resources are limited and political and social conflict is intense (Flint Ashery and Steinitz 2022). Resilient solutions are defined as those for which there is the greatest compromise and agreement among the parties (Smith et al. 2014). Negotiations are routinely utilized in decision-making. However, negotiations and their outcomes tend to reflect the existing power structures present in an area. The introduction of new digital technology and techniques to the negotiation process may help achieve more viable outcomes and are particularly critical in the context of the intense social, environmental and economic change facing our cities and regions. As funding for public services comes under increased pressure, negotiations over spatial interests must be done strategically to enable authorities to "do more with less." Nevertheless, to make a realistic judgement of planning effectiveness (Hopkins 2001; Alexander 2016), there is also a need to assess potential areas of agreement or conflict among stakeholders and to seek areas of possible collaboration. Many implementation experiments have signalled that the weakest point of stakeholders' involvement is their lack of interest and representativeness (Sigalov-Klein et al. 2024). This is characteristic of top-down planning approaches (Flint Ashery 2023). There is thus a need to develop the foundational structures within a society for digital technology to be in a position to contribute to the social processes of planning.

Digital negotiation in planning has the potential to build lasting trust between residents and authorities over land uses in a process that reduces conflicts and irregularities. Further, evidence and consensus-based policymaking lead to more efficient, flexible, and tailored-made allocation of resources in municipalities to support the residents. The overall aim of this book is to share knowledge on the use of digital technology of GDH in land-use planning, policy, and implementation with a wide range of concerned stakeholders. The work on these studies brought "the people of the place" (e.g. residents, teachers, and parents incl. "unheard voices"), academics, practitioners (e.g. planners, architects, appraisers), NGOs (e.g. environmentalists), public representatives working in municipalities, policymakers and digital technologies' experts together within our workshops to make decisions for a better future. Although these academic and practical fields are highly interrelated, they have never been brought together to explore scenario-driven designs for regional and local-scale studies that address future global changes locally in the ever-changing landscape.

This book is based on geodesign workshops conducted for Jerusalem's neighbourhoods of Beit Tzafafa (the Israeli and the Jordanian parts), Talpiot, Talpaz, Ezrat Torah, Ramat Shlomo and Neve Shaanan neighbourhoods in Tel Aviv. These neighbourhoods represent different urban circumstances and house different populations: In Jerusalem, Beit Tzafafa, Talpiot and Ezrat Torah are inner-city neighbourhoods located within the 1948 border. While Beit Tzafafa is a Jerusalem enclave home to a Muslim population representative of three tribes, Talpiot is home to a general

population, and Ezrat Torah has a broad range of ultra-Orthodox communities. Alternatively, the Jordanian Beit Tzafafa, Talpaz and Ramat Shlomo are peripheral neighbourhoods. While the Jordanian Beit Tzafafa is home to a rural Muslim population, Talpaz is home to a relatively poor general population, and Ramat Shlomo was built and populated by a strict ultra-orthodox population in one fell swoop during the mid-1990s by the government. Tel Aviv's Neve Shaanan neighbourhood, however, serves as the "first port" for foreign workers. Accelerated gentrification processes are creating severe tensions between the veterans of the neighbourhood, the foreign workers, some of whom are undocumented, and the incoming young professionals.

As cross-learning and assessment are essential, the first part of the book deals with the digital potential of collaborative planning. Ora Bloom uses a case study of an urban renewal initiative that addressed safety concerns caused by structural defects in their buildings as an example of the complexity involved in managing a multiplayer system. Ayelet Sapir and Eyal Yaniv discuss how citizen engagement contributes to a neighbourhood's quality of life and well-being, and highlights how mediation constructs may facilitate such engagement. The second part of the book examines the role of geodesign in capturing and fostering comprehensive, inclusive, efficient and responsible planning processes that consider the impact of climate change on the urban fabric. Rinat Steinlauf-Millo presents the geodesign planning for Neve-Sha'anan, a dense urban fabric which, due to institutional, planning and socio-economic factors, has developed into a complex and neglected neighbourhood that suffers air pollution and flooding. Mariana Sigalov-Klein and Michael Sofer examine how citizen science can be used in planning future for Beit Tzafafa, to integrate knowledge sources and increase minority participation in a directed, digital process that leads to holistic planning. The third part proposes geodesign processes for addressing the broader context of urban life and future planning. Michelle Specktor provides a practical introduction to geodesign implications for leveraging urban developments and supporting sustainable urban mobility plans. Miri Jano Reiss and Anat Tchetchik examine whether and how digital planning practices can be implemented to promote walkability in a hilly neighbourhood of Talpaz, despite the challenging physical circumstances. Using geospatial analyses, Joel Roskin and Rotem Elinson analyse the natural environment's impact on Bet Safafa settlement and interpret how physical and archaeological factors played a role in the development of residential and agricultural areas. Laura Riegle, however, focuses on the adaptive reuse of building complexes to provide occupants with access to the outdoors, fresh food and social interaction while reducing carbon emissions. The fourth part examines the reflection of ideal concepts in the geodesign planning process. Dinur and Flint explore the relationship between joy and the peri-urban spatial structure and illustrate the impact of relationships between the object and the subject—between the therapist and the patient, planners and plans, as well as between individual users and the urban fabric. Yossi Katz and Flint examine how the Levitical city beauty ideal has been incorporated into the planning of the modern neighbourhood of Talpiot, Jerusalem, based on two geodesign workshops regarding green infrastructure and agriculture.

I hope that this book will promote comparative testing of spatial negotiation in different contexts considering inclusiveness, level of participation, number and

quality of outcomes and long-term impact. In bringing these materials to print, I have the great pleasure of thanking my dear colleague and friend, Dr. Hrishi Ballal, the founder and lead developer of Geodesign Hub, as most of the illustrations were created with GDH software. I would like to thank Prof. Mike Batty, my postdoc supervisor at CASA UCL, as well as Prof. Carl Steinitz for introducing me to the world of Geodesign, and the contributors to this book who shared the world of geodesign with me.

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Part I
Planning Between Collective Action and Public Engagement

Chapter 2
Collective Action in Urban Renewal Projects

Ora Bloom

Abstract Urban renewal initiatives require the involvement of various parties with differing interests, and their success is dependent on the management processes of the overall stakeholder system, as well as collaboration between the parties involved. The stakeholder system is constantly evolving, and the objectives and roles of the actors may change over time. To promote consent and decision-making, effective action strategies require the dissemination of knowledge to homeowners and other relevant stakeholders. The collective knowledge of all parties involved is crucial to the success of the project. There are various methods of knowledge transfer available. Several companies in Israel and around the word have developed technological platforms to facilitate urban renewal processes and promote knowledge sharing among stakeholders. Their objective is to redefine the relationships between the parties involved and enhance the flow of information. The chapter highlights the complexity of managing the multiplayer system involved in urban renewal projects and presents a case study of a large-scale urban renewal initiative in a disadvantaged neighborhood of Tel Aviv-Jaffa. The project was initiated by the Clinic for Housing Rights and Urban Renewal at the Faculty of Law, Tel Aviv University—an academic-professional body, with a social and pedagogical vision, that sought to give legal assistance to residents in the neighborhood, addressing safety issues caused by structural defects in their buildings.

Keywords Public participation · Urban renewal · Collective action · Nonprofit organizations · For-profit corporations · Internalization of social values · Decision making apparatus · Development companies · Vacate-and-build project · Knowledge sharing · Multi-stakeholder system

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2.1 Introduction

Urban renewal projects represent complex human processes, as their implementation is contingent on a series of decisions made jointly between many stakeholders with varied interests, as well as broad consent among affected homeowners. In order to motivate all players toward collective action that ultimately leads to construction, development companies that are usually spearhead urban renewal projects are required to adopt work practices that differ from routine business conduct. While in most cases planning and construction of new buildings and neighborhoods does not require that developers interact with local property owners, urban renewal projects require them to maintain close contact with the homeowners for significant timespans, even several years.[1] The relationship between the developers and the pre-existing apartment owners is one of interdependency: On one hand, developers require broad consent commitment to the project from affected owners. On the other hand, the homeowners seek the best possible deal in terms of how the redevelopments will improve their property to cater to their needs and interest (floorspace, amenities, etc.). This delicate balance of interdependence requires the developers to establish trust relations with the homeowners and to be attentive to the needs of the local population. They must adopt practices that are usually foreign to their corporate identity, and with which their personnel are unfamiliar and therefore generally lack the skills for optimal management of these projects. Another challenge facing the developers is consideration of the future owners of the housing units added through the project; this new population often has a different profile from the pre-existing population, with different needs and aspirations. The larger the urban renewal project, the more complex the interaction among stakeholders becomes. As the population involved becomes more diverse and the number of stakeholders grows, the decision-making and agreement mechanisms become more cumbersome and fragile.

In this chapter, I will first discuss how development companies involved in urban renewal projects are evolving their corporate identities, the challenges involved in spurring stakeholders to collective action, and the various ways in which developers gain the consent of property owners to allow the project to go ahead. In the second part, I will present a unique case study: a large urban renewal project in a disadvantaged neighborhood of Tel Aviv-Jaffa, which was initiated by an academic body within Tel Aviv University. I will describe how it emerged and the special circumstances that led to its progress. Although the project spanned many years, in this chapter I will focus only on the first stage, which included assembling a stakeholder system in an attempt to spur collective action.

[1] Urban renewal usually involves renovation redevelopment of multiowner apartment buildings. In this chapter, the terms owners, apartment owners, and homeowners all refer to the owners of apartments in such buildings.

2.2 Commercial Corporations as Social, Human, and Public Bodies

Development companies that lead urban renewal processes communicate daily with the owners of properties within the building or complex designated for renewal, first and foremost to obtain their consent to proceed with the project. In order to avoid objections from property owners, they must develop their competency in listening, building trust, and understanding delicate emotional situations. In addition, they must evolve a social perspective that identifies the needs and preferences of homeowners. In other words, their involvement in these projects requires them to acquire new skills and work patterns, and to embed social considerations into the corporation's decision-making apparatus. The need for corporations to commit to social values is not enshrined in state laws or in contractual agreements; thus, this commitment is not intuitively understood.

Rebecca De Winter asserts that corporations' internalization of social values can be explained by two parallel processes: In one process, the corporation attempts to brand itself by creating imagery that portrays its operations as having human, social, and moral traits. In this way, it creates a new identity that is disseminated in such a way as to gradually permeate the public consciousness. The second process, which takes place in parallel, is a gradual formation of a new internal corporate identity, created by the internalization of the social image that has been presented outwardly. When a corporation manages to brand its external identity through social and human images, it becomes more exposed to public criticism of its conduct in relation to the actual implementation of the social images it has adopted. Thus, the corporation produces a kind of "rhetorical trap" that has an impact on its internal organizational identity and decision-making apparatus.[2]

When a corporation is required to justify certain actions that it takes, its actions are examined according to public standards; every action is judged as either legitimate or illegitimate. The corporation's involvement in these justifications challenges the dichotomous division between the standards that are generally used in the private market and those that are expected from parties who operate for and on behalf of the public. When a corporation seeks to justify its actions in the language of social values, it reframes itself as a "collective moral" player, which places it in a new sphere in which the boundaries between the private and public spaces are blurred. The corporate identity that results from this blurring of boundaries makes it impossible to continue to define the corporation as an economic institution whose only purpose is to maximize profits.[3]

Peter French contends that the moral features of a corporation should be examined through observing its decision-making structure. This structure has two components: One is the organizational structure, which defines the power relations among

[2] De Winter (2001, pp. 108, 111).

[3] Ibid., at p. 110. This form of rhetoric aligns well with the increasing trend of State transfer of its traditional powers and functions to commercial corporations, which are supposed to provide market-based social welfare solutions, subject to State regulation. Ibid. on p. 112.

the different individuals that make up the corporation; the second component is the "corporation policy," which reflects the agreed-upon tenets inherent to the decision-making apparatus.[4] When this apparatus is activated appropriately, the internal decision-making structure results in a synthesis of the various intentions and actions of the individuals that make up the corporation. This synthesis creates a rational and coherent template and enables actions and events that could present as the actions of individuals to be attributed to the corporation as an abstract entity.[5] Thus, the corporations themselves, and not only their individual employees, must account for their actions, in their capacity as moral entities.[6]

The expectation that corporations serve social goals in urban renewal projects, therefore, obliges them to reconstruct their decision-making apparatus. This apparatus is influenced by external requirements that are publicly dictated and imposes new modes of conduct on real estate corporations involved in such projects. In other words, the "rhetorical trap" that is defined by a corporation's external identity in the public conception, requires it to gradually internalize new characteristics that are likely to clash with the traditional purpose of maximizing profits.

2.3 Collective Action

Urban renewal projects require collective action among several players that are interdependent. The conduct of each of the players may influence the success or failure of the project. In theory, all players involved in these projects have a common goal, but the interests of each are likely different. When the interests do not overlap, even initiatives that are considered to be "win–win" may fail. Therefore, the success of urban renewal projects depends on the management processes of the overall stakeholder system, together with cooperation among the various players. An example of this is the collective action in the ultra-Orthodox inner-city neighborhood of Ezrat Torah. The neighborhood was initially structured for the general population, but the settlement of ultra-Orthodox communities created group pressure to shape its space to meet their needs (Fig. 2.1).[7]

The stakeholder system of a given project is dynamic, and any of its actors may change their objectives or roles along the way. The coalescence of various players writes Michel Callon, indicates a dynamic and volatile process, rather than one that is complete and stable. Any entity that has been earmarked as a relevant player may commit to its defined function and participate in the overarching plan, or alternatively, may resist the plan—by defining its identity, goals, or interests differently from those it was assigned. Therefore, the lead actor who drives the system has the important task of maintaining the actors within their assigned roles. Callon maintains

[4] French (1979, p. 207).

[5] Ibid. at pp. 211, 213.

[6] Ibid. at p. 215.

[7] Flint Ashery (2020)

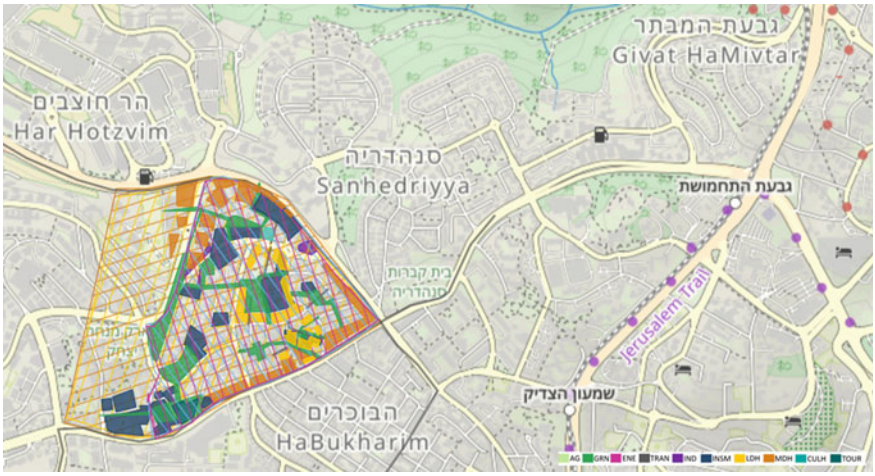

Fig. 2.1 Agreed product in the geodesign workshop with the participation of planners and residents. Cooperation among the various players led to consensus collective action despite the differences in interests

that the definition of roles, objectives, and motivations are not processes that occur independent of the actors' environments, but rather occur as a result of interaction with other actors. Therefore, in order to preserve stakeholders in a particular role, the lead actor is required to guide the relationships they manage—to bring about "desirable" connections and oversee their management, and to ensure that undesirable connections—which may divert the process from its path—are severed.[8]

2.3.1 The Actors

In addition to the developers and homeowners that are the lead actors, the stakeholder system in urban renewal projects also includes public bodies such as planning institutions, local authorities, the urban renewal administration,[9] and professionals such as lawyers, architects, appraisers, engineers, and supervisors. Relatively new players in the Israeli landscape are social consultants and community organizers. The role of social consultants is to collect information about the local population and formulate

[8] Callon (1986).

[9] The Israeli urban renewal administrations were established in 2016 through the Governmental Authority for Urban Renewal Law 2016. The administrations have been operating within the local authorities since 2016. The duties of the administrations include making accessible and publishing information and promotional materials to residents, developers, and professionals, including through conferences; providing assistance to apartment owners in selecting a representative of their interests; providing assistance to the owners in applying to developers and determining their parameters for choosing a developer.

recommendations to be submitted to the local planning committee, within a social survey report, which presents vital information about the local population—their needs and residential environment. The role of the community organizers is to attain the apartment owners' consent to carry out the project—initially, through the signing of an in-principle agreement.

Some of these mentioned actors are in direct contact with the apartment owners over the course of the project. As such, their conduct and methods will affect the process of attaining the latter's consent, and ultimately, the efficiency of the decision-making process. For example, if the project architects present a plan that is out-of-touch with the needs of the local population, the homeowners will likely have reservations that will delay them giving consent, and these reservations might even thwart the project. Similarly, attorneys who ignore the concerns of apartment owners, and do not give a detailed explanation of the terms of the contract, will likely create resistance among the owners and delay or prevent the project's progression.

Thus, urban renewal projects create a delicate balance that requires actors from different commercial fields to develop unique practices that are outside the realm of their regular business activities. Each of these actors has an effect (to varying degrees) on the implementation of the project, and each plays a role in a broad cooperative system that is intended to lead to a common goal.

2.3.2 Nonprofit Organizations

Additional actors involved in urban renewal projects include nonprofit organizations that take part when the project involves disadvantaged populations who do not have the tools or resources to ensure that their interests in the project are represented. These organizations can take different forms, including nonprofit associations, neighborhood committees, social activists, and academic bodies. Given that the case study presented in the following section deals with such an organization, I will briefly address the perceived role of these bodies.

The accepted view is that nonprofit organizations best advance the interests of homeowners, as their motives, unlike those of for profits actors, are not financial but rather focused only on promoting important social goals. Their strategies for action concentrate on building trust and knowledge transfer, ensuring that the apartment owners are informed regarding each of the stages that are expected in the process, including their significance and implications. The purpose of building an infrastructure of trust is to make the apartment owners full of partners in decisions making regarding the apartments they own, and to recruit them to commit and take responsibility in the overall process.

On the basis of the information that apartment owners receive, they are able to make an informed decision regarding the project's progression. Thus, it is essential that homeowners receive information not only regarding how the project will affect their lives during planning and construction, but also regarding its potential implications for their future, post construction—such as high maintenance costs, or

the dramatic changes anticipated to their living environments. Providing this type of support to apartment owners requires a deep understanding of social processes as well as experience working with disadvantaged populations—characteristics generally associated with nonprofit organizations.

2.3.3 Comparing the Roles of Nonprofit Organizations and For-Profit Corporations

While the primary goal of real estate companies in urban renewal projects is to persuade the apartment owners to agree to sign up to the project, nonprofit organizations are not orientated toward the goal of attaining the apartment owners' agreement. Rather, their main role, as stated, is to transmit the knowledge that is necessary for apartment owners to make an informed decision regarding whether to agree to the advancement of the project. The common perception is that the not-for-profit approach may harm the economic efficiency required for the implementation of the project, since nonprofit organizations lack the necessary economic incentive.

The question arises—is this perception, that sees the roles of for-profit corporations and nonprofit organizations as dichotomous, anchored in reality? Experience shows that no, not necessarily. Real estate companies understand the need to build trust and to transmit knowledge to apartment owners as effective strategies that will eventually lead to the highest rates of enlistment to the project. It may be that those representing the developers do not have the same skills and experience as nonprofit staff in all that pertains to working with disadvantaged populations, but the reality of urban renewal forces them to adopt these types of skills, even if to a lesser extent. On the other hand, we can assume that nonprofit organizations are not constantly working only to further social goals, and that their involvement in market ventures requires them to acquire new action strategies that change the rules of the game that affect their conduct.[10]

2.4 The Legal Procedure Regarding Obtaining Consent

The first phase in promoting an urban renewal project is to obtain broad consent for the project from the apartment owners. The higher the rate of consent, the more likely it is that the project will occur, and that the construction will end in a relatively short timeframe. The legal arrangements in Israeli law regarding urban renewal projects determine the threshold rate of consent. When this rate is achieved, apartment owners who are interested in progressing the project may apply to the court in an attempt

[10] For more on this topic see Kennedy (2002).

to compel the remaining homeowners to consent.[11] The threshold rate of consent varies according to the type of project planned. In the past, the central principle that guided the legislator was that the greater the project's impact on the property rights of homeowners, the higher the threshold rate of consent. The roots of this principle are in the Basic Law: Human Dignity and Liberty (1992), which stipulates, in Section 3, that "the property of a human being shall not be violated." According to this law, every person has the right to do as they wish with the property they own, and to prevent other people from violate their rights, as long as their actions do not harm other owners. Despite the elevated status of Israel's Basic Laws, the legislator, in considering the balance of the right to property against the public interest, determined that the property right of an apartment owner in a condominium is not absolute, and that the interest of the majority of homeowners justifies a proportional impingement on the property rights of those who refuse to consent to an urban renewal project. In the explanatory notes to the Vacate and Build Bill, the legislator noted that the law's purpose is to assist in filling the socioeconomic need for more efficient use of Israel's limited land resources, to address the decreasing quantity of open space, as well as to assist in the rehabilitation of deteriorating urban complexes.[12] In the spirit of the law, the court ruled that apartment owners who oppose a vacate-and-build project do not have the right to sacrifice the public interest nor the interest of the other homeowners in favor of their personal interests, when the latter are not reasonable.[13]

In accordance with the key principle that guided the legislator whereby the greater the violation to the property right, the higher the threshold rate of consent, the Vacate and Build Law previously determined two different rates: In "vacate-and-build" (demolition and reconstruction) projects, the threshold rate was 80%, while in projects that involved refurbishment of existing buildings—including reinforcement of the structure and the addition of a relatively small number of dwelling units—the threshold consent rate was 66%. In 2021, the Israeli legislature approved an amendment to the law that lowered the threshold rate of consent for the former—vacate-and-build projects—to the same low rate that applies to the latter—refurbishment. This change was justified on the basis of Israel's housing shortage, which has intensified in recent years, as well as the many bureaucratic barriers to implementing urban renewal projects, at the heart of which is the matter of owner consent.

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[11] According to the Vacate and Build Law, when the required rate of consent is reached, the developer or apartment owners may apply to the relevant legal court against the holdouts, in order to force those remaining apartment owners to agree to the project. An application of this type can be a tort claim in which the holdouts are sued for the amount of damage caused to the other apartment owners as a result of their refusal, or an application for an injunction, where the court may compel the holdouts to give their consent for the project. The legal process includes hearing the holdouts' arguments, and examining whether or not their objection to the project is based on one of the grounds that justify a refusal. If the holdouts' objections do not fall within the scope of the grounds set out as justified by law, the court will rule that their objection is not justified and oblige them to pay compensation to the other owners or order the project to proceed against their objections.

[12] See: Explanatory Notes to the Vacate and Build (Compensation) Bill, 2005, Knesset 88, 198 (hereafter: the Bill).

[13] See Judge Danziger's ruling in Civil Appeal 3511/13 Regina Schwarzberger v. Shalom Marin et al. [Hebrew].

The new legislation thus weakened the status of the right to property established by the Basic Law: Human Dignity and Liberty, with the goal of removing barriers and accelerating the pace of urban renewal projects. But the legislative change might have the opposite-than-intended effect: When the law enables the project to proceed in the face of a considerable rate of opposition, we can assume that the holdout owners will do all in their power to obstruct the project, thus leading to delayed implementation. For this reason, the developer has an interest in making every effort to obtain the consent of the holdouts, without resorting to legal proceedings. As noted, these efforts require interpersonal skills and good knowledge sharing and transfer mechanism.

2.5 Knowledge-Sharing in Urban Renewal Projects

Action strategies that are effective in promoting the processes of obtaining consent and decision-making in urban renewal projects require the flow of knowledge both to homeowners and to other relevant stakeholders. Collective knowledge is the key to the success of collective action. There are various means of knowledge-sharing in urban renewal procedures, as I will detail later.

2.5.1 Public Participation

One of the accepted means of knowledge transfer related to planning procedures is public participation. Local authorities use public participation to transmit information to residents and involve them in planning decisions about their living environments.[14] Public participation serves local governments in that it can increase the legitimacy, equity, and effectiveness of its actions, and can be a tool to empower residents and strengthen the democratic process.[15] The predominant notion is that residents who take part in urban processes taking place in their environments become involved, active, and influential citizens. In addition to fulfilling democratic values of sharing and participation, it is also accepted that residents' involvement may significantly contribute to identifying problems, contributing to planning solutions tailored to real needs of the target populations, and recruiting residents as change agents who lead and motivate planning processes in cooperation with the local government.[16]

[14] In Israel, there is no formal requirement that local authorities involve the public in the decision-making process, apart from in the Planning and Construction Law 1965, which contains a specific procedure for public participation. The law requires the planning and construction authorities to provide information to the public when they prepare a plan and provides the right to object to those affected by the plan. See Carmon and Alterman (2011).

[15] The literature written on the subject mainly deals with theories of public choice and collective action and focuses on the relationship between local governments and residents.

[16] For a discussion on this topic, see Nagid (2015, p. 18).

While the local authority's commitment to public participation processes is common practice and the foundation of several theories, there is very little academic or public discussion on corporate bodies', particularly development companies', commitment to hold participation processes pertaining to their urban renewal projects. In Israel, the practice of sharing information with apartment owners has largely evolved from practice, and only since 2018 have developers been obligated by law to hold an information session for owners before asking them to sign any document. This session allows the developer to introduce themselves to all homeowners affected by the project and to present them with the deal they propose to offer.[17]

2.5.2 *Community Forums, Representative Committees, and Smaller-Scale Meetings*

In urban renewal projects, knowledge transfer methods vary from project to project. The most common is community forums, in which the developer and other professionals explain the project process to apartment owners. Another method is to select a building committee whose role is to mediate between the developer and the apartment owners, to assist in making collective decisions. Additional methods that developers utilize to build trust with apartment owners include smaller-scale (one-on-one or small group) meetings between developer representatives and owners, as well as events and activities that contribute to strengthening the local community.

Community forums are known to create complexity. These events are steeped in emotions, including anger, anxieties, and fears that are not necessarily assuaged within the meeting time, often leading the forum to end with emotions running high. Another major problem is that the information transmitted during the forum is often unclear to participants: In forums with a large number of participants, many homeowners find it difficult to follow the large quantity of complex information conveyed, and they may not have knowledge of many of the concepts and language used. These circumstances create a sense of helplessness and frustration.

The possibility of conveying knowledge within a large forum, despite the necessity, is therefore limited and cannot come in place of smaller-scale meetings and additional knowledge transfer methods. Selecting a representative committee is also not an ideal solution for mediating knowledge, as often certain apartment owners do not consider those selected as representative of them, and thus refuse to cooperate with their decisions.

[17] Section 1A, Amendment No. 6 to the Vacate and Build Law (Promoting Vacate and Build Projects), 2006.

2.5.3 Mailing

Another means of knowledge transfer in the framework of urban renewal projects is by mail—whether electronic or physical. Providing written material that includes information and updates is of great importance, however, such material is often not presented in clear language, and in many cases is not translated into the various languages understood by the apartment owners. Another problem that is often not addressed is the need to cater to owners who are illiterate.

2.5.4 Invitations to Project Meetings

Lead stakeholders may encourage apartment owners to take an active part in urban renewal projects by inviting them or their representatives to participate in regular project meetings, attended by key actors including the planning institutions and various professionals. The effectiveness of this approach is debated: Some believe that where the homeowners are highly involved, this may interfere with the project's progress and delay its implementation. On the other hand, there are those who claim that when fully involved in the project, the owners have a greater commitment to the process, thus ensuring it is condensed. Regardless of which of these theories is correct, very few developers take the step of inviting owners to project meetings, though it would likely increase transparency and trust relations between the players.

2.5.5 Technological Means of Knowledge Sharing

Innovative information and communication measures that are being developed in Israel and around the world allow for easy access to databases and serve as accessible, affordable platforms for knowledge exchange and operationalization of multi-participant consulting procedures. The ease of use and absence of time, distance, and locational constraints, make it simpler for all participants to access information and get involved.

In recent years, several technological initiatives have evolved in Israel, with the goal of supporting urban renewal processes through knowledge sharing. Their aim is to redefine the relationship between the various stakeholders and allow knowledge flow. One such initiative is getStatus,[18] which serves as a digital platform that allows actors involved in urban renewal projects to build and manage a cooperative knowledge base, and also provides apartment owners with key information using various visual aids. For example, the owners can view a diagram online, at any time, that allows them to understand the current statues of the project: Stages that are complete are colored green, the current stage is colored blue, and future milestones

[18] https://www.getstatus.online/.

are colored gray. This color-coded snapshot provides clarity, increases transparency, and minimizes the knowledge gaps that generally exist between the parties.

GetStatus' technological platform allows the developer to share all general documents relevant to the project (e.g., legal agreements, renderings, plans) as well as to share private files with individual homeowners. The owners can also upload documents to the system, such as their ID and other personal details. Thus, a two-way information stream is created. The system also enables the developer and other actors to send email and phone messages to owners, and to track the tasks they set for themselves.

The system's knowledge base is managed through smart dashboards based on analytical data that includes statistics and trends, displayed visually. The information displayed through each dashboard is derived from the various stakeholders' data, which is managed by the source company, usually in an array of Excel spreadsheets. The contribution of the smart dashboards to the project process is not only in numerical data analysis: These dashboards are intended to provide the developer and other stakeholders with tools that guide their conduct throughout the process, including making improvements. These dashboards also assist to break up the process of obtaining consent from apartment owners, either at the level of the entire project or individual building. Thus, the getStatus platform is a technological tool for increasing transparency, through bidirectional knowledge sharing. The goal of this transparency is to build trust, and thus to gradually remove objections to the project.

The importance of this type of system is clear in light of the difficulties associated with knowledge transfer by traditional means. The lack of certainty and of knowledge flow that characterizes many urban renewal projects cause affected apartment owners to suspect that significant information is being withheld from them. This suspicion undermines the trust relationship, creating resistance to the project. And yet, such technological platforms do not provide the required solution in all cases—particularly when it comes to populations that are elderly, technology-challenged, do not understand the language used, or are illiterate. There is no substitute for a personal relationship between the developer's personnel and the apartment owners, especially when it comes to disadvantaged populations.

In the next section, I will describe a unique stakeholder system that was led by an academic body that acted as a kind of knowledge mediator between the apartment owners and the developer, in a large project involving a disadvantaged population.

2.6 Part Two—Case Study

The case study deals with a multistakeholder system in an urban renewal project in the Jaffa C neighborhood, Tel Aviv-Jaffa. The project began as an initiative of the Clinic for Housing Rights and Urban Development at the Faculty of Law, Tel Aviv University—an academic-professional body, with a social and pedagogical purpose that sought to assist residents of Kurt Tucholsky Street to deal with the ramifications

of safety concerns in the form of structural defects identified in their apartment buildings.

2.6.1 Chain of Events

In January 2007, Tel Aviv-Jaffa municipality pronounced four buildings on Kurt Tucholsky Street as hazardous, and issued orders against the apartment owners, requiring them to correct a long list of defects within a short timeframe of 90 days. The apartment owners, most of whom are elderly and of low socioeconomic standing, were unable to fund the necessary repairs, and as a result, a few months later, the municipality filed indictments against them for failure to repair a hazardous structure (a criminal offense with penalty of fine or imprisonment).[19]

Following the indictments, representatives from the neighborhood contacted the Clinic for Housing Rights and Urban Renewal (henceforth, "the Clinic") requesting legal assistance. In the first phase, the Clinic approached the municipality in an attempt to find a financing solution to repair the buildings. The proposal that the Clinic submitted to the municipality included an arrangement whereby the home-owners would receive a loan for which repayment would be spread over sixty monthly payments without interest nor indexation. Following internal discussions with the municipality's legal advisor, the municipality expressed a willingness to help the owners, given their economic position; however, the legal advisor expressed concern that assisting by providing subsidized loans would set a precedent for owners within other buildings pronounced as hazardous across the municipality. Thus, after further consideration, the municipality decided not to adopt the Clinic's proposal. But, appreciating the difficulties faced by the apartment owners, the municipality contacted the national Ministry of Construction and Housing with a proposal to establish a joint fund to address the issue of hazardous buildings. The Ministry refused the proposal, re-enforcing that the full responsibility for addressing such cases rests with local governments.

The authorities' inaction, in the face of ongoing criminal proceedings against the Kurt Tucholsky apartment owners, led the Clinic to abandon accepted channels and to look for alternative, market-based, solutions. In 2009, the Clinic conceived of a planning solution that was based on the logic and benefits of NOP 38—regulation that allows construction bonuses to be provided in refurbishment projects that reinforce

[19] The orders issued (known as Order 3) are a legal tool utilized by Tel Aviv Municipality in order to maintain the resident safety and the maintenance of old buildings. Their role is to encourage apartment owners to act together to manage the hazard. The orders oblige the owners to repair the buildings' defects within a limited timeframe of 90 days, at the end of which indictments are filed if the repairs are not made. The uniqueness of orders 3 is that they comprise a form of collective punishment.

existing buildings against earthquakes.[20] The Clinic proposed that the reinforcement works required would be undertaken by a developer, which would, in exchange for footing the bill for those works, receive the buildings' rooftop building rights. The developer would use those rights to construct new apartments, which could be leased to students studying at the nearby Academic College of Tel Aviv-Yaffo. The proposal, the Clinic's members hoped, would lead to repair of the buildings' defects with minimal cost to the apartment owners, while advancing a social initiative—injecting a young population into an aging, disadvantaged neighborhood.

2.7 Collective Action

The Clinic was the initiator and driving force of the project in its early stages. Its initial motivation was to find a solution to the problem of hazardous buildings, and it was motivated only by social and pedagogical interests. In order to establish the Clinic's status as the lead actor that managed all stakeholders in the project, its initial mission was to strengthen its relationship with the apartment owners, including building trust and establishing its legitimacy in their eyes. To achieve this goal, Clinic members visited the neighborhood twice a week and assisted the owners with various legal issues. In addition, they held community meetings in each building, where they presented key information to the homeowners. Once the relationship was strengthened, the Clinic began to involve more stakeholders.

2.7.1 The Three-Way Cooperative Relationship Between the Clinic, Developer, and Apartment Owners

The first player that the Clinic brought in to connect with the apartment owners was the developer. For several months, this relationship was fully mediated by the Clinic: The team organized all meetings between the parties, acting as the "matchmaker," inviting both sides to meet. In addition, the Clinic team prepared each of the parties

[20] National Outline Plan (NOP/"TAMA") 38 grants additional building rights to apartment owners whose buildings undergo reinforcement. The owners transfer these rights to a real-estate developer in exchange for the reinforcement, renovation, and upgrades (sometimes expansion) of their apartments. The State also foregoes the homeowners' purchase tax and capital gain tax, and the local municipality pitches in by foregoing the betterment levy it is entitled to charge when tenants obtain additional building rights. The homeowners get a reinforced, improved building that is more resistant to earthquakes, overall renovation including both the building's interior and exterior, and sometimes significant expansion of each apartment. An elevator is also added since the developer constructs extra floors on the rooftop. It is common for storerooms to be built, as well as parking solutions, all according to the physical and economic conditions of respective projects. Each project is examined individually: its economic potential must be well explored in order to ensure, on the one hand, that the developer stands to gain rather than lose from it, and, on the other hand, that apartment owners receive maximum benefits.

for the meetings and attended every meeting as an active participant. The meetings themselves were mediated by the Clinic team, which included a group of third-year law students in addition to Clinic staff. At each meeting, the Clinic team made sure to introduce all participants, set and explain the agenda, and to intervene either when tempers flared or when they identified a knowledge gap between the parties. The most interesting aspect of these activities was how the Clinic prepared each side for the meetings. This preparation aspect embodied the Clinic's endeavor to develop the foundation for the relationship between the owners and the developer, even before the initial encounter between the parties took place. The message that the Clinic conveyed to the apartment owners at the first preparatory session was that they would meet a developer whose key motivation to join the project would be financial, but that nevertheless, the developer could be a partner who would benefit them by significantly improving their living condition. Given this paradigm, the Clinic encouraged the homeowners to think and act as consumers, as a legitimate partner in the transaction, and as lead negotiators who could also make demands: "You need to understand that you hold a lot of power in your hands."[21]

Another aspect of attempting to mold the relationship between the owners and developer came to light when residents raised questions that were beyond the Clinic's role and responsibility. In directing these questions to the appropriate party, the Clinic delineated the roles and responsibilities of each of the stakeholders. The Clinic encouraged the apartment owners to form a direct communication channel with the developer, through which they could ask their pressing questions. That encouragement took a form that was not only verbal, but also demonstrated in practice, as evidenced by the following case: At the outset of the second stakeholder meeting, the Clinic's law students sat among the apartment owners, rather than sitting separately as they did in other meetings. This arrangement was spontaneous, rather than a result of a decision made by the Clinic staff. During the meeting, the students asked the developer several tough questions about the project plans—the vast majority of which were from the perspective of the apartment owners and about neighborhood interests. The students did not pretend to be apartment owners, but their placement among them, along with the nature of the questions they asked, challenged the developer's representatives, leading them to supply complete answers to the apartment owners.[22]

The students later discussed the meeting among themselves. They noted that they had made sure to ask the developer all the "tough" questions that the apartment owners should have raised but did not do so. By voicing the concerns that indeed needed to be heard, the students created a model for apartment owners to emulate, presenting the latter with a mode of behavior that they may not have considered possible.[23]

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[21] From Galia Rattner's thesis, "Attempting to find solutions to the problem of dangerous buildings: sociology of 'partnership' at the Yaffo Gimmel project." Rattner accompanied the clinic as part of her practicum in the framework of her master's degree and documented all the meetings that took place over an entire year.

[22] Rattner, Ibid.

[23] Rattner, Ibid.

As mentioned, the developer also participated in preparatory sessions organized by the Clinic, prior to first meeting with the apartment owners. Part of the preparation was informative in nature: The Clinic team handed over the minutes of meetings it had held with the owners, as well as a list of questions and issues raised by the apartment owners (moderated by the Clinic). Another part of the preparation focused on presenting the Clinic's vision and gradually building the developer's social awareness regarding the needs of the homeowners.

The Clinic staff believed that by maintaining an ongoing relationship with the developer, the latter would absorb some of its values and its worldview. Shortly after the Clinic's relationship with the developer began, the former's staff proudly noted that the developer called itself a "social developer." This sense of pride emerged from the Clinic's goal to ascribe a specific role and identity to the developer; one that appreciates the need to contribute positively to the lives of the apartment owners and of the entire community.[24] From the developer's perspective, pronouncing itself as a social developer was the first step toward adopting social values as part of the company's social identity.

The Clinic team's experience in guiding the relationship among the stakeholders and their different identities was at times defined by success, and at other times defined by episodes of failure and loss of control over the stakeholder system, as discussed below.

2.7.2 Moments of Success in Guiding the Stakeholder Relationship

From the first drafts, the architectural plans included the installation of elevators as an integral part of the refurbishment of the buildings. The introduction of elevators is a fundamental aspect of plans prepared under NOP 38. But in the case of Kurt Tucholsky Street, this feature was perhaps the most significant that the developers could supply for the benefit of apartment owners, in particular the elderly and ailing among them, to improve their mobility and quality of life. When the developer first presented the plans, the owners were told that the architects had found that the only way to install an elevator would be through pre-existing concealed laundry hanging spaces located on external walls outside each apartment's kitchen.[25] When the developer noted the intensity of the owners' objections to this proposal, they organized a meeting between themselves, the owners, and the architect. The latter claimed that given the constraints of the buildings, there was no other option, to which claim the owners responded in anger and opposition. The owners had two main claims: (a) that it is not appropriate to have guests enter each apartment through the

[24] Rattner, Ibid.

[25] It is quite common in Israel, particularly in older buildings, to hang laundry from clotheslines suspended on external walls. Often these clotheslines are concealed with metal or concrete latticework.

kitchen and (b) that they require the laundry spaces, as most of them hang laundry there rather than using an electric dryer. Thus, the owners' opposition provided a vivid illustration of a clash between cultural and social perceptions. The unequivocal message the owners conveyed to the developer and the architect was that they should be attentive to the former's needs, because otherwise the project would not come to fruition.

Although the developer and architect reiterated that there was no alternative and that the solution that they were presenting was the best they could find, the subject remained highly sensitive. In the two weeks following presentation of the plans, students from the Clinic held small-scale meetings with each family individually, in which the subject of the location of the elevators arose repeatedly as a significant complication. Finally, after repeated objections, the developer set the architect the task of finding another creative solution that would better suit the homeowners' demands. Such a solution was indeed found: The alternative architectural plan placed the elevators at the front of the building, allowing entrance to the apartments directly to their living rooms (and not their kitchens). This placement of the elevator would lead to a slight reduction in the size of the living room window in each apartment, but as a "compensation", the plans add a sun terrace to each apartment.

The apartment owners responded enthusiastically to the new plans. The Clinic saw the change to the plans as an achievement on the part of the owners, congratulating them on their great success. The change to the plans in response to the demands of the owners was thus marked out among the Clinic staff as one of its key successes. From the Clinic's perspective, the achievement was twofold: First, the communication between the owners and developer was conducted in the spirit that the Clinic had worked to instill, and just as significant—the plan change took place without threatening the stability of the project system. Second, the achievement demonstrated one of the means by which the power relations between the developer and homeowners are formed: Through the Clinic's design and management of the relationship between the developer and owners, and through its encouragement and support, the owners acquired power vis-à-vis the developer. And yet, in the recognition of that power, a disquieting question arose in the background: In the future, would the owners be capable of bringing about a similar process themselves, without the Clinic's assistance?[26] This question remains unanswered.

2.7.3 Moments of Failure in Steering the Stakeholder Relationship

The Clinic managed to steer the relationships between the various stakeholders, as long as the process was under its control. The issue of the elevators discussed above demonstrates a case in which the communication between the developer and the residents was conducted in accordance with the Clinic's design. And yet, the Clinic did

[26] Rattner, Ibid.

not have full control to manage the relationships among the stakeholders throughout the process.[27] For example, various market limitations dictated new conditions for the project. When the architectural plans came before the District Planning Committee for approval, its appraiser formed the opinion that the project was not economically viable in its then-format and therefore, that additional floors should be permitted. This decision conflicted with the Clinic's standpoint, as it had aimed to control the flow of new dwellers in the buildings, so that the pre-existing social and cultural fabric would not be significantly impacted. The Clinic team also feared that the addition of a significant number of apartments would significantly increase the buildings' maintenance costs, to the extent that the original owners would face financial harm in the future.

Another example of the Clinic's lack of control in steering the system was the change of plans regarding the population that would live on the newly floors to be added to the buildings. As mentioned, the original plan was that the new, upper floors would be designated as rental housing for students from the nearby academic college. The Clinic team's vision was that the students who would live in the new apartments would integrate into the community, even contributing their time to assist local residents, under the College's volunteer program. However, despite the fact that in the early stages of the project, there was full cooperation between the Clinic, the developer, and the College, the College eventually withdrew from the project. The College's withdrawal, together with other market constraints, led to the new apartments being sold on the open market rather than rented to students. From that moment on, the Clinic was no longer in control of the social elements of the project, and thus was unable to direct the social enhancements that the team had envisioned.

2.7.4 The Dynamism of the Stakeholder System

The project began as a social initiative by the Clinic's team, but branched out over time, with more and more stakeholders coming on board, compounding the various interests in, and expectations from, the project. The plan became more sophisticated, more complex, and more detailed. To understand the dynamism of the stakeholder system, one must recognize the many ways in which the project was constantly evolving.

The project's general action plan changed several times along the way. For example, as described above, the Academic College, which was initially involved, found alternative housing solutions for its students, leading to cancelation of the plan to rent the new apartments to students. The project's construction plan also changed frequently, being often redesigned according to both the bidding of various stakeholders and market constraints. In addition, each of the stakeholders changed their positions over time and changing circumstances: For example, at the outset, the apartment owners simply sought a solution to their indictments and to their buildings'

[27] Rattner, Ibid.

safety defects; over time, their focus widened to the "grand plan" for urban renewal. The Clinic also underwent a change: At first, it was highly involved in promoting the project, but over time, the staff began to doubt their level of involvement in the process. Understanding that the project would drastically change the apartment owners' lives led the team to feel an increased sense of responsibility and concern for the owners' future. When the project reached the stage in which the developer and owners signed contractual agreements, the Clinic took a step back and the developer managed the signing process. At that point, the Clinic team limited its role to explaining the contract and its terms to the owners. Over time, as the involvement of the Clinic diminished, the developer became the dominant actor conducting the project.

Individual stakeholders sometimes took on multiple standpoints simultaneously. For example, the municipality filed indictments against the owners, but at the same time was a partner in the attempt to find a solution to repair the hazardous buildings. There was also significant dynamism in the relationships between the various players. These relationships ranged from cooperation and even friendship, to mistrust and even hostility. For example, the developer's relationship with the apartment owners, which was originally fully mediated at by the Clinic, became at times independent and disconnected from the Clinic's influence. The owners' original hesitation and suspicion of the developer were superseded by trust and direct communication. The Clinic's relationship with the developer was also variable: At times, there was full cooperation between the two, but at other times the Clinic staff felt the need to be cautious and to put limits on the developer's power. All of the above portrays a complex stakeholder system. Uncertainty, tension, suspicion, and competing interests were present alongside the cooperative effort.[28]

Despite the attempts to supervise, and to direct relationships and communication, the Clinic was unable to control the stakeholder system at will. The large number of actors and constraints created a vibrant and changing system; relationships were created and dissolved, and each of the actors had the power to undermine, as well as to influence the project's character.

2.8 Conclusions

From the outset, the urban renewal project for buildings on Kurt Tucholsky Street involved the formation of a stakeholder system that was made up of multiple actors that both influenced and were impacted by the project. In the early stages, the key players were the apartment owners, the Clinic, and the municipality, who were then joined by the developer followed by the Academic College, which was searching for residential solutions for its students. Additional stakeholders, who joined later, were lawyers and the project architect. But this list does not represent the entire stakeholder system; rather, this system was fluid and transformed frequently, as over

[28] Rattner, Ibid.

time different players took on more or less central roles, or their association with the project ended.

The collective action that the Clinic attempted to spur had both successes and failures. In its undertaking, the Clinic was required to take a series of actions: Initially, it had to define the problem and the solution in service of which the stakeholders would come together, and also frame the story and vision that justified the initiative. Next, it had to recruit the stakeholders through a variety of means. In order to ensure that the stakeholder system operated as planned, the Clinic also worked to guide the communication among the actors. Thus, the Clinic's team brought about, shaped, and encouraged the relationships it saw as desirable—those that would ensure that the parties would adhere to the roles it had assigned them.[29]

The Clinic had a specific vision for the relationship between the stakeholders, which shaped its expectations from each of them. Having a role within the system, as well as the specific relationships that the team developed with both the developer and apartment owners, allowed the Clinic to be broadly involved in their relationship and to function as a knowledge mediator that sought to minimize differences between the parties. But this role did not guarantee that the players fully adhered to their assigned roles. As demonstrated, over time the relationship slipped out of the Clinic team's control and developed in new directions, often to the Clinic's dismay.

As an active player in the market that has awareness of its forces from a critical perspective, the key tools available to the Clinic were the use of the empowerment mechanisms that it developed in its work with the apartment owners: Instilling them with new skills for negotiation with the developer, regularly transferring knowledge at all stages of the project, and knowledge mediation between the different stakeholders. The Clinic also played an important role in shaping the developer's corporate identity by creating expectations among the apartment owners. Those expectations became enshrined in the company's decision-making apparatus, and even served the developer in future projects that it obtained based on its new self-ascribed identity.

Looking back, it seems that these are the only means left for nonprofit bodies such as the Clinic—those that seek to create social change within the confines of the market and find themselves bound by power relations and market constraints that do not necessarily align with their goals and values. The Clinic made every effort to direct the project to the extent possible, but ultimately the system took on a life of its own through the actions of the various stakeholders. A few years following the story told in these pages, construction began on this significant project and at the time of writing, it has reached its final stages.

[29] Rattner, Ibid.

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Chapter 3
Citizens' Engagement and Well-Being: Home Is Where the Heart Is

Ayelet Sapir and Eyal Yaniv

Abstract Cities are challenged by the growing need to improve their management skills to maintain a high quality of life and well-being for their residents. In their ambition to achieve this goal, they set to become smart cities and therefore implement citizen engagement methods as part of smart governance as well as reach smart cities 3.0 evolvement (Flint Ashery in Scales of change, pp. 185–192, 2023). Implementation of citizen engagement takes different forms and capacities from consulting the public to cocreation of solutions for the city by citizens, city managers and other stakeholders. Neve Sha'anan neighborhood in Tel Aviv Yafo was chosen as a case study to discuss aspects of citizen engagement and its relationship with well-being. Citizen engagement in the neighborhood was implemented using Geodesign to develop a plan for the central bus station (see Steinlauf-Millo's chapter). The process is used to analyse the mediation between citizen engagement and well-being through motivational and cognitive factors. These factors include satisfaction, place attachment and service quality. Conclusions indicate the importance of citizens in the decision-making of the local habitat and the need to include the different communities that reside in a place.

Keywords Citizen engagement · Smart cities · Well-being

3.1 Introduction

Populations in cities have boomed significantly over the past few decades (OECD 2020). Most of humanity is living in cities (Chourabi et al. 2012) with a forecast approaching 70% by 2050 (United Nations 2018). Therefore, cities are challenged by

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the growing need for municipal services that require them to improve their management skills if they aim to maintain a high quality of life and well-being for their residents.

The need to acquire new management skills was a catalyst for a new field in research, namely smart cities. Smart cities is a term that describes cities whose goal is to provide their citizens with better quality of life and well-being by investing in technologies, communication, mobility governance and human resources (Caragliu et al. 2011; Irungbam 2016; Kummitha 2019; Kummitha and Crutzen 2017). Indeed, the six dimensions upon which smart cities performance is usually measured are: smart economy, smart mobility, smart environment, smart people, smart living and smart governance (Caragliu et al. 2011).

One of the methods employed within these dimensions is citizen engagement as part of smart governance (Giffinger et al. 2007a). Citizen engagement, meaning the active participation of citizens in the decision-making process of their city, was found to have a positive effect on the well-being of citizens (De Guimarães et al. 2020). Furthermore, citizen engagement is part of the evolution of smart cities. Literature describes three generations for smart cities development. Smart cities 1.0 was technology driven and led by technology companies. Smart cities 2.0, Technology enabled, city led and finally smart cities 3.0 citizen cocreation, where citizens engage with the city in creating services they need (Apanaviciene et al. 2020; Cohen 2015).

Cities implement citizen engagement at different levels, methods and fields of interest. These levels refer to the involvement and power citizens have in the process from passive information recipients to codevelopers of solutions for the city (Arnstein 1969). The methods used to gain citizens' input are also versatile. Citizen engagement can be facilitated using surveys, group consultations, brainstorming accelerator programs and more. Lastly, the fields of interest that can benefit from citizen engagement are as wide as the cities' management issues, for example design of urban spaces, a decision on utility for areas, creation of new services, usage of city data and much more.

This chapter will discuss the case study of the Neve Sha'anan neighborhood in Tel Aviv Yafo where citizen engagement was employed for urban planning using Geodesign methods (Ashery and Steinlauf 2018). This discussion aims to contribute to the development of the citizen engagement theory. First, it will discuss how citizen engagement contributes to the quality of life and well-being in the neighborhood. Subsequently, mediation constructs will be reviewed to illustrate the mechanisms that may facilitate such a contribution. Moreover, the discussion raised in this chapter aims to make a practical contribution to the understanding of municipal managers. The goal is to provide them with an understanding of how urban planning using citizen engagement can assist them to tune with the expectations of their citizens. They will gain a better understanding of the motivation to join citizen engagement initiatives as well as the contribution of the initiatives to the well-being of their constituents.

This chapter begins with the definition of citizen engagement explaining its significance and the different formations that citizens can contribute to their city's decision-making process. Then, quality of life and well-being are discussed to address the

relationship between these two constructs. The next section is dedicated to the motivational constructs (satisfaction and place attachment) and the cognitive construct (service quality) that are suggested to mediate the relationship. Then, the Neve Sha'anan case study is described along with the Geodesign method used for urban planning in the neighborhood. The theoretical considerations are described through the prism of the case study to demonstrate how Geodesign methodology aims to improve citizen well-being and quality of life. Finally, the chapter is concluded by thoughts and recommendations for future research.

3.2 Literature Review

3.2.1 Citizen Engagement

Engagement is an interaction or dialogue that takes place between citizens and organizations concerning the decision-making of the organization. It is a widely studied area in marketing targeting consumer engagement (Calder et al. 2009; de Oliveira Santini et al. 2020; Surprenant and Solomon 1987). Citizen engagement has been widely studied in the fields of political science and public administration, with research showing that active participation in decision-making processes leads to better outcomes for individuals and communities (Caragliu et al. 2011; Cortés-Cediel et al. 2019; De Guimarães et al. 2020). In the context of cities, this term refers to the citizens and the decision-making procedures where they live (Chen et al. 2020; Hatuka and Zur 2020; Zarei and Nik-Bakht 2021).

In 1969, Arnstein published a paper that introduced a ladder for citizen participation in governmental initiatives which measures activities according to the power citizens have in the decision-making process. At the lower end of the ladder, the citizens are merely passive participators receiving input from the municipalities that either manipulate their behavior or inform the citizens regarding the municipalities' activities. At a higher level, actual interaction with the citizens can be found when the government asks for citizens' contributions as information providers or consults with them regarding their preferences on different topics related to the city. Finally, at the top of the ladder, citizens have the ability to influence decisions when they gain power and control to affect the decisions made.

In this chapter, the term citizen engagement, will focus on the higher levels of the citizen engagement ladder and refer to a bidirectional interaction or discussion between the government and citizens as part of the collaborative urban planning process (Ashery and Steinlauf 2018; Bonsón et al. 2012; Cegarra-Navarro et al. 2012; Hatuka and Zur 2020; Powell et al. 2009; Powell and Colin 2008). Engaging citizens aims to give people more of a voice in the discussion over governance (Alizadeh et al. 2019) thereby enhancing citizen power (Sierbers and Torfing 2018).

Citizen engagement is an integral part of the development of smart cities. It contributes to smart governance which is one of the six dimensions smart cities are

measured by Giffinger et al. (2007b). Citizen engagement acknowledges the importance of citizens being the heart of any urban community (Kummitha and Crutzen 2019). Undeniably, citizens are the foremost recipients of cities' services that have a direct effect on their day-to-day lives. Therefore, the importance for inclusion of citizens in discussions and decision-making regarding their living environment is recognized by researchers and practitioners (Callahan 2007).

Much work has focused on the participation of citizens in collaboration with government activities (Ianniello et al. 2019; Pina et al. 2017). However, this references the behavioral aspects of such activities. Meaning that it measures the number of individuals that responded or the number of responses to an initiative. Engagement on the other hand goes beyond participation. It is the degree of bringing one's self into the situation (Kahn 1990). Engagement is defined as the emotional and cognitive states individual people have concerning their participation (Calder et al. 2009; Paek et al. 2013; Smith and Gallicano 2015).

Engagement is a bonding between participants and the organization. In the context of cities, the organizations are local governments or municipalities that promote advocacy by the end user who are the citizens. Moreover, engagement presents an emotional connectedness that shows trust in the partner engaging with (Pansari and Kumar 2017). This is the definition that the present study will use when studying citizen engagement.

Promoting citizen engagement is a key factor for smart cities through smart governance (De Guimarães et al. 2020). Thus, making it an intriguing idea to study and pursue. In General, engagement includes activities and communications that can be taken by individual citizens to contribute to their local community (Cegarra-Navarro et al. 2012) at different levels (Callahan 2007; Ianniello et al. 2019). These activities allow for interactions between municipal governments and the citizens that reside in the city (Zhu et al. 2022).

Citizen engagement encapsulates challenges and opportunities for both participants, the city and the citizens. Initiation of citizen engagement activities has to consider the complexity of the process along with the advantages and benefits the process may yield.

Citizens have the potential to contribute to many municipal activities including participatory budgeting, urban planning, development of services and more (Campagna et al. 2016; Ruesch and Wagner 2014). Their ability to affect decision-making of municipal affairs depends on the power they are entrusted with (Arnstein 1969).

Citizen engagement can be implemented through a variety of instruments and tools such as surveys, discussions, competitive events, conferences, or cocreative processes. Some initiatives are implemented online while others are offline face-to-face processes (Yetano and Royo 2017). Each is designed to provide different outputs.

One of the options that is gaining popularity to implement citizen engagement initiatives is a cocreative process. Cocreation, a term coined in marketing, is defined by having multistakeholder involvement at different stages of development (Alimamy and Gnoth 2022; Buonincontri et al. 2017; Khan and Krishnan 2021; Vargo and Lusch

2004). The outcomes of cocreation procedures are the product that was developed by the interaction among various actors (Sierbers and Torfing 2018) working together (Ercsey 2017) to achieve a common goal.

Cocreation methods in urban planning involve actively engaging citizens, government officials, professional planners and other stakeholders in the planning of urban spaces and decision-making processes for these areas. These methods aim to foster collaboration, inclusivity and collective intelligence to create more sustainable and people-centric urban environments. Commonly used methods are Charrettes Participatory Mapping (Kim et al. 2020; Roggema 2014), Geodesign (Ashery and Steinlauf 2018; Campagna et al. 2016; Kuniholm 2020; Steinitz 2012) and surveys. They aim to bridge the gap between professional urban planners, municipal managers and the community to foster a common understanding in creating a plan for an urban space. Examples of the contribution and involvement of citizens to urban planning to create an impact on the design of the space (Campagna et al. 2016) can be seen in cities like Winnipeg,[1] Calgary,[2] Kelowna,[3] Tel Aviv Yafo[4] and others involving citizens in the development of the concept of new and existing city areas.

Regardless of the method used, citizen engagement at the higher levels described in the participatory ladder (Arnstein 1969) is a complex and costly process for the local government to organize such an activity. Therefore, as such it should have a significant benefit to the city and its citizens. Since it is expected to contribute to the well-being and quality of life of the citizens, makes the process worthwhile pursuing.

3.3 Well-Being and Quality of Life

Well-being refers to the happiness or pleasure level a person feels (Kahneman and Krueger 2006; Medvedev and Landhuis 2018) reflecting satisfaction either in short- or long-term periods (Hooghe and Vanhoutte 2011).

Well-being is an interesting field of research for many disciplines like psychology, medicine, economics and community (Cooke et al. 2016; Hooghe and Vanhoutte 2011; Kahneman 1999; Medvedev and Landhuis 2018). Economists find that understanding the motivation and decision-making of people is related to well-being (Kahneman and Krueger 2006; Medvedev and Landhuis 2018) making it an interesting construct also in the context of citizen engagement and inclusion of citizens in city planning.

Quality of life is a multidimensional construct associated with different factors like satisfaction, sense of community, health, employment, safety, environment, transport, noise, pollution, crime, governance, available services and more (Appio et al. 2019; Ballas 2013; Macke et al. 2018; Weziak-Białowolska 2016).

[1] https://engage.winnipeg.ca/river-stradbrook-wellington-road-renewal-and-protected-bike-lanes.

[2] https://engage.calgary.ca/heritage.

[3] https://getinvolved.kelowna.ca/north-end?tool=map#tool_tab.

[4] https://shituf.tel-aviv.gov.il/#/.

Quality of life and well-being are considered by some researchers as interchangeable terms while others suggest that quality of life refers to objective factors (Li and Weng 2007) while well-being refers to subjective ones (Mouratidis 2020). Well-being is considered at times as the outcome of positive situations that are referred to by the quality of life for citizens (De Guimarães et al. 2020) while others consider the terms interchangeable.

Smart city research recognizes that quality of life is essential for the development of smart cities (Cortés-Cediel et al. 2019; De Guimarães et al. 2020; Gil-Garcia et al. 2015; Macke et al. 2018; Nam and Pardo 2011) and is in fact one of the goals for smart cities in their race to become smarter (Appio et al. 2019; Yigitcanlar et al. 2018). Literature shows that participative projects have an impact on the citizens' quality of life (Chourabi et al. 2012; Macke et al. 2019) recognizing the importance of the citizens' input to these projects (Cortés-Cediel et al. 2019).

Since smart city and participative projects affect citizens' quality of life (Chourabi et al. 2012; Macke et al. 2019) and urban planning was found to be connected with the quality of life (Papachristou and Rosas-Casals 2019) it can be assumed that citizen engagement in urban planning will have a positive impact on quality of life. The theory presented here suggests that the relationship between citizen engagement and well-being is mediated through motivational and cognitive aspects.

Several reasons could explain the connection between citizen engagement with quality of life and well-being. For example, some explanations point to motivational factors while others suggest that the connection is facilitated through cognitive factors. Motivational aspects include emotional and psychological factors. This chapter explores the mediation role of motivational factors such as place attachment and satisfaction from the design of the space as well as cognitive aspects like service quality on the relationship between citizen engagement and well-being.

3.3.1 Satisfaction

Satisfaction is a sense of delight that reflects the level of expectations met. It demonstrates a subjective evaluation by a person from the performance of a service or product or the person's assessment how much the performance met the expected outcome (Corrado et al. 2013; Molm 1991; Nadeem et al. 2020; Sales-Vivo et al. 2020; Surprenant and Solomon 1987). Satisfied customers are content with the offering they receive from the organization they are interacting with (Hollebeek and Rather 2019).

The result of citizen engagement activities concerned with urban planning is a design of the urban space by citizens collaborating with other stakeholders such as governmental managers, urban planning professionals and other interested parties. Satisfaction from the process reflects how delighted are the participants with the process that has met their expectations. Although measurement of satisfaction in such initiatives is challenging (Kuniholm 2020), it is interesting to learn the level and origin of satisfaction of the citizens taking part in the process.

3.3.2 *Place Attachment*

Place attachment is a multifaceted construct that refers to a bond one has to a location and its affection toward a place (Boley et al. 2021). Researchers have focused on psychological aspects describing emotional connection and feelings that people have with a place and how they identify with a specific geographical location (Boley et al. 2021; Corrado et al. 2013; Shin and Jin 2022; Williams and Vaske 2003; Woosnam et al. 2018). A place is defined both by physical factors such as size structures and shapes as well as psychological factors reflecting their experiences and memories of a place. People's relationship with a place and the meaning they attribute to the place becomes part of the placeness of a certain location. Indeed, it has been suggested that the regeneration of urban surroundings has to consider the emotional connection of those living or visiting the place to keep its sense of place (Ujang and Zakariya 2015). Therefore, citizen engagement in creating a place would provide the planners' insights into the makings of a place in order to continue dwellers' attachment to the venue. Connection with a place may be based on a social basis where one depends on the assistance of fellow citizens in the community at times of need. It may also stem from a physical basis that considers the quality of the place. Another possible connection could be based on cognitive factors such as memories one has with the place (Corrado et al. 2013; Kan 2007; Scannell and Gifford 2010). Measurements for place attachment are mostly focused on place identity and place dependence. Whereas the first implies the emotional connection and the latter the functional connection (Boley et al. 2021; Williams and Vaske 2003; Woosnam et al. 2018). Citizen engagement initiatives in urban planning can reveal the source of bonding and build on it to enhance and strengthen attachment.

Place attachment is interesting for long-term citizens as well as those visiting for shorter terms. Therefore, it is studied with regard to citizens living in a certain location as well as tourists visiting a place (Shin and Jin 2022; Suntikul and Jachna 2016; Woosnam et al. 2018). Literature shows newcomers to a city are less satisfied and more critical than citizens who have lived longer in a specific place (Weziak-Białowolska 2016). Moreover, those living longer terms show more place attachment. Figure 3.1 shows, for example, the proposed urban planning for the ultra-Orthodox neighborhood of Ramat Shlomo, in which personal identities were integrated into the planning design of the space.

Literature suggests that place attachment is related to civic participation in citizen engagement initiatives (Shin and Jin 2022). Moreover, there is also evidence that a lack of belonging may be could be related to less participation (Hatuka and Zur 2020). Thus, making the relationship between citizen engagement and place attachment interesting to explore.

Turning now to consider the cognitive aspect that could explain the relationship between citizen engagement and quality of life, the next paragraph will review the evaluation of the outcome of the citizen engagement initiative.

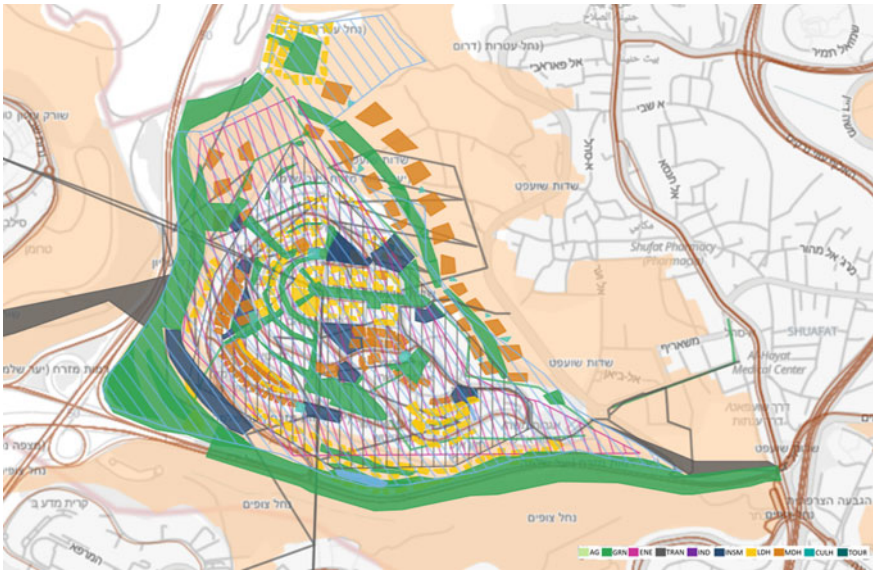

Fig. 3.1 Final plan for Ramat Shlomo neighborhood as designed during the geodesign workshop. The group identity is reflected in the division of the neighborhood into mini-complexes for each of the ultra-Orthodox sect, including dedicated institutions (synagogues for each sect, separation of schools between sects and genders) and facilities, extensive use of public transportation and bike paths

3.4 Service Quality

Research suggests service quality mediates the relationship between citizen engagement and well-being. At large, municipal outputs toward citizens are service-oriented (Li and Shang 2020), making the quality of city services an important determinant of well-being in urban areas. Such services can include for example online, social, waste disposal, etc. Access to high-quality services such as public transportation, affordable housing and healthcare are crucial for the health and well-being of citizens. The utility and service expected from urban planning are shaping the public space to address the needs of those using it. Service quality in the eyes of citizens in this context is defined by the ability of the space designed to comply with their needs and requirements of that space. In smart cities, high quality of service is expected (Zhu et al. 2022).

Service quality can broadly be defined as an abstract concept for evaluating the perceived performance of a service to the end user. According to Parasuraman et al. (1985), the construct illustrates the gap between the expectations from a service to the perceived performance.

Research has shown that citizens with consistent access to high-quality services are more likely to be satisfied with their lives and report higher well-being. It is

generally expected that solutions that have a better fit for those using them will be more satisfying.

Citizen engagement by nature and specifically participatory urban planning involves more people developing city spaces. This has the potential to improve quality of outcomes developed using the wisdom of the crowds (Hong et al. 2016, 2020).

Cocreation, the collaborative creation of solutions, is considered an antecedent of satisfaction (Nadeem et al. 2020; Sales-Vivo et al. 2020). Such satisfaction could have an impact on the gap evaluated when assessing service quality.

The impact of satisfaction on the city changes in accordance with an implementation of services. Citizens that are not happy with city services such as transportation, amenities and environment will report dissatisfaction with the city. However, citizens that are satisfied with security show an impact on satisfaction with the city in comparison to other areas of service such as transportation, amenities and environment (Mouratidis 2021; Weziak-Białowolska 2016). These aspects are especially important when developing a plan for urban space and considering the diverse issues that the space should provide to the residents and visitors.

3.4.1 Citizen Engagement: Geodesigning the Neve Sha'anan Neighborhood

Citizen engagement is both a concept and a set of methods used to attract citizens to participate in the planning process as will be further described in relation to the Neve Sha'anan neighborhood.

Neve Sha'anan is a neighborhood located at the southern part of Tel Aviv Yafo. This neighborhood founded in 1921 has evolved into one of the most complex neighborhoods in the city, characterized by overcrowding, neglect and crime. Neve Sha'anan is populated by communities of low socioeconomic status. An estimated 15,000 people live there, of which 10K are undocumented residents, refugees, asylum seekers and foreign workers.

The Neve Sha'anan project discussed in this chapter is an interesting case study that uses Geodesign to engage citizens. Geodesign is an approach to urban planning and design processes that combines geospatial analysis, design and collaborative decision-making (Ashery and Steinlauf 2018; Haddad 2015; Steinitz 2012). These include surveys, consultations and cocreation (Davis et al. 2021). The Geodesign workshop as it was performed in Neve Sha'anan (see Chap. 5) is an interesting case study for examining citizen engagement as it encapsulates all constructs of the model. The following paragraphs will review the theory of citizen engagement as it is manifested in this case study.

3.4.1.1 Citizen Engagement

The engagement of citizens (as well as other stakeholders) can be examined and assessed by their contribution and dedication to the workshops they participate in and their involvement in articulating the priorities of the group that they represent. In bringing these priorities and insisting on the ones important to them to the negotiation discussions, they demonstrate their level of engagement. The Geodesign methodology allows citizens to engage in the planning process and create a planning solution that is in line with their values and beliefs. Citizens in the process are equal partners along with other stakeholder groups that contribute to the decision-making of the final planning solution created. The voice and opinions of the citizens are kept throughout the planning process and their impact on the planning process is significant. The citizens' work is in collaboration and communication with the government officials participating in the design. The consensus map that the process leads to shows the influence of the citizens. In initiating a collaborative process of design, the local government commits to smart cities and smart governance methodologies.

In literature, citizen engagement has been associated with well-being and quality of life. The next paragraph will review how the implementation of Geodesign as a citizen engagement methodology contributes to well-being and quality of life.

3.4.1.2 Well-Being and Quality of Life

Assessing well-being and quality of life is a complex task as an outcome of the Geodesign planning process. Indeed, this outcome is a plan that has been accepted by all stakeholders participating in the planning. However, until its implementation, it only illustrates the vision or wishes of those involved for the best option plan. Although well-being may be affected by collaborative planning itself, it should be considered that the ultimate goal of any planning process is the implementation of the plan.

Research shows that the level of agreement for a plan is related to the likelihood of its implementation (Steinlauf-Millo et al. 2021). Nevertheless, for the decision-making process to be completed, might require the consequent acceptance of the plan to implement and consequently the implementation itself. These are expected to influence the quality of life of the citizens living in Neve Sha'anan or any other area planned to use the Geodesign methodology.

3.4.1.3 Place Attachment

The place, its features and its functionalities are at the heart of the Geodesign process. The concept encapsulates the idea that all stakeholders have a say in the development of a plan for a specific location that would address their needs and wants to create a better living environment. The function of a place is addressed in place attachment by place dependence. While the identity of the place may be paramount for citizens

that look to impact their community and interact with others both within and other stakeholders to introduce their wishes to the new plans.

Although most literature on place attachment discusses place identity and place dependence (Boley et al. 2021; Woosnam et al. 2018), there is some evidence to suggest that connection with the community increases place attachment (Lewicka 2011). Collaboration using the Geodesign methodology in GDH studios creates an opportunity for citizens to connect with their communities and neighbors when planning an urban space that serves them. Moreover, the merging of groups that is done during the different iterations of the process exposes them to other stakeholders in the area such as business owners, government officials and others that enable them to have an even greater interaction with peers and increase their social network that revolves around the area.

3.4.1.4 Satisfaction

Satisfaction is a sense of delight that reflects the level of expectations met. In Geodesign, the methodology designs a process which is navigated toward developing a plan that meets the expectations of the participants by negotiation between them on the issues important to consider in the area as well as to the group that they belong to. Each stage of the process results in a consensus map and prioritization of the discussed issues that impact the area.

However, since the plan does change through negotiations, and the final result is indeed a compromise that was reached by all parties involved in the process, it is worth considering that there should be an assessment of the satisfaction level of the participants after several rounds of planning and merging of groups. It is especially intriguing to discover whether the changes in the results of each stage are reflected in the satisfaction levels of the participants or, whether the fact that the changes were made through a process of acceptance by participants has an impact on the satisfaction that stays the same.

The Geodesign platform also allows separate evaluation of satisfaction for citizens from the urban space. This feature allows the assessment of satisfaction during the different stages of the process.

Place attachment and satisfaction are motivational constructs that are emotionally oriented. The construct discussed in the following paragraph relates to the quality of the plan being developed and is considered to illustrate the cognitive route.

3.4.1.5 Service Quality

The Geodesign process promotes a solution that is based on acceptance and agreement by all participants involved. The expectations of all stakeholders are woven throughout the process from the first draft created separately by each group to the final unified urban plan. Beginning at the preliminary stage when the groups are formed, participants are divided into groups according to their different identities, citizens,

government officials, planners, etc. Such a division is aimed at creating closeness of interests inside each group. In the next step, each of these groups performs an internal discussion about their needs and requirements. The result is a consolidated vision of the group's priorities and maps regarding the designated area. In the following stages, each group is teamed with another stakeholder group that is closest to it in its prioritization. The new team negotiates a consolidated vision that considers all their previous separate expectations and priorities and adapts them through discussions and negotiation. The outcome of this stage, again, is aligned with the original expectations of those participating in both groups. Using GDH enables tracing of changes from each stage to the next. Although each iteration of the process and teaming of new and bigger groups has an effect on the original plan, these changes are sewn to the final plan by discussion and acceptance of participants of the changes. Thus, leading to a result that meets the expectations of participants. The linkage created in the Geodesign process between the original plan and the outcome should ensure that the gap Parasuraman et al. (1985) assesses will be kept as minimal as possible and increase service quality.

3.5 Conclusion

The growing increase in population in cities has motivated city managers to seek new governance and management methodologies to enable effective functioning that contributes to well-being and quality of life. One of these methods is citizen engagement which promotes the citizens into bringing their voices into the decision-making process in the city.

This chapter used the case study urban planning of Neve Sha'anan neighborhood in Tel Aviv Yafo that implemented Geodesign methodology using GDH to engage citizens and demonstrate the considerations for citizen engagement theory. It characterized the elements of citizen engagement in urban planning and Geodesign and proceeded to propose the theory for citizen engagement relation with well-being using these elements.

This analysis shows the rationality of the three proposed mediators in explaining the relationship between citizen engagement and well-being. These mediators include satisfaction, place attachment and service quality. While the first two are motivational constructs referring to the emotional connection with the process, the latter is a cognitive construct that refers to the merit of the result. The chapter also indicates why engagement should be assessed according to the emotional attributes rather than the behavioral ones of participation.

However, this analysis sheds light on issues that require further investigation by scholars. The main issue that requires attention involves the participants that choose to take part in the citizen engagement initiatives. To gain the community's point of view on the matter of engagement, organizers ensure that a balanced representation of residents will participate. Such a balance should consider gender, age, economic status, homeowners and renters. In Neve Sha'anan, such considerations also include

the documented and undocumented residents as well as subcommunities and ethnicities living in the area. Nonetheless, it raises the question of whether only those residing in the neighborhood should be invited to the discussion. Indeed, urban space has a major effect on those living in the neighborhood. Nonetheless, future research should consider whether residents of adjacent neighborhoods using the area should also take part in the process.

Another topic that requires elucidation that specifically arises from the case of Neve Sha'anan is the differences in place attachment for different types of residents and how these differences impact the relationship between citizen engagement and place attachment. Much work has been done on factors for place attachment considering differences between tourists and residents (Aleshinloye et al. 2021; Romão et al. 2018; Woosnam et al. 2018) as well as on citizen engagement with tourists (Buonincontri et al. 2017; Mathis et al. 2016). Scholars have also considered differences between short-term and long-term residents in place attachment (Weziak-Białowolska 2016). However, Neve Sha'anan residents have different types of connections to the area since some of them are documented residents and citizens while others have another legal standing (Flint Ashery and Steinlauf-Millo 2021, 2022). Nonetheless, undocumented individuals have community connections and a vested interest in the area that may also impact their place attachment as well as their citizen engagement considerations.

One thing that is clear is that different stakeholders have different considerations when developing a plan, and it is worthwhile to collaborate with relevant stakeholders to gain insights that benefit the result.

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Part II
Geodesigning Holistic Planning

Chapter 4
Geodesigning Neve-Sha'anan, Tel Aviv-Yafo: Adapting to Climate Change Through Negotiation and Collaborative Planning

Rinat Steinlauf Millo

Abstract This research examines the role of digital negotiation in capturing and fostering comprehensive, inclusive, efficient and responsible planning processes that consider climate change impacts on the urban fabric. The study focuses on Geodesignhub (GDH), a digital interface for collaborative planning, as a method for examining the challenges and opportunities inherent in the deep involvement of the public in digital planning processes. Tel Aviv-Yafo's Neve-Sha'anan neighbourhood provides an example of a dense urban fabric which, due to institutional, planning and socio-economic factors, has become a complex and neglected area suffering from air pollution and rainfall flooding hazards. This study examines the current situation and reveals how a transparent, continuous digital feedback process enables deep stakeholder engagement, while pursuing agreements through digital negotiation.

Keywords Geodesign · Digital negotiation · Climate change · Adaptation · Urban planning

4.1 Introduction

Planning strives to link scientific and technical knowledge with human actions in public space and guides future actions in space (Friedman 1987; Alexander 2016). The planning process is determined by systemic structural factors, regulates and organizes spatial competition (Cullingworth and Nadin 2006; Wilson et al. 2019) and mediates between the conflicting interests of the various stakeholders (Kiernan 1983; Forester 2006; Ruming 2012; Baarveld et al. 2015). However, how negotiation processes can facilitate climate-adapted urban planning is not yet fully understood.

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This research aims to examine how negotiation and collaborative planning can be promoted by planning support systems (PSS) to foster agreed-upon planning that reduces the present and future climate change impacts on the built environment. Studies have shown that to reach agreements, a negotiation procedure can involve several parties having a dispute trying to resolve it through communication (Lax and Sebenius 1986; Claydon and Smith 1997; Fisher et al. 2020). With the development of digital planning, a trend is developing in the western world that sees the planning process as dynamic and continuous. As part of a comprehensive planning process, development goals and objectives for the planning area are formulated through feedback process. Design alternatives are formulated via this process, offering efficient solutions responsive to changing circumstances, aided by simulations predicting future scenarios (Hall and Tewdwr-Jones 2010). Creating alternatives through negotiation, comparing them, and evaluating future scenarios can produce an optimal planning system responsive to future changes. To enable fair negotiations, this system requires transparency and involvement of various stakeholders and decision-makers who update the goals and objectives to address evolving needs and local dynamics.

Based on urban data and insights, this research examines using Geodesign to reach agreements through negotiation around fundamental issues. A knowledge gap persists between planning practice and using negotiation to promote planning, partly due to the theory-practice gap in planning (Steinlauf-Millo et al. 2021). A number of researchers who have examined the theory-practice gap in planning explain that planning involves creating reality in the physical space, whereas theory deals with abstract concepts that are difficult to translate into specific planning actions, therefore it progresses simultaneously and separately (Kiernan 1983; Alexander 1997; Thompson 2000; Willson 2001; Kudva 2008; Watson 2008; Allmendinger 2017). Incorporating Geodesign into a practical planning process that addresses the fundamental issue of climate change, we can strengthen the connection between theory and practice. With regard to the chosen case study, the complex and neglected Neve-Sha'anan neighbourhood in Tel Aviv-Yafo, the research examines the role of digital negotiation in the planning processes. The study describes the theoretical aspects and elements of the method. It also describes its potential for enabling adoption of a comprehensive and critical digital process for the neighbourhood. The research discusses how planning teams break down their experiences and preferences into agreed-upon ideas while considering broad and local contexts, especially regarding climate change. This process aims to involve various stakeholders and promote extensive public participation in generating sustainable development planning alternatives. Through negotiation and by creating, comparing, and evaluating alternatives and future scenarios, an optimal planning system responsive to future climate changes can be developed. Critically, this system is transparent and involves various stakeholders and decision-makers who address evolving local needs.

4.2 Theoretical Background: Negotiation in Planning

Development, Transportion, landscape, preservation of buildings, public policy, economy, society, culture, environment and ecology are only some of the areas integrated into the planning process. These are each represented by different stakeholders, professionals, community members and politicians. With the multitude of fields, opinions and actors involved, the decision-making process in planning has become difficult (Shmueli et al. 2008; Samsura et al. 2010; Baarveld et al. 2015). Consequently, the planners role has become very complex. In addition to planning, they must also mediate and find compromise between diverse interests and professional, political and social opinions (Shmueli 2005). In fact, planning is a joint decision-making process which progresses through negotiation (Shmueli et al. 2008).

Several urban planning researchers have recognized negotiation's role and importance (Faludi 1985; Susskind and Cruikshank 1987; Forester and Stitzel 1989; Healy 1997; Claydon and Smith 1997; Verhage and Needham 1997). Many emphasize negotiation's importance for decision-making in a broad collaborative planning system (Healey 1997; Hoch 2002; Shmueli et al. 2008; Ruming 2012). For example, in "collaborative planning: shaping places in fragmented societies", Healy proposes a joint planning procedure to build agreements that strengthen the integrative nature of planning. The goal is to enable planners to reconcile social forces ranging from globalization to local public opinion (Thompson 2000). The theory of negotiation in planning developed from communicative planning. Researchers realized "dialogue" or "conversation" represent only part of the communication needed in the planning process (Sager 2013), and that "discussion" and "negotiation" are required to enable optimal planning and reflect planning in the real world (Baarveld et al. 2015).

Susskind and Cruikshank (1987) pioneered the study of negotiation in urban planning. The collaborative planning approach is a consequence of their work which drew inspiration from Fischer and Ury's (1981) definition of principle-based negotiation and attitude-based bargaining. They recognized interdependent parties in all planning decisions, highlighting that promoting joint decision-making processes like negotiation ensures mutual gains (Shmueli 2005). Later, Gresch and Smith (1985) recognized that negotiation contributes to the management of conflicts in legislation at the national level, while Sheldon and Claydon (1990) engaged in a systematic study of negotiation processes in local authorities (Claydon and Smith 1997). Over the years, urban planning researchers have defined negotiation variously (Baarveld et al. 2015). Lax and Sebenius (1986) define negotiation as a process where conflicting parties interact to cooperate and achieve better outcomes than non-cooperation. By focusing on cooperation's potential improvement, they emphasize its importance. In other words, compromise's whole exceeds the sum of its parts. According to Fisher et al. (1991), negotiation is a basic means of getting what you want from others through back-and-forth communication, the goal of which is to achieve an agreement when the participants have both common and conflicting interests. They emphasize both joint communication and individual results. Claydon and Smith

(1997) describe negotiation as a process were parties attempt agreements, distinguishing negotiation itself from bargaining or compromise which can be part of the negotiation process but are not the negotiation itself. Ruming (2012) defines negotiation as a process in which elements of plans and of development are traded in an effort to ensure a result. All definitions involve adversarial parties requiring agreement to ensure an outcome. However, only Ruming centers the planning process itself in his definition.

Baarveld et al. (2015) identify several common elements across the above definitions: (1) At least two dependent actors are involved in the process; (2) They have divergent interests; (3) There are conflicts between them; (4) They have several common interests; (5) They communicate; (6) They strive to reach agreements. The authors specify two negotiation approaches: integrative and distributive. They claim real-world negotiation combine both approaches, examining negotiation processes from two Dutch urban renewal projects (Baarveld et al. 2015). Within pathes towards mutual agreement, forming shared aspirations and declaring intentions are both essential.

When planning complex areas with difficult stakeholder conflicts, like within existing neighbourhoods, dialogue or discussion are insufficient. Negotiation is needed to yield binding agreements and compromises (Baarveld et al. 2015). Therefore, Ruming's (2012) definition is most relevant for examining how negotiation can promote pre-agreed planning. His definition, situates negotiation within the planning process itself, focused on ensuring outcomes or final design versions.

Public involvement in planning is just emerging in Israel, and planning negotiations are still in their infancy (Eshkol and Eshkol 2017). Israeli planning law does not require a process of public participation or collaborative planning, only plan publication for approval. Public participation processes, if existing at all, are promoted on a voluntary basis by planning institutions (Shmueli 2005). Over the past 20 years researching the Israeli field of public participation in planning, Shmueli concluded willingness exist, yet input minimally influences final decisions and plans. In a 2005 article, she examined the Israeli planning system's readiness for collaborative planning by analyzing different types of public participation processes of three district plans. Despite willingness for public participation, opinions remained insignificant affecting ultimate planning. Shmueli et al. (2008) claim that since planning entails joint decision-making, planners can benefit from using negotiation theory to advance their goals. The authors advocate negotiation procedures in planning to improve planning decisions and thereby increase implementation probability.

Tel Aviv-Yafo Municipality is a pioneer in the field of public participation and collaborative planning in Israel. Since 2005, the city has operated a "municipal program for public participation, with the goal of encouraging an organizational culture that supports public participation and assisting municipal units in implementing participation processes" (Tel Aviv-Yafo Municipality website). In the field of urban planning, the municipality follows a "procedure for consultation with the public in urban planning processes" designed to engage the public in the early planning stages. This public consultation procedure is mandatory and incorporated into every upcoming urban plan, aligning with the recommendations of urban planners

and receiving approval from a special municipal committee. However, the procedure does not explicitly address the existence of a negotiation process between stakeholders as an integral part of public participation. Additionally, there is no established process for integrating the voices of undocumented populations (Flint Ashery 2023). As the next step in researching planning negotiations, it is necessary to examine how these processes can be optimized using planning support systems (PSS). The next section introduces the GDH interface as a prototype for PSS systems. This system, has been selected as a case study in this research to assess the capability of a planning support system in optimizing planning processes and promoting pre-agreed planning through ongoing negotiations.

4.3 Geodesign and Planning Support Systems (PSS)

The Geodesign method enables negotiation and collaborative planning in urban planning. The origins of the term "Geodesign" date back to the beginning of human settlement when people chose to live near water sources, attempted to control nature, and create and sustain a rich and diverse world that includes social structures and political dynamics. A significant impetus to the subject was given in Steinitz's article from 1990 (Steinitz 1990), in studios and workshops, in which he defined a methodological and theoretical framework situated at the intersection between planning practice, geographical sciences, information technologies and the "inputs of local residents", to continue an organic process of growth (Steinitz 2023). After the 2000s, Geodesign became one of the most popular approaches to sustainable digital planning (Wilson 2015). In collaboration with Prof. Michael Batty, Prof. Carl Steinitz supervised Dr. Hrishi Ballal in his doctoral thesis, in which Ballal provided a practical framework for collaborative design through a digital web-based workflow based on a systems approach. From this work developed an interface called Geodesignhub.com (GDH), a computerized support system for planning (PSS).

An early definition of planning support systems was provided by Harris (1989), who described PSS as "spatially-enabled information systems integrating Geographic Information Systems (GIS), models, and user-friendly geovisualization interfaces—including sketch planning functions and dynamic dashboards—supporting the planning process". According to Harris, such a system will support the planning process and will not be satisfied with one of the characteristics, but will strive to answer all of the requirements. Harris's article remains groundbreaking even today, as it defines the need of the planning domain for a system that provides a fully digital platform for planning. Since then, many PSS have been created, mostly focusing on knowledge creation or impact assessment aspects of the planning process (Flint Ashery and Steinlauf-Millo 2021, 2022; Flint Ashery and Steinitz 2022).

The innovative GDH fully aligns with Harris's definition. GDH was developed as a digital internet interface for planning, aimed at fostering collaborations and negotiations among professional teams and their clients, policy-makers and the general

public. The interface is utilized to generate design alternatives as a response to changing circumstances, actively measuring and comparing their effects. Continuous updating of the planning alternatives during negotiations results in a dynamic circular planning process that is frequently updated as the planning area develops. Simulations for real-time assessment and future forecasting enable decision-makers at the relevant public level to actively participate, regularly and transparently update goals and objectives to meet changing needs. The system is adaptable to various scales, allowing the introduction of local knowledge from the public, combined with insights and lessons derived from big data. Despite the extensive knowledge behind the system, the user interface is simple, and using the system does not require prior knowledge. This enables policy-makers, professionals from different fields, and the general public to collaborate using a common planning language, promoting communication, objectivity, transparency and responsibility towards future generations, as well as fostering the accumulation of local knowledge for "good planning".

GDH is a practical framework for collaborative planning through an open digital workflow based on a systems approach. The software offers flexibility and infrastructure that actively supports the drafting of plans and planning procedures, facilitating collaborations between professional disciplines and the public (Goodchild 2010). As demonstrated in the research, DGH enables the advancement of complex planning procedures subject to dispute through negotiation.

Commonly employed for public policy and urban planning purposes, GDH addresses areas such as infrastructure investments, environmental management and climate change adaptation (Nyerges et al. 2016). This software serves as a mediator and negotiator for socio-political issues related to location, allowing a focus on results and proposing planning strategies that contribute to the establishment of sustainable communities. GDH's unique developments and tools enhance negotiation and collaboration capabilities. The integration of project management interfaces and collaboration tools within GDH ensures the implemention of negotiation results and transparent coordination of associated activities.

4.4 Neve-Sha'anan Neighbourhood

Neve-Sha'anan was established in 1921 based on the principles of the garden city, designed in the shape of "The Menorah" (temple lamp), being one of the initial Hebrew neighbourhoods formed in the southern part of the expanding city of Tel Aviv (Fig. 4.1). From its inception, Neve-Sha'anan has struggled with various organizational, spatial, social and economic challenges. In particular, the division between two municipalities—Tel Aviv and Jaffa—until 1950, resulted in distinct development trajectories for the north and south areas of Neve-Sha'anan (Fig. 4.2). These differences are reflected in master plans which contradict the ideals of the neighbourhood as a "garden city" and in the absence of open and built public spaces. Over time, the area has evolved into one of the city's most complex regions.

Fig. 4.1 Neve-Sha'anan 'Menorah' layout, Tischler Josef, 1921

Neve-Sha'anan, characterized as a dense inner neighbourhood, stands as a "limit case", marked by marginalization and neglect. Covering a surface area of 760,000 m^2, Neve-Sha'anan comprises 2% green public areas and 3% built public areas. With a diverse population of approximately 15,000 residents, including various ethnicities and financial backgrounds, the neighbourhood is home to many foreign workers, refugees and asylum seekers. Official statistics from the Central Bureau of Statistics (CBS) and Tel Aviv Socio-Economic Research Centre (SERC) indicates approximately 4,900 documented residents and an additional 9,000–10,000 undocumented foreign residents, encompassing family members. According to the socio-economic index used for population classification in Israel, considering factors like demography, education, income, and employment, the socio-economic status of Neve-Sha'anan rates at 3.6 out of 10, with an average monthly income of 3,124 shekels per capita, excluding the undocumented foreign communities (SERC Statistics 2013). In comparison, the socio-economic status of the entire city's population is 8 out of

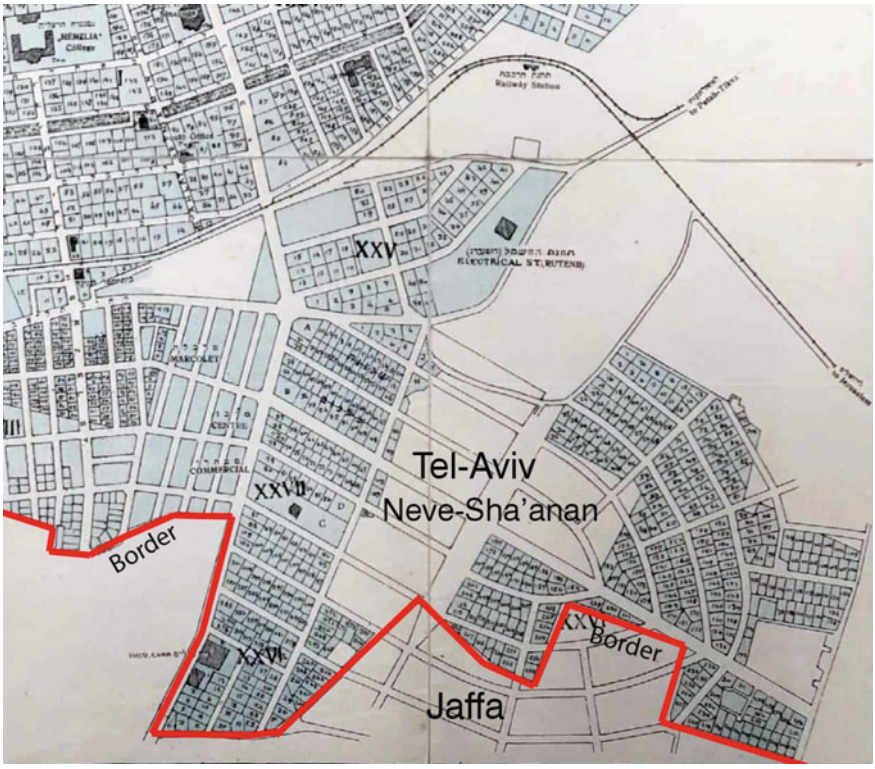

Fig. 4.2 Border between Tel Aviv and Jaffa dividing the "Menorah" layout, Tel Aviv map, Sheinfeld, 1923

10. Moreover, the neighbourhood has relatively high levels of crime, prostitution and drug use. Given the juxtaposition of high levels of neglect on the one hand, and accelerated development on the other, the neighbourhood presents an interesting case study for examining climate change effects and adaptation measures in a compact area primarily driven by private development initiatives.

As examples of these private initiatives, there are two problematic central bus stations. The "old central station", constructed in the 1940s in the northern part of the neighbourhood, was built on land donated to the municipality in exchange for the right to develop a commercial centre. This resulted in the establishment of a bustling and hectic commercial zone in the vicinity. The "new central station", located in the southern part of the neighbourhood, was constructed between 1967 and 1993, covering an area of 240,000 m^2 dedicated to transportation and commerce over seven floors. The construction of the new central station disrupted the delicate urban layout of the "Menorah plan" due to its substantial size, and noisy and busy nature, and the introduction of harmful pollutants into the neighbourhood (Fig. 4.3). Presently, Neve-Sha'anan is undergoing significant transformation owing to urban

renewal plans, coupled with private initiatives, which could result in an additional 1,500,000 m^2 of built area and approximately 7,000 residential units.

The combination of a complex and neglected urban area undergoing extensive urban renewal positions this neighbourhood as an excellent case study. It provides an ideal context for investigating the efficacy of Geodesign as a tool to promote the initial planning process in a conflicted area.

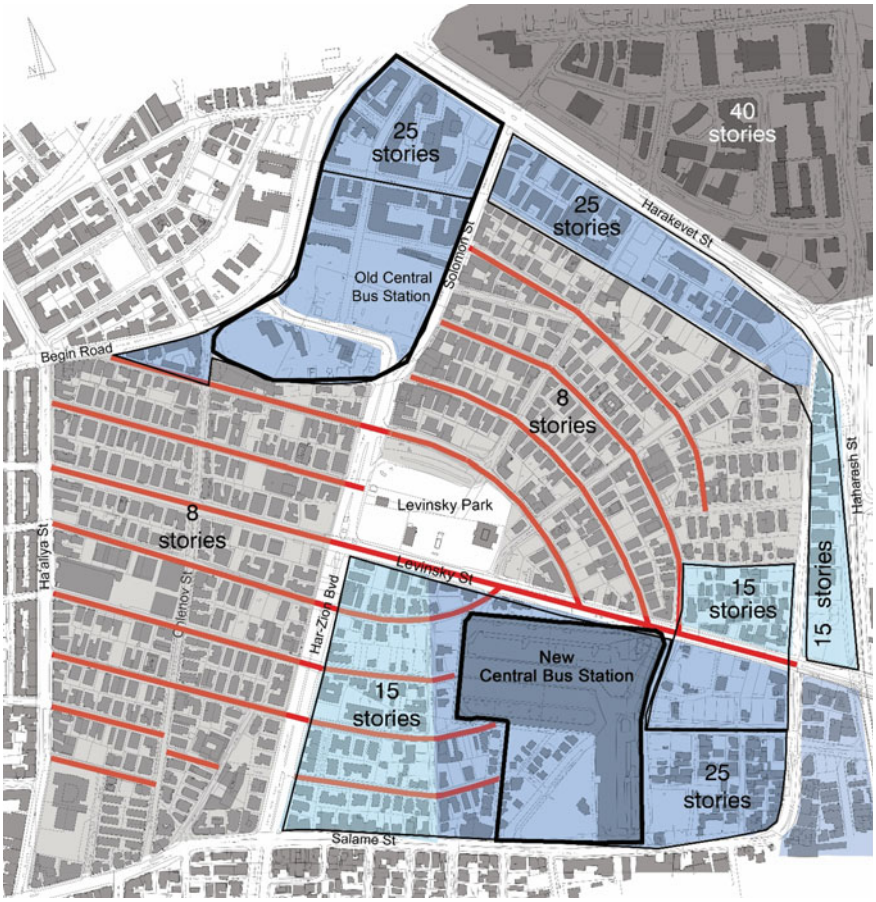

Fig. 4.3 Outlines of the Menorah plan, the old and new central bus stations on a buildings heights map of Neve-Sha'anan. Steinlauf-Millo, 2023

4.5 Methodology

The methodology employed in this research is rooted in Steinitz's method as formulated in his 1990 article and his 2012 book "A Framing for Geodesign: Changing geography by design" (Steinitz 1990, 2023). Steinitz's method establishes an infrastructure for planning based on a specific geographical location, enabling the active participation of a large number of stakeholders in the planning process. As described above, this methodology was digitally transformed by Ballal into the GDH interface. The GDH system was utilized in two planning workshops that engaged 24 representatives from various fields relevant to the planning area. During the workshops, participants were organized into four interest groups, each proposing planning alternatives for the Neve-Sha'anan neighbourhood according to their initial interest. After a process of presentation and selection of potential partners, the four interest groups merged into two new groups. Through a negotiation process, these groups arrived at a new collectively agreed-upon alternative. In the final stage, all source groups were consolidated into one large group, collaboratively planning the final agreed design alternative for the Neve-Sha'anan neighbourhood.

The workshops placed emphasis on realistic planning, aiming for a high level of implementation feasibility. The overarching objective was to create a robust planning and decision-making tool tailored to the complexities of the ongoing planning process in the area. The primary goal of these workshops was to formulate a planning alternative geared towards doubling the population from the current 15,000 people to an anticipated 30,000 people expected to reside in the Neve-Sha'anan neighbourhood by the year 2035.

4.6 Research Findings

The technological leap over the last decade in the realms of communication and data have enabled the integration of climate change research with the theoretical and practical domains of urban planning. The two Geodesign workshops focused on the future planning of the Neve-Sha'anan neighbourhood, drawing the participation of 24 individuals from diverse disciplines. This interdisciplinary team included city planners, architects, community representatives, and environment and sustainability experts, representing the four key stakeholder teams relevant to the Neve-Sha'anan neighbourhood: government and municipality, business and entrepreneurship, community, sustainability and the environment.

Following the Geodesign workflow, both workshops involved stakeholder teams creating their initial design versions based on the defined priorities of each specific team. The negotiation phases followed next. The first negotiation phase in workshop 1 led to the collaboration of the sustainability and environment team (ENV) and the business and entrepreneurship team (BEOD), while the government and municipality team (AGOV) partnered with the community team (COM). Conversely, in workshop

2 the negotiation phase resulted in collaboration between the BEOD and COM teams versus the AGOV and ENV teams.

Following the final round of negotiations, all teams in both workshops collaborated to formulate the final design version. The final design alternative of workshop 1 preserved the neighbourhood's initial "Menorah" layout. The building of the new central station was preserved and repurposed as a centre for energy production and public uses. Mixed uses towers were strategically placed along Har-Zion Ave. Medium-density residential housing was placed in the western part of the Congress area, while mixed-uses structures were placed in the eastern part. The design incorporated public buildings and open green spaces, including the transformation of the new central station's overpass system into a linear park. Policy documents promoting green building, rainwater retention, green roofs and solar panels were integrated throughout the neighbourhood. New bike lanes were established to connect the neighbourhood to the city centre (Fig. 4.4).

The final design alternative of workshop 2 also preserved the neighbourhood's initial "Menorah" layout. Large-scale construction was allocated to the eastern part of the neighbourhood along the Ayalon highway and Harakevet St. The character of the neighbourhood was preserved while accommodating various small-scale initiatives. Agreements highlighting the importance of social justice led to the formulation

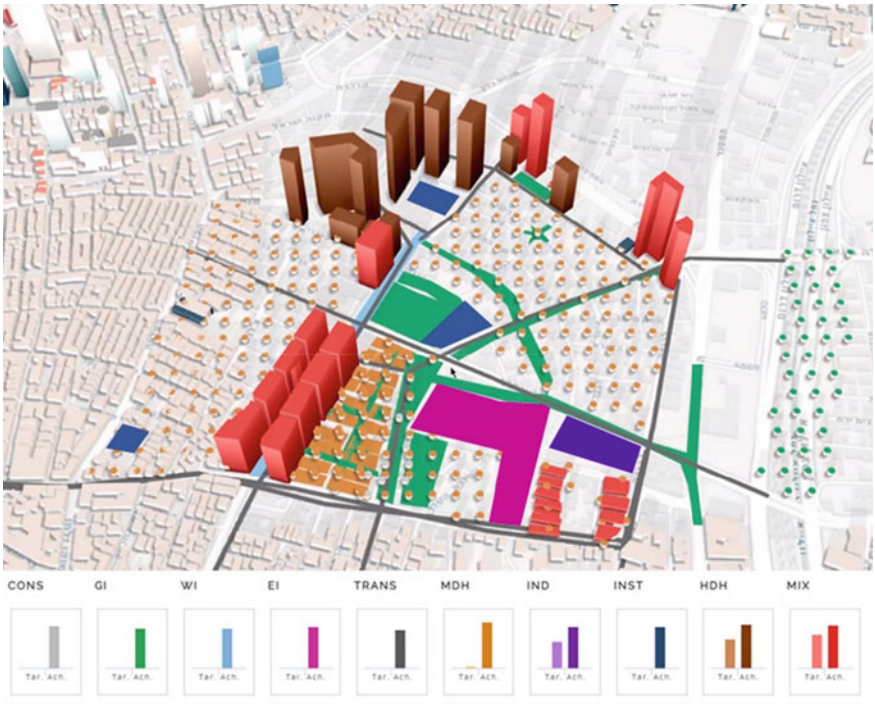

Fig. 4.4 Workshop 1, final design version, 2020

of a building retrofit fund designed to protect rental housing throughout the neighbourhood. The building of the new central station was preserved and repurposed for diverse uses, including public and commercial functions, as well as serving as a green roof. High-density housing, combined with affordable housing and open green public spaces, were strategically placed along Salame St. Preservation efforts included listing buildings for preservation, notably the well-houses (farmsteads), which would serve as cultural centers and water systems. Integration of bike lanes was achieved by incorporating them into existing roads, some of which would be closed to vehicle traffic. The final design also integrated policy documents promoting green construction, green roofs and solar panels on the roofs and facades of south-facing buildings, and a policy for retaining runoff water along Har-Zion Blvd. (Fig. 4.5).

In both workshops, participants successfully achieved the design goals and demonstrated proficiency in utilizing most of the tools of the interface. In both workshops, discussion spanned both macro and microlevel considerations. The participants created policy documents dealing with the existing urban fabric and chose to preserve the neighbourhood's original Menorah layout. In addition, they created policy documents focused on environmental concerns, green construction, sustainability, the preservation of the existing population in the neighbourhood, and strategies for reducing housing prices. In both workshops, the teams addressed climate change issues while incorporating policy documents and projects to address current and future challenges. Green shaded areas were added throughout the neighbourhood and on buildings roofs aimed to reduce the urban heat island affect, and optimize runoff water management to mitigate flood risk. The inclusion of urban agriculture

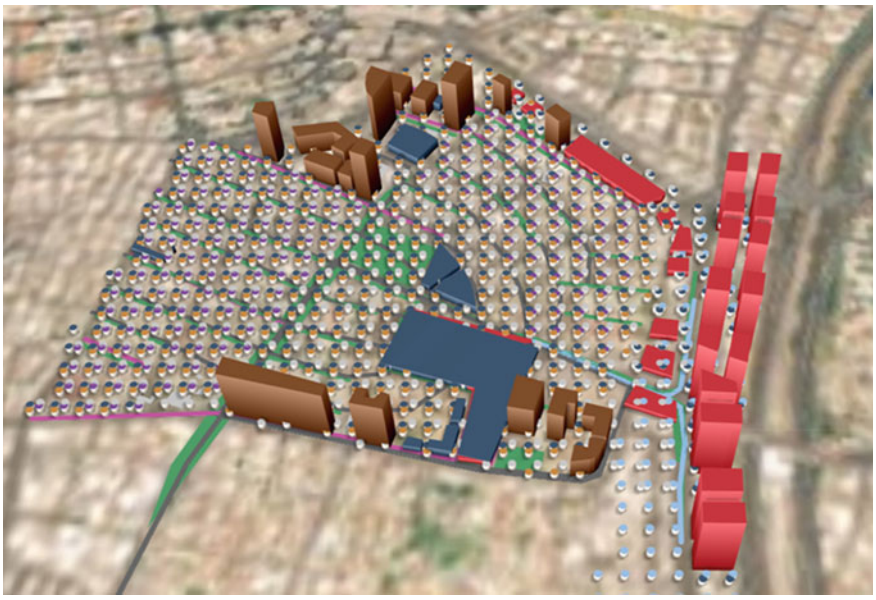

Fig. 4.5 Workshop 2, final design version, 2020

areas was proposed to provide food for the community of low socio-economic status. To reduce air pollution, a proposal was made to eliminate the use of the central station building as a bus station, coupled with efforts to expand sidewalks and bike lanes to encourage non-motorized travel. Policy documents were introduced to incentivize the retrofitting and energy efficiency of existing buildings, aiming to prevent unnecessary demolitions which could contribute to environmental damage. Controlled increases in construction volumes in defined areas were suggested to avoid damage to sensitive areas. Furthermore, policy documents and renewable energy production projects were allocated throughout the neighbourhood.

The final outcomes of the two workshops divide the neighbourhood into several planning complexes, as indeed occurs in practice. The proposed addition of buildings along both main and peripheral streets, coupled with substantial construction in the eastern (Lavanda-Haharash) and the southern parts of the neighbourhood (along Salame Road and the Congress complex), as well as in the northwest (the Shomron complex) concur with the strategic plans for the neighbourhood. At the same time, both workshops strived to re-unify the neighbourhood both socialy and cognitively by preserving the original street layout of the Menorah plan (with the exception of the new central station), preserving the original parceling in the north of the neighbourhood, proposing economic solutions for the restoration and renovation of existing buildings and preservation of heritage buildings.

In both workshops, participants chose to incorporate the approved master plans into the final design alternative, even if they had reservations about them. In both workshops the issue of the insufficient open and built public areas was central. In both cases, participants chose to increase the inventory of open and built public areas, benefiting both existing and new communities. Extensive open spaces, pocket gardens, linear parks, bicycle lanes and public transportation routes were added to enhance connectivity within the neighbourhood and promote mobility and accessibility for all residents in the neighbourhood. Furthermore, in both workshops, participants chose to transcend the boundaries of the neighbourhood, foregoing the designated boundaries ("blue line") of the plan and considering additional areas to achieve the desired goals. This approach is impossible in traditional planning, which is constrained by boundaries influenced by factors like source plots, costs, and land designations, making it incompatible with the optimal planning procedure. These collaborative planning processes that factor in climate change effects, as well as social and economical aspects, are expected to mitigate potential hazards in the future development of the neighbourhood.

4.7 Discussion

Serving as prototype for a planning support system (PSS), GDH proves to be suitable tool for promoting the initial planning process in conflicted areas, particularly those requiring negotiations among numerous stakeholders to achieve comprehensive agreements. The GDH interface enables the generation of multiple digital map-based planning alternatives simultaneously by different stakeholders. It allows a detailed comparison of these alternatives, emphasizing their advantages and disadvantages. Subsequently, the GDH interface supports collaborative planning through discussions, and the formulation of a unified, agreed-upon design. This final planning alternative forms the basis for a more advanced urban plan that takes into account anticipated climate changes and proposes adaptation solutions.

Neve-Sha'anan, a complex neighbourhood in Tel Aviv-Yafo, is subject to an ongoing conflict. Therefore, it serves as an excellent case study for examining the use of Geodesign, as a tool to conduct the initial planning process in a conflicted area. The conflict that the neighbourhood faces between rapid development and the desire to preserve architectural and social values, was reflected in the negotiation process facilitated by GDH. Through GDH, the participants achieved a consensus regarding the necessity for extensive development in the neighbourhood, outlining specific areas conductive to development while concurrently preserving the overall layout of the neighbourhood. During the workshops, GDH enabled placing the design ideas of the stakeholders in the relevant areas, creating a visually accessible representation. Moreover, the interface enabled a negotiation process during which decisions were reached regarding the preferred design alternative, gaining agreement from the majority of participants.

The two workshops focused on the Neve-Sha'anan neighbourhood, were attended by city planners representing municipal interests, entrepreneurs, residents, and environment representatives. These diverse stakeholders held opposing perspectives regarding the future planning of Neve-Sha'anan. However, the workshops fostered a constructive dialogue and negotiations that ultimately resulted in the development of policy documents and projects addressing climate change. Importantly, these initiatives garnered acceptance from all participants and were integrated into the final planning alternatives. The fact that issues related to climate change were central to the consensus, without dispute, significantly enhances the potential for successful implementation of climate change adaptation strategies. This solidifies a foundation for the approval of future planning initiatives, gaining support from all stakeholders involved.

The workshops highlighted that the ability to visualize the entire neighborhood area on the GDH interface and address all dilemmas and challenges facing planners simultaneously and in real-time fosters collaborative and inclusive planning. This approach enables a comprehensive examination of the entire area and its potential, contributing to a more holistic and informed decision-making process.

4.8 Conclusions

This research focuses on the ability of collaborative planning and negotiation to facilitate agreed planning solutions in addressing the impacts of climate change. The research employs a structured methodological procedure and a prototype for a planning support interface to illustrate how future planning of a complex urban area, undergoing accelerated development processes, can be promoted through a short and focused procedure of multi-participant negotiation procedure.

The research explores the use of digital technologies to establish a method for substantial collaborative planning, shifting the emphasis from the planning product to the negotiation process as the critical step in the urban planning process. Geodesign, a leading decision-making approach (Steinitz 2014, quoted in Gottwald et al. 2020), is highlighted as an optimal digital means for decision-led planning processes and negotiations, particularly DGH, which is based on Steinitz's methodology.

Conducting a comprehensive and critical digital planning process through GDH workshops resulted in a decision-making procedure that assists teams in breaking down thoughts into practical ideas, forming a common language, and maximizing planning potential while considering both broad and local contexts. This inclusive process, involving various stakeholders, enables agreements on fundamental issues, such as climate change, during negotiations and promotes agreed planning based on empirical knowledge and information.

The case study presented demonstrates a relevant example of digital planning that contributes to existing urban planning methods, emphasizing the practical and negotiable aspects through technology. The Geodesign interface allows for immediate placement and display of the planning product in its geographical context, enabling the examination of short and long-term consequences, updating planning alternatives, comparing options, and selecting the best alternative for diverse stakeholders. Therefore, this interface provides a continuous feedback planning process that enables ongoing examination, self-criticism, repetition, and correction of planning processes, optimizing the planning process and improving the final planning products.

The future management of cities, infrastructures and residents will have a digital component. To enable this digital transition successfully, it is imperative to understand the organizational implications that come with it. The purpose of the workshops is to encourage thinking with a spatial–temporal dimension, flexibly and efficiently, about the future of the Neve-Sha'anan neighbourhood through planning alternatives based on projects and policy documents. The workshops serve as an illustration of strategic thinking on complex issues like climate change, demanding negotiation processes for resolution. The ability to foster consensus through a shared process often acts as a mediating tool to address challenging differences among stakeholders. Traditionally, this process is manual, requiring a substantial amount of time, effort, and technical analysis. The introduction of a digital process in these workshops has the potential to expedite the procedure, providing transparency and critical understanding in preparation for decision-making.

The central question pertains to Geodesign's potential contribution to Israeli planning and its seamless integration into the current system. While acknowledging the necessity for additional research to tailor Geodesign to Israel's planning system and align Israeli planning with digital planning systems, this undertaking is deemed a pivotal and indispensable step in the advancement of planning practices.

The future has arrived, and the digital component in the management of public investments in cities, infrastructures and citizens is expected to become more and more common. To bridge the technological gap effectively, there is a pressing need to systematically comprehend the meaning and organizational implications of the digital planning process. The central focus should be on understanding how the negotiation process is embedded into planning, and identifying opportunities to incorporate technological methods into this process. This understanding becomes pivotal in shaping the future landscape of planning activities and stands as a cornerstone of the planners' skills in future.

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Chapter 5
Digital Collaborative Planning as a Path Toward Holistic Planning: A Case Study of Jerusalem's Beit Safafa Neighborhood

Marianna Sigalov-Klein and Michael Sofer

Abstract This article examines the way citizen science can be harnessed to assimilate sources of knowledge and increase the involvement of local minority populations in planning. The ability of a digital collaborative planning process to bring together diverse sources of knowledge for holistic planning of minority neighborhoods has so far received only partial research attention. This study seeks to add to previous theoretical approaches by using local knowledge combined with "big data" to plan an urban future for Beit Safafa, an enclave Muslim neighborhood in Jerusalem. Data collection was based on a planning workshop with the participation of residents, as well as discussions with representatives of the Jerusalem Municipality and the Ministry of Environment and students in the Department of Geography and Environment at the Bar-Ilan University. Additional data was derived from real-time analysis and simulations of interactive scenarios of evaluation, impact and decision-making in neighborhood planning, using the Geodesignhub platform (GDH). The findings indicate that mixing knowledge sources in a directed way, digital process supports the creation of holistic planning that combines all urban systems. The ability of local knowledge to mediate at the points of contact between the various systems creates a uniform and seamless space. In this way, both the aspiration for democratization of the planning process and an optimal planning product for the residents are achieved.

Keywords Urban planning · Implementation policy · Geodesign · Digital collaborative planning · Jerusalem · Beit Safafa · Muslim population

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5.1 Introduction

Public participation in planning processes is a duty and a civil right. Public participation rests on two main goals: aspiration to democratize the planning process (Bobbio 2019) and striving to achieve the optimal planning product for residents (Gadot 2006). The public participation process constitutes an invitation to the public to take an active part in decision-making processes relating to planning the space in which the community lives. Indeed, planning the space together with the community, using accumulated local knowledge, has been found to provide an optimal response to the needs of those to whom planning relates (Abers 1998). The public participation process benefits individuals, communities and authorities, formulation of policies adapted to the field (Carmon and Alterman 2011), planning that is adapted to different target audiences (OECD 2009), enlisting public support for planned changes, speeding up and optimally implementing plans (Druckman and Alterman 2010), saving resources (Vraneski and Alterman 1994; Cohen 2017) and providing efficient, transparent, reliable and up-to-date information (OECD 2009).

The research literature in this field focuses on the relationship between government and citizens and the level of public involvement in planning (Auerbach 2008; Sagi 2013). Many studies deal with barriers to public participation as a whole, illuminating how barriers of age, language (Aparajita et al. 2011), accessibility and awareness (EIPP 2009) affect the level of public involvement in planning. The struggle for public participation in planning at every level of decision-making raises the demand for a wider range of stakeholders to find new ways of deeply engaging the public (Flint Ashery 2017). As the Fourth Industrial Revolution (IR4) is driving rapid change in technology, patterns and social processes due to increased connectivity and smart automation, the potential impact of the combination of local knowledge and "big data" in planning, and particularly the involvement of minority populations, has received scant attention.

This study focuses on the Jerusalem neighborhood of Beit Safafa and aims to examine how "digital collaborative planning" enables the integration of knowledge sources for holistic planning. "Digital collaborative planning" is a model concept of public participation in spatial planning using a GIS platform (Campagna et al. 2016; Sigalov-Klein et al. 2024). Beit Safafa is located in southern Jerusalem and is populated by an Arab Muslim population. The neighborhood is surrounded by Jewish neighborhoods and has a population of 13,000. Collaborative planning in Beit Safafa is challenging, because it is based on two opposing approaches: one seeks to preserve the rural attributes of the neighborhood, and the other seeks to develop it as an urban neighborhood. In particular, the tension between the desire to promote policy and implement it in a "professional" manner, and the desire to involve the general public, becomes sharper when planners and the public come from different social, religious or ethnic backgrounds (Khamaisi 2007; Harari 2017; Steinlauf-Millo et al. 2021). When it comes to communities that have been excluded from decision-making processes for years, public participation processes may take place against the background of a deep lack of trust on their part and a sense of

threat regarding future changes and development expected to follow the planning process (Ben-Arieh 2008; Flint Ashery & Natapov 2020). Public representatives, on the other hand, may be perceived as having narrow perspectives that examines policy according to their private needs and in the immediate term.

The article begins with a theoretical framework with an emphasis on the importance of local knowledge and public participation in planning. It is followed by a presentation of the world of Geodesign. The next section describes the workshop for future planning for Beit Safafa 2040 and provides an assessment of the public's in-depth participation. The paper concludes with an analysis of the strength of the method used in the workshop, which includes making compromises using structured tools followed by a discussion and conclusions.

The planning process described involves the local population and residents of Beit Safafa together with policymakers and planners from outside the local society and culture, all of whom were involved in a controlled and coordinated planning process. Neither the workshop facilitators nor the authors of the article belong to the local community. The planning process was therefore an intercultural encounter that included fundamental tensions between different values, which may also be preserved in the planning product of the joint process.

5.2 Theoretical Background

The planning methods prevalent in the last century placed great weight on the role of the planner, their professional knowledge and planning methods (Flint Ashery 2023; Burby 2003). However, over the years, another approach has emerged that proposes to give greater weight to the residents living within the specific area of the plan (Lane 2005) and to see local culture and society as having a body of knowledge that should define the optimal planning product for the local population (Fenster 2012; Fischer 2000). The professional use of local knowledge assumes that knowledge derived from the residents' intimate acquaintance with their surroundings should be considered in the planning process (Rowe and Frewer 2000). Local knowledge is private knowledge based on personal experiences, expressing unique cases and having significance in the specific context (Sigalov-Klein et al. 2024; Flint Ashery and Stadler 2021). Local knowledge not only expresses specific needs, but also includes an understanding and deep familiarity with the community, and with its culture, traditions and customs and values (Ben-Arieh 2008).

Planning that is attentive to residents and invites them to take part enables planners to draw on residents' local knowledge and positively influence the conduct of communities (Raved 2019). When residents do not feel that their welfare is considered paramount, their degree of partnership or responsibility in municipal activity decreases (Yiftahel 2006; Hasson 2014). The commitment to promoting planning rights is expressed in supporting public participation processes and increasing transparency and information flow in planning (Bobbio 2019). These strategies are an

alternative planning concept to the undemocratic practice prevalent in the centralized governmental model that characterizes the Israeli planning system. Alfasi (2002) argues that the statutory mechanisms for public participation tacitly accept the current structure and act within it. They give the public the opportunity to express a position but not to substantially change the decision-making processes. However, high expectations on the part of public participants in the planning process, coupled with a lack of reaching an agreed compromise on the final alternative, may arouse feelings of anger and disappointment when community members' positions are not accepted or partially accepted (Goodes 2005).

In Israel, the absence of an obligation to involve the public at the beginning of the planning process (Planning and Building Law of 1965) has been found to cause low levels of participation. Public participation is often seen as "going out of the way" in situations where the planning is almost complete (Benvenisti and Sagi 2005; Goldman-Shaiman and Nofar 2008). In these situations, public involvement is reduced to marginal influence, a phenomenon that further disadvantages marginalized groups (Totry-Jubran 2005; Cohen-Blankstein and Greenspan 2015). This illustrates the potential importance of integrating citizen science into the planning process.

Citizen science is defined as the practice of science by people without a professional and academic background using a wide range of means (Eitzel et al. 2017), including using the local population as a source of information. This science is gaining increasing popularity among researchers from diverse fields. Its importance lies in its ability to attract large numbers of research volunteers to create observations at scales or resolutions unattainable by individual researchers (Kobori et al. 2016). The research process typical of most citizen science projects is achieved through team building, defining a research question, collecting and managing data, analyzing and interpreting data, disseminating results and evaluating program success and participant outcomes (Newman et al. 2012). For our purposes, citizen science amplifies the benefits of public participation in planning. Citizen science makes it possible to integrate emerging technology and expand the boundaries of research and public involvement in urban planning for the population for which the planning is intended. Such public participation is likely to increase community involvement in the decision-making process, help reduce public objections and involve the public at the very beginning of the process (Ramirez-Andreotta et al. 2015).

Recently, the development of technological and online platforms has made planning information more accessible to citizens, creating the potential to increase public involvement in planning (Caglioni and Campagna 2021). Electronic communication systems serve as readily available and inexpensive platforms for exchanging knowledge and running multi-participant consultation and litigation procedures (Nagid 2015; Afzalan et al. 2017). Hill (2013) explains that residents are not only consumers of city services, they want to be active players. Hence the demand arises to understand how and why decisions are made, to participate in these processes and to be involved in formulating municipal policy.

This article contributes to the bodies of knowledge that integrate citizen science into urban planning through public participation tools, based on the assumption that digital public participation that integrates local knowledge may fill in knowledge that

is missing from "big data" and help guide planners in creating plans that address the real needs of the community. The article sheds light on how maximizing the potential inherent in integrating information sources through digital technologies can increase citizens' sense of belonging to their communities and their involvement in spatial decision-making processes.

5.3 Geodesign and GDH for Design Support

As a concept, the term Geodesign expresses the potential for more efficient and symbiotic collaboration between geosciences, data, planning and local residents. Geodesign helps teams break down their ideas into practical applications, formulate a common language and maximize the potential for implementation, while outlining the broad contexts with reference to local conditions. The digital platform that supports Geodesign is known as Geodesignhub (GDH) and aims to develop collaborations and negotiations among professional teams and their clients, policymakers and the general public. GDH combines a spatial planning and design process based on contextual environmental impact assessment, which includes evaluation of the project, analysis, creation of alternatives and identification of their impact, as well as simulations relating to their impact. Given the complexity of the issues, this process involves multidisciplinary teams, including professionals in planning, geosciences and information and communication technology, as well as members of the local community who can provide local knowledge and values. The process involves the diverse (Flint Ashery and Steinitz 2022) in a digital design process that creates agreements in principle toward collaborative decision-making (Campagna et al. 2016).

The platform makes it possible to express planning ideas in 2D and 3D, including changes to the existing land configuration. In a collaborative process, participants can copy and adapt diagrams contributed by other participants, synthesize the different alternatives and conduct digitally supported human negotiation of the alternatives. Alternatives can also be created in response to changing circumstances by measuring and comparing their effects. The system also supports cost calculation, comparison of options and assessment of the effects of each alternative.

Haklay et al. (2018) described the clear benefits of using GDH as part of a public participation process that includes mediating between diverse values and priorities. Among the advantages mentioned are the possibility of involving a large number of participants in collaborative planning, achieving optimal, rapid understanding among participants regarding complex development challenges, conflict management and reaching agreements on the course of action. The public participation process described later in this article will reveal how local knowledge from residents of different ages can be harnessed to create optimal planning of their neighborhood. The case study before us, the Beit Safafa neighborhood in Jerusalem, sheds light on

how citizen science—from collecting data through creating planning alternatives—contributes to a process of public participation that includes negotiation processes and the creation of an agreed solution.

5.4 Beit Safafa—Planning Background

Beit Safafa is a neighborhood in southern Jerusalem (Fig. 5.1) populated by an Arab Muslim population. The residents of Beit Safafa originated from the Abu Khattab, ‘Alian and Darwish clans from southern Jordan, the Gaza Strip and Egypt. At the end of the 1948 war, the village of Beit Safafa was controlled by the Jordanian Legion. Since the railway connecting Tel Aviv and Jerusalem passed through its center, it was decided to divide the village in such a way that the northern part would be under Israeli control, while the rest of the village would remain under Jordanian control, allowing the railway to continue functioning. In 1951, Beit Safafa was transformed from an independent agricultural village into a neighborhood within Jerusalem’s municipal boundaries, but its rural character was preserved: construction in the neighborhood is relatively low and between the houses there are cultivated agricultural areas. After the 1967 war, the two parts of Beit Safafa were united under Israeli control. Starting in the 1980s, the neighborhood became especially attractive to the Arab–Israeli population who wanted to settle in Jerusalem. Today, the neighborhood is bordered to the north by Talpiot’s industrial zone, to the east by Hebron Road, to the southwest by the Gilo neighborhood and to the west by the Begin highway and nearby Sharafat.

Beit Safafa’s internal planning policy contradicts the overall urban construction policy, especially the Light Rail Planning Policy, which threatens to change the rural characteristics of the neighborhood (Policy Documents 2019). This policy allows high-rise construction and provision for public use in areas bordering the light rail. Lack of trust in the planning system following extensive expropriations made in the past (Bimkom 2014) has delayed the implementation of planning procedures and sharpened the conflict between the desire to develop and increase the stock of housing units versus the aspiration to preserve the traditional character of the neighborhood. The neighborhood has no additional land reserves for development. Land ownership is private, and there is a clear lack of agreement regarding consolidation and division procedures. The neighborhood is surrounded by main roads that create high accessibility to the surrounding area. On the other hand, the traffic system isolates the neighborhood and turns it into a kind of series of islands in the heart of transportation arteries. The internal roads have been only partially developed: most of them lack sidewalks, are not part of a continuous road network, and their level of maintenance is low. The central street of the historic neighborhood has no street lighting. The background materials for the planning workshop included population preferences as captured through dedicated applications, large open access data relating to the surface system, topography and satellite data and urban plans to be detailed below.

The master plan for Beit Safafa allows for the development of the neighborhood in accordance with its traditional attributes, considering the residents’ vision on the

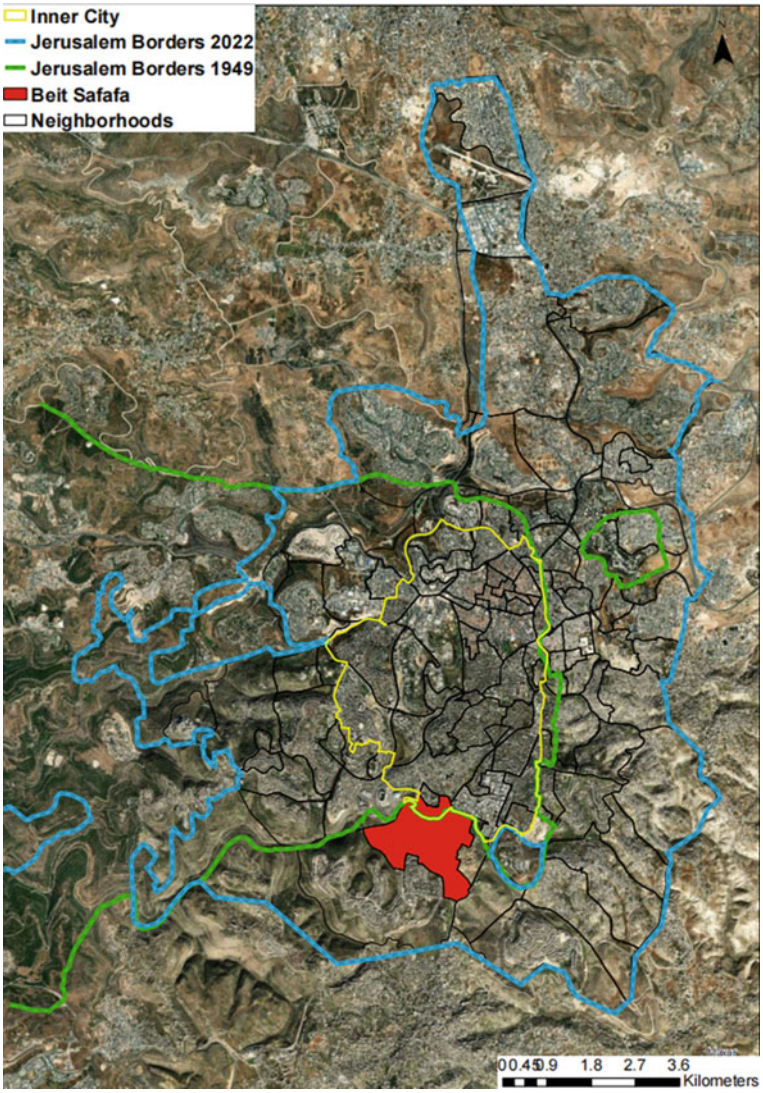

Fig. 5.1 The location of Beit Safafa neighborhood

one hand and future needs in light of the projected population growth and carrying capacity of the area on the other. Plan 2317, the general master plan for the Beit Safafa neighborhood, is still in force at the edges of the neighborhood, where no detailed plans have been advanced. Several complex master plans apply within the neighborhood: plan 3801 in the village core; in the east, plans 3855 and 3488; in the south, plan 5834B; and in the west, plan 3365. The Begin highway passes between the neighborhoods of Beit Safafa and Sharafat. In the Sharafat area, plan 4552 applies to

the core of Sharafat, and in the east, plan 3802. In addition to these detailed plans, the Jerusalem Municipality applies Master Plan 2000 for Jerusalem (2009), the master plan for the Beit Safafa neighborhood (2015) and the Light Rail Planning Policy (2019).

The 2000 Master Plan for Jerusalem has served as a general policy document for the city since 2009. The plan outlines general planning principles for the neighborhood, including land designations in built-up areas, new urban residential areas, building regulations, building rights and defining the area of the historic city and areas designated for preservation. The plan establishes four new development areas adjacent to Beit Safafa: a new Givat HaMatos neighborhood; a hotel complex on the side of Hebron Road east of the Givat HaMatos neighborhood; a residential and employment complex on the side of Tabalia street east of Beit Safafa; and a western compound adjacent to Sharafat. Currently, in a complex designated for hotels, a master plan is being advanced for mixing residential, employment and hotel uses with about 2000 housing units. The residents of Beit Safafa are concerned about the construction of a compound intended for the Jewish population. Beyond the fear of conflict with the new residents over various cultural features, the community administration is also concerned about harming the traditional attributes of Beit Safafa.

The Light Rail Planning Policy was approved by the district committee in 2019 and relates to the volume of construction, the number of floors and provision for public uses in the areas adjacent to the light rail. This plan was approved four years after approval of the master plan for Beit Safafa and allows an increase in building volumes from 3–4 actual built floors and 6 approved floors in the master plan, to 10 floors on Dov Yosef Boulevard along the light rail. The realization of rights according to the Light Rail Volumetric Policy in Beit Safafa and Sharafat will lead to a profound change in construction patterns from rural construction to high-density construction along the side of the light rail's Green Line.

5.5 Future Planning for Beit Safafa 2040

The main goal of the workshop was to achieve a chosen planning alternative for Beit Safafa in 2040. Yearbook data for 2020 indicates a total of 3520 built housing units in the neighborhood. The master plan for the neighborhood sets a total of 10,670 housing units for 2040. The database for evaluating the planning area was based on data from the Jerusalem Municipality and includes the master plan for Beit Safafa, other approved master plans and those in the preparatory stages. Policy documents were also included. The social characteristics layer was based on the master plan approved by the local committee in 2015. The digital information about the Beit Safafa neighborhood is taken from the municipality's GIS website. Among other things, it includes the layers of buildings, roads, land designations and future light rail lines.

After a preliminary analysis of the study area, ten spatial planning systems were selected to match the future development needs and the targets for expected population of the neighborhood in 2040: low-density housing (LDH) up to 3 floors—171,425 m^2; medium-density housing (MDH) 4–6 floors—1,296,368 m^2; institutions (INSM)—270,068 m^2; agriculture (AG)—140,000 m^2; green infrastructure (GI)—381,997 m^2; industry and commerce (COMIND)—17,972 m^2; energy infrastructure (EI); transportation (TRANS); culture and heritage (CUL); and tourism (TOUR).

An innovative issue was adjusted for each of the planning systems according to the Sustainable Development Goals (SDGs). These were adjusted in line with the features of the place, the principles of the master plan for Beit Safafa (2015) and the planning concepts of the municipality. For example, in the energy infrastructure system (EI), we addressed the use of energy storage and conservation measures, such as the installation of photovoltaic cells and buried transformer rooms. In the field of agriculture (AG), we addressed the development of urban agriculture through green roofs on educational institutions and in public parks, to ensure sustainable food security. In the field of transportation (TRANS), based on analysis of the data, a diverse mass transit system was proposed in the rural fabric, offering a combination of walking, bicycle paths, development of passageways, expansion of existing rights of way and creation of new roads, including integration of the light rail line. In the industrial and commercial system (COMIND), we addressed increasing uses for commerce, agriculture and arts and crafts on a commercial level. The green infrastructure system (GI) group made a proposal to connect green spaces in the neighborhood as well as conservation of endangered natural sites and species. For institutions (INSM), we proposed a variety of mixed-use public buildings open around the clock to meet educational, community and social needs. Low-density residential (LDH) will be limited to construction up to 3 floors, while preserving the existing built fabric. Medium-density residential (MDH) is limited to the construction of 4–7 floors to enable the preservation of the existing fabric and allow limited urban renewal in this area. In the field of culture and heritage (CUL), we proposed to preserve historical and archeological cultural sites and terraces. These systems were used to prepare a map of land designations for Beit Safafa based on the colors of the IGC method.

The planning workshop was held during May 2022. It was attended by representatives of the Beit Safafa Community Administration, planners and architects from the Jerusalem Municipality who live in Beit Safafa and members of the master plan team for the neighborhood, representatives of the Ministry of Environmental Protection and urban planning students from Bar-Ilan University. Although most of the participants have backgrounds in urban planning or geographic information systems, their age range was large, and they possessed different degrees of digital literacy. The first days of the workshop were devoted to in-depth familiarization with Beit Safafa and its unique characteristics, a presentation of the theoretical background of Geodesign and an introduction to the basic operations of the GDH system.

5.6 "Deep" Public Participation in Planning

To develop an effective knowledge management strategy and smart decisions while creating several planning alternatives, the workshop participants were divided into four interest groups: (GOV) Government and Authorities; (DEV) Development; (COM) Community; and (ENV) Environment. Each of the four groups included participants from a variety of ages, levels of digital literacy and professional experiences. Each group defined the main interests for its activity and accordingly ranked the importance of the ten abovementioned systems. Thus, while the Developers (DEV) sought to maximize profits and ranked mixed-use construction as their main system, the Environmentalists (ENV) ranked green systems as the main system followed by energy, agriculture and transportation. Subsequently, each group located development areas according to its interests and the specific characteristics of the neighborhood, prepared new polygonal and linear diagrams[1] or prepared existing project and policy diagrams for each of the ten planning systems to create the first planning alternative for Beit Safafa for 2040. Muhammad Lafi (52), coordinator of the community administration and resident of Beit Safafa, participated as a team member in the COM group and shared his impressions of his level of involvement in deep planning:

> The design process is interesting and new (…). It's a program that shares planning with the public from the beginning and creates precise public participation (…). I was pleasantly surprised by the planning of every little detail of where everything would be.

During this phase of the workshop, each group created design alternatives that combined project and policy diagrams according to group priorities and interests.

After completing the alternatives, each group presented its specific alternative. This round highlighted the differences between the diverse interests that led to different decision-making. Thus, a Community group (COM) focused on preserving traditional farmland and terraced areas that are a cultural component for neighborhood residents. The Environmentalists (ENV) focused on energy policies and green infrastructure, and the Government and Authorities' group (GOV) tried to balance the different systems. The alternatives were evaluated by all workshop participants with the assistance of the GDH platform, which provides information on each alternative's compliance with the goals set in advance for each of the design systems.

The possibility of information-oriented planning and data derived from both planning authorities and local residents has been found to be effective in presenting reasonable planning alternatives that reflect a variety of positions. Lafi emphasized that the simple interface for learning and presentation contributed to his ability to examine and share his local knowledge: I always say (to the planning authorities in the municipality), "go down to the field and get to know the area (…)". Here I felt a full partner being involved in the planning within the framework of the workshop

[1] The schemas are arranged according to the following layers of information marked with a markup that corresponds to an international planning language. Sealed polygons are detailed projects, while dashed polygons are general policies.

that took place. The final alternative that was accepted represented my desires but also considered the interests of others.

Lafi's remarks illustrate the importance of deep and active involvement of the public in the planning process and the close ties between professional planning knowledge brought by the professionals involved in the process and local knowledge relevant to the planning, which comes from local participants. A unique feature of GDH is that it enables inserting local knowledge together with insights and lessons derived from big data, in order to consider both types of knowledge in the planning process.

In particular, the use of a defined and uniform graphic language served as a basis for discussion between various parties about the future of Beit Safafa's space. Participants of different ages, with diverse sources of knowledge and experience, were assisted by the GDH user interface. The combination of the simple user interface and the use of the system that does not require prior knowledge increased the participants' involvement in decision-making and encouraged them to contribute their local knowledge. Lafi explains how these factors increased his sense of involvement in planning:

> The software has a particularly large impact on the public that does not come from the field and without the appropriate background (…). This is my first time using software and it was very easy to learn, although I don't come from the field of planning, and I haven't had any experience using the software before.

Technical and visual facilitation of public participation, including "translation" of types of knowledge, has been found to contribute to increased public involvement in planning. The platform under consideration (GDH) supports collaborations and negotiations between teams of professionals, policymakers and the general public in drawing up plans and planning procedures. When planning is done in communities where social and spatial patterns of organization are perceived as different from the supposed patterns of the general public, effort and commitment are required to understand local patterns and to be able to provide them expression and meaning in planning.

5.7 The Power of Planning Compromise

The Beit Safafa workshop revealed how structured digital dialogue between participants with different interests, based on a rich variety of data sources, can advance the decision-making process toward reaching a consensus. At the beginning of the second day of the workshop, each group presented its planning alternative, detailing how the values it aspired to promote in the planning process of the space were expressed. Subsequently, a process of negotiations began between the groups as they worked on moving from four alternatives to two planning alternatives. As part of the process, an analysis was conducted using a sociogram that examined possibilities for cooperation between groups based on similar ideas. The possibilities of

cooperation between the groups generated two larger new groups: "Community" + "Government and Authorities" (GOV + COM); and "Development" and "Environment" (DEV + ENV). The participants reached a basic agreement to prioritize the common good, putting residents first and providing a comprehensive response to public spaces while addressing a wide range of uses for the benefit of the community. Thus, both of the new groups agreed to prioritize construction of medium-density housing on the main roads. Despite the difference in values between the Developers and the Environmentalists, both emphasized the need to preserve the historical core, preferred construction alongside green areas rather than in their place and avoided construction on the periphery and center of the neighborhood.

The Environmentalists advocated medium-density residential construction and ignored commerce and employment, due to the proximity to the existing employment area in the north of Beit Safafa, while the Developers gave priority to commerce and employment. Another gap between these two groups concerned the degree of preservation of open spaces and residential construction initiated by the authorities, as opposed to the wide residential distribution and scarcity of open spaces proposed by the Community. A joint evaluation process combined with digital negotiations helped to bring about agreements and compromises regarding the location and scope of green spaces and public buildings, creating a transportation network, increasing spatial accessibility, preserving the historic core and creating green energy policies through the installation of solar panels.

After combining the teams, each of the new unified groups used a digital evaluation model within the Geodesignhub (GDH) in an effort to build an agreed alternative. Each group updated its priorities in light of the priorities chosen by the unified stakeholder group and put together a planning alternative in accordance with the new agreements. Mohammed Lafi expands on his place in the process of constructing an alternative scenario:

> In the workshop, I felt equal. In real life, a municipal employee or planner doesn't know the territory… (and) the interactions between neighborhoods, projects, and people… I felt like a full partner and involved in the planning within the framework of the workshop that took place. The platform was very easy to learn even for those who do not come from the field of planning… I felt that my opinion was considered in the final planning that was made while considering the interests of all.

This model allowed groups to analyze the effects of different policies and projects integrated into the scenarios examined. Since the modus operandi was collaborative and all materials were shared digitally, each group could see the other group's solutions and choose whether to adopt or reject them. The comparison between the different scenarios led to similar solutions and the creation of common ground, such as establishing a connection between Beit Safafa and Sharafat by creating an overpass over the Begin highway and increasing building rights at the meeting point between the light rail Green Line on Dov Yosef Street and the Begin highway.

After presenting the two groups' planning alternative, the groups were merged into one group to create an agreed-upon planning alternative (Fig. 5.2). Muhammad (a 52-year-old resident of Beit Safafa) explains how the final planning alternative combined the best ideas of all the groups and omitted the less successful ones.

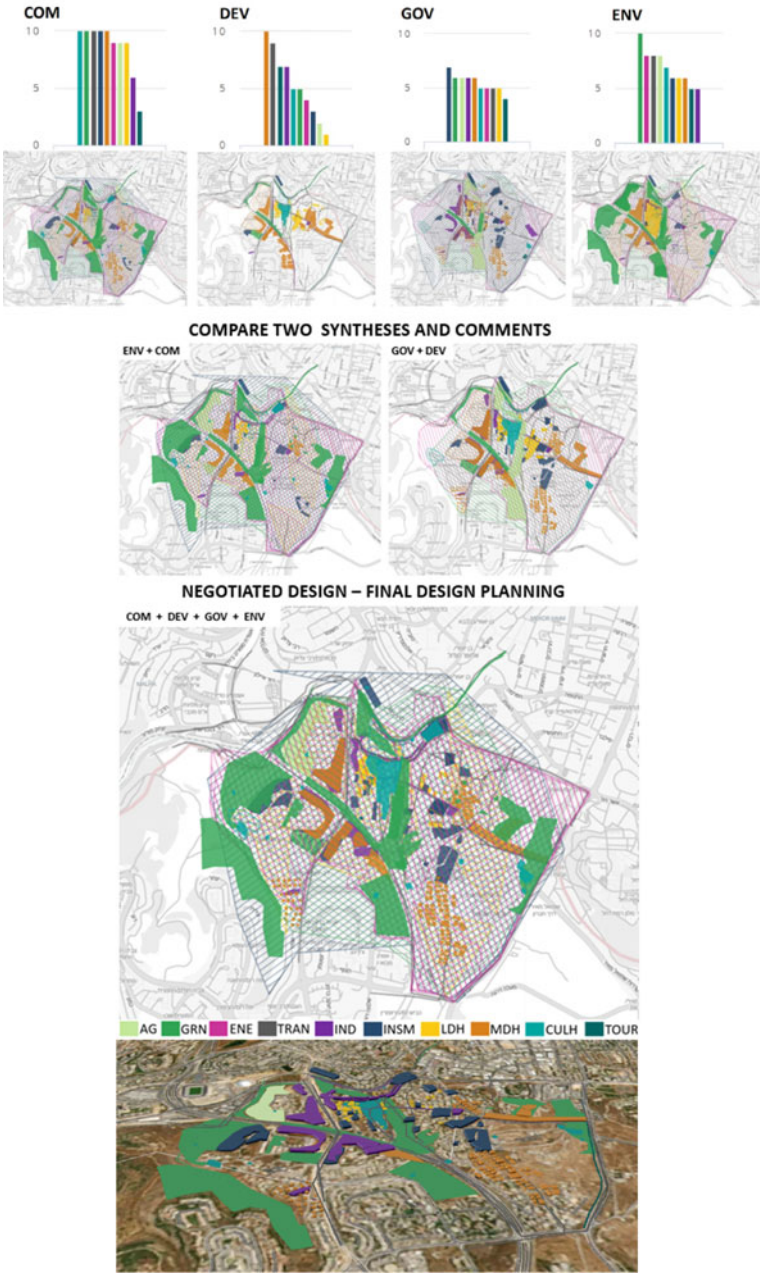

Fig. 5.2 Transition from four to two scenarios to one alternative. *Source* GDH

The final alternative that was accepted represented my desires and expectations and took them into account as well as the interests of others. The software makes it possible to see issues from different perspectives. This allowed each side to concede a little and reach a common interest. This made it possible to understand the other side as well… In discussions, there are often large gaps and quarrels, and we fail to reach solutions. In the workshop, I felt that there were common things between the sides, there were negotiations, and a solution was reached together.

Thus, in the joint alternative, all the groups chose a green overpass over the Begin highway in order to allow easy and safe passage between Beit Safafa and Sharafat, which are currently separated by the highway; increasing building rights and mixing residential, commercial and employment uses at the intersection of the light rail and the highway; preservation of the historic core; preservation of the green areas and densifying the neighborhoods inward instead of establishing a proposed urban residential area west of Sharafat; proposing new areas for public institutions; and street shading policy and solar roofs.

5.8 Conclusions

This study focuses on Beit Safafa, an Arab neighborhood in south Jerusalem, and examines how citizen science can be harnessed to increase the involvement of the local population in planning. The research literature asserts that citizen science can contribute to public participation from the initial stage of planning. This study shows how it is possible to integrate emerging technologies into expanding community involvement in planning its space and help reduce public objections. In our view, this is especially important for the Muslim population living in Beit Safafa, who greatly value the characteristics of their community and also have a high level of suspicion regarding the municipality's planning interests. The method chosen enables us to assist in achieving the optimal planning product in a comprehensive, participatory and democratic planning process. The article contributes to the planning literature by presenting GDH as providing a process for successful planning negotiations, thereby enabling a reexamination of public participation in a technological medium. The workshop revealed the potential to increase deep public participation by adopting a digital process that leads to transparency and comprehensive critical understanding to facilitate decision-making. In other words, the combination of local knowledge and "big data" in a deep planning process involving minority populations makes it possible to maximize residents' involvement in spatial decision-making processes and hence citizens' sense of belonging to the community space.

Beit Safafa is an interesting case study for examining the involvement of the local population in a digital planning process. Planning in Arab neighborhoods in Israel raises, quite often, opposition to planning principles such as density, high-rise construction and expropriation of private land for public purposes. In planning the future of the neighborhood, a central idea was implemented according to which sustainable future planning for the neighborhood will address issues related to the

challenges of the SDGs. We call this process "Micro SDGs", and we have included it in the design ensuring the availability and sustainable management of water and sanitation for all, food security, ensuring access to affordable, reliable, sustainable and modern energy, building resilient infrastructure, making the residential area inclusive, safe and flexible and implementing solutions to meet climate goals and mitigate the impacts of climate change in the neighborhood.

Public participation in the workshop was aided by digital tools that combined residents' local knowledge with big data and illustrated the impact of the residents' planning vision on the neighborhood. Local reference raises the question of the necessity for big data where global principles and regional information are replaced by location-specific data. After all, instead of considering extensive cultural areas or the entire city, we became acquainted with the local people of Beit Safafa, private individuals working in a particular place. Instead of global individuality or local typology, we identified diversity at the local level and the opportunities that diversity offers: means of expression, the unique attributes and components of the place of Beit Safafa, how the place looks, feels and functions. Instead of investigating stability or broad patterns of change, we learned about the interactions that take place in the neighborhood. Geodesign at this level is not abstract, but the everyday reality for the local people. This article supports Steinitz's (2023) claim, "Think locally, act globally". Unfortunately, most people, including planners, think locally and also act locally.

Many times, the residents' desire to be active and involved players in the decision-making process regarding the space in which they live does not match the level at which their opinions are considered by professional bodies. Organizers were concerned that the process described above would strengthen the sense of belonging and involvement of neighborhood residents who participated in the workshop only temporarily, and that planning officials in the municipal authority would refrain from sharing with the public in a broad and comprehensive manner over time. By conducting the workshop, the municipal authority exceeded its obligation to share, and however, if the municipality does not continue to include residents, this can be harmful and may further deepen the inherent suspicion in the relations between the community and the municipal authority. To reduce these effects, as noted, the division of participants into different interest groups included all participants, in such a way that each group incorporated representatives of residents, planners and policymakers from different fields, of different ages. All knowledge, including the polygons of all groups representing projects and policies, was shared and revealed to everyone throughout the workshop. The discussions and presentations were held publicly. All participants enjoyed full equality in the decision-making process in a way that empowered the participants, increased the involvement of the residents and enabled them to make their voices heard, share and translate local knowledge into planning systems and thus increased the connections between the various groups. The negotiation process was not biased in favor of a particular party but rather motivated toward obtaining a planning alternative that was agreed upon by all participants. This practice makes it possible to plan the space through a feedback process between the values represented in the plan and their adaptation to the area of the local population.

This process makes it easier for the municipal authority to adopt some of the proposals in an informed manner and allows participating residents to take knowledge back to their communities.

In conclusion, the Beit Safafa workshop raises further questions about the way digital collaborative planning can foster the involvement of minority populations in holistic planning during periods of polarization and radicalization. Can citizen science assimilate and integrate sources of knowledge in a way that reduces conflicts in community space planning and increases citizens' sense of belonging to their communities? We have seen that deep involvement in decision-making processes while sharing local knowledge increases the responsibility and public involvement of local residents and encourages them to consider diverse needs and desires. In this way, the aspiration to democratize the planning process supports achieving the optimal planning result for the residents. Understanding how the negotiation process is embedded in planning and the opportunities for introducing technological methods into this process are central to planning activity and should be a cornerstone of future planners' skills.

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Appendix Links About Using the Tool

https://www.youtube.com/watch?v=Jf_R4rB7MIQ.
https://youtu.be/QERJbL9J1Xw.

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In-depth interviews

Muhammad Lafi (52, male), resident of Beit Safafa (Interviewer: R. Marmour on December 20, 2022)

Part III
The Use and Impact of Geodesign in Applied Fields

Chapter 6
Smart Mobility and Geodesign in Urban Life

Michelle Specktor

Abstract In recent years, the expansion of digital technology and forecasts for a significant increase in both urbanization and global mobility demand have created an important challenge for planners and designers all over the world as they attempt to design and plan cities that are more livable, safe, accessible, and sustainable. There is a growing trend toward smart mobility in cities, as they strive to become smarter. Smart mobility is essential to urban planners, urban designers, city stakeholders, policymakers, and communities for leveraging urban developments and supporting sustainable urban mobility plans, as well as for achieving the vision of transportation with zero externalities: no fatalities, no delays, and no negative impact to the environment. In terms of smart mobility and Geodesign implications for urban mobility, there is much to explore. In the interest of keeping this article short, only a brief yet practical introduction to smart mobility and Geodesign implications for urban mobility is provided. It is recognized that smart mobility in urban design requires an integrated holistic approach. This can best be achieved through Geodesign to improve urban mobility and address multidomain and cross-implications of urban mobility in a broader context of urban life and futuristic planning.

Keywords Urban mobility · Transportation · Digital transformation · Smart city · Well-being · Accessibility · Urban design · Transport planning · Policymaking

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6.1 Introduction

Mobility is a fundamental aspect of life, particularly urban life, since mobility implies a degree of integration into society that affects every aspect of daily life and the quality of life (Medina-Molina et al. 2022). Throughout urban environments, mobility occurs in a variety of ways that include transportation options, accessibility, inclusivity, diversity, new technology, shared and new economic models, transport justice, regulation, and policymaking.

We are currently experiencing a massive shift in the way we commute and travel in cities. Keeping up with global changes requires our urban planning and development to incorporate new modes of transportation, digital technologies, renewable energies, and infrastructure improvements (e.g., Martens 2016; Nieuwenhuijsen 2020; Mouratidis 2021). The cities play a key role in helping to achieve the UN's Sustainable Development Goals (SDGs). Goal 11 specifically focuses on creating safe, inclusive, sustainable, and resilient cities ensuring high living standards and community growth, while taking advantage of the benefits for society, the environment, and mobility.

This paper has two purposes: first, to provide a practical introduction to smart mobility with a particular focus on Geodesign and its implications for urban mobility; second, to encourage readers to participate actively in the development and growth of this emerging field.

To understand urban development and mobility, we must first understand how transportation plays a role and is important. The concept of smart mobility will be explained along with the enabling technologies, fundamental concepts, and the core values of digitalization. Additionally, opportunities and challenges associated with smart mobility in urban environments will be discussed. Lastly, Geodesign will be discussed to improve urban mobility and resolve transportation issues.

This article is written with the understanding that readers may draw on a wide variety of backgrounds and disciplines. To ensure mutual understanding, it is therefore important to define a few key terms and concepts (Table 6.1).

Now that we have defined some key terms and concepts, we can move forward. In today's rapidly urbanizing world, transportation in general and smart mobility, in particular, are significant challenges. Considering that transportation permeates every aspect of urban life and vice versa, it is essential to address the issue of transportation from a multidisciplinary perspective. There is an ongoing discussion about urbanicity, i.e., living in cities and using smart mobility in urban environments, implying an interdisciplinary approach across fields (e.g., Petts et al. 2008). The relationships among urbanicity, walkability, smart mobility, urban developments, and urban planning are at the core of the Geodesign methodology (Steinitz 2012).

Table 6.1 Glossary of key terms and concept

Term	Explanation
Transport	It means 'across-carry' in Latin. The movement of people or goods from place to place is called transportation or transportation (in US English and UK English, respectively)
Mobility	Having the ability to move or be moved from one place to another. Mobility is one of the key features of a smart city
Cyber-physical systems (CPSs)	Comprised computational software, physical components, and human–machine interfaces (HMI) connected via the Internet. Regardless of the process, physical devices, or infrastructure used, the goal of such a system is to be operated in a seamless and integrated manner through the use of sensing devices, connectivity, software algorithms, and human–machine interaction. Smart cities can be thought of as large-scale implementations of CPS
Smart city	Smart cities can be viewed as large-scale implementations of cyber-physical systems. The development of interconnected communities and regions that utilize advanced technologies for the benefit of individuals and businesses, as well as for economic growth and environmental sustainability
Smart mobility	Smart cities are characterized by smart mobility. Smart mobility offers digital mobility services for seamless multimodal commutes. They are based on advanced, digital technologies, and digital mobility applications as well as shared economic concepts
Multimodality	The capability to use a combination of multiple modes of transportation, such as walking, scootering, biking, public transportation, automated vehicles, vehicle-sharing, ridesharing, and on-demand mobility to complete a trip from origin to destination
Walking	In simple terms, walking is the physical activity of moving about on foot, or pedestrian mobility
Walkability	The degree to which a built environment is friendly to the presence of people in an area, including things like accessibility, walking conditions, safety, comfort, landmarks, and conveniences
Micromobility	It is a relatively new and emerging mode of transportation for single-person transportation such as electric bicycles (e-bikes) and electric scooters (e-scooters). Shared micromobility services are common in smart cities
Mobility as a service (MaaS)	The use of a unified digital application and mobility hubs for smooth commutes, combining public and private service providers. Users can plan, book, and pay for seamless trips from origin to destination using multiple modes of transportation
New mobility	As part of a paradigm shift towards sustainable, inclusive and accessible transportation, it combines connected, automated, shared, and electric (CASE) vehicles with new business models and digital platforms to address evolving urban mobility requirements.

6.2 Globalization and Urbanization

Globalization, which allows people and goods to move easily across borders, as well as urbanization, which increases cities' growth potential and encourages more people to move there, has accelerated in recent years. Sustainable Development Goals (SDGs) also raise issues related to greenhouse gas (GHG) mitigation, climate change, and renewable energy. Consequently, urban mobility and travel patterns are increasingly being examined for their health and environmental impacts (Medina-Molina et al. 2022).

Worldwide, over two-thirds of the population will live in urban areas by 2050—double what it is today. Urban populations are expected to reach 7 billion in 2050 (UN 2014). A weekly average of 1.5 million people migrates to urban areas. New infrastructures are needed, including roads, buildings, and transportation systems, to accommodate this population migration. Most of the infrastructure that will be required by 2050 does not exist today. With the exponential growth of the global population, transportation logistics and mobility are becoming increasingly important in cities around the world. The integration of smart mobility with smart cities has become a growing focus of stakeholders wanting to develop sustainable urban mobility plans (SUMPs) and innovative urban planning that is holistic (Wefering et al. 2013). The holistic perspective of Geodesign plays a key role in this process.

6.3 Urban Morphology and Road Users

Urban street networks in cities are complex not just because of their hierarchical and geometrical structures, which are usually determined by geography and history (Flint Ashery and Natapov 2020), but also due to the variety of functions, vehicles, and mobility needs they serve, and the variety of users who use them (Flint Ashery and Stadler 2021a). As a result, multiple stakeholders from diverse fields such as landscape architecture, urban engineering, history, economics, sociology, environmental engineering, geo-informatics, and transportation engineering should be involved in the urban science process. The use of integrated techniques and combined data will enable a deeper understanding of urban development and the seamless implementation of holistic solutions to urban mobility challenges and urban challenges in general (Kitchin 2016).

A wide range of new factors impacted urban planning and urban design in the early-twentieth century as a result of the mass-produced automobile, reshaping urban environments. It has historically been the case that sidewalks were built alongside roadways to provide a safe path for pedestrians, minimizing interactions between pedestrians and vehicles. However, with cities becoming increasingly dense and micromobility increasing, pedestrians and vehicles cannot be completely separated. New regulations and planning obligations are being developed to reduce anxiety among pedestrians in an environment they perceive as unsafe because they have no easy means of escaping micromobility vehicles on sidewalks.

6.3.1 Typical Urban Street Networks

Urban networks typically include arterials, distributors, main thoroughfares, access roads, and local streets (Jiang and Claramunt 2004). Different types of road users rely on them, and they require complex navigation through various junctions, infrastructure, and regulations (e.g., speed, parking, and loading). A variety of vehicle types and road users participate in the road network, including cars, buses, delivery vehicles, and taxis, as well as vulnerable road users (VRU) such as pedestrians and micromobility users. Participants interact with each other and with the roads' infrastructure, including roundabouts, priority junctions, dedicated pathways (e.g., sidewalks, micromobility lanes, and roads), crosswalks, traffic signals, and digital signs.

6.3.2 Shared Spaces

In contrast to a typical urban street network, the approach of the shared spaces considers all users of this network to interact with each other on an equal basis without any defined priorities and must navigate in an environment, such as on parking lots and pedestrian streets, that are less well-defined and regulated than a typical urban network (Hamilton-Baillie 2008). Futuristic urban shared spaces will incorporate residential homes, offices, and public spaces into one human-friendly environment (Varma 2017). In shared spaces, there is an emphasis on mixing land uses and on minimizing the separation between different types of users including pedestrians and micromobility users. As an example, different types of surface colors, textures, and roadside features are used to reduce motor traffic speeds, while curbs, road surface markings, traffic signs, and traffic lights are removed. Increasing skill and knowledge about the nature of properly designed shared spaces is increasing as more projects are implemented.

More than half of the land in an average American city is used for streets, driveways, parking, traffic signals, and signs, as well as auto-related businesses, such as gas stations, car repair shops, garages, and car dealerships (Manville and Shoup 2005). As the automobile gained popularity, it became associated with sprawl. Urbanization will inevitably lead to the development of a metropolis, which will further take on challenges of urban mobility as it progresses toward the development of a megapolis.

6.4 Embracing Digital Transformation

Throughout the past few years, we have seen a digital transformation revolutionize our lives. Through digital transformation, new services and user experiences are developed or revised throughout the entire life cycle of business processes,

responding to rapidly changing market conditions. We are witnessing one of the most significant paradigmatic shifts in the history of cities. Due to the growth of connectivity and digital technology, new digital mobility applications and services are emerging (Lyons 2018), which are transforming urban planning and urban design.

In the twenty-first century, Cyber-Physical Systems (CPSs) are progressively embedded into physical objects and infrastructures, allowing them to sense, analyze, act, and connect to their environment via the Internet. Because they integrate physical and computational components, Cyber-Physical Systems are also referred to as 'Smart Systems'. As a result, these systems provide the foundation for the development of many of the future smart devices and smart services that will have a significant impact on many aspects of our lives (Baheti and Gill 2011).

Early in 1993, anyone could access the World Wide Web (www) information dimension over the Internet for free. About 59.5% of the world's population were active Internet users via hardware interconnections as of January 2021. There were 4.32 billion mobile users who accessed the Internet by using mobile devices, representing 92.6 percent of the total. In any aspect of our lives today, the Internet of Things (IoT) plays a key role in driving the digital transformation we are experiencing taking these connectivity and digitalization concepts one step further. In this way, sensors, software algorithms, and other technologies work together in real-time, with data and actuators being exchanged between the physical and cyber components of a digitally transformed system.

There were 1.7 megabytes of data produced by every person on the planet every second in 2020. Data produced by humans every day amounts to 2.5 quintillion bytes. Approximately 90% of the world's data has been generated in the past two years, 2020–2022. We are living in an age where data is considered the 'new oil'. Oil and retail companies are losing market share to data-driven companies, such as Microsoft and Meta (formerly Facebook). The cyber-physical components are enabled to interact with each other thanks to the expansion of open data sources. Further, the data-rich environment of today makes it possible to leverage Big Data and apply Artificial Intelligence (AI) for advanced digital transportation and smart mobility services (Lee et al. 2023).

5G mobile networks are being rapidly deployed worldwide due to the astonishing amount of data exchange and interconnection they enable. With a 5G network, virtually everyone and everything will be connected at the same time with the least amount of latency. In communications, latency represents the time between transmitting information and receiving a response. Often, this is referred to as the end-to-end communication delay. For mobility services, the reduction of latency from hundreds of seconds to a few milliseconds is a game changer. All smart mobility services, including connected, automated, shared, and electric vehicles (sometimes called CASEs), require low latency. To optimize IoT, 5G aims at providing extremely low latency, and increased bandwidth, as well as high availability, unmatched reliability, and unbreached security, which will result in a tactile Internet. The Tactile Internet is considered the next evolution of the Internet of Things, which integrates machine-to-machine (M2M) and human-to-machine (HMI) interactions seamlessly.

Consequently, real-time interactive systems offer many benefits for industrial applications, societal needs, and emerging services, such as smart mobility (Gohar and Nencioni 2021).

As part of the fourth industrial revolution, Digital Twin technology is considered to be the next big thing. In a Digital Twin, physical objects along with their various elements and dynamics are visually represented. This technology can be applied to optimizing value chains across many different sectors, including urban living and smart mobility (Wang et al. 2022). There are three categories of Digital Twins: Product Digital Twins ensuring reliability in product development and improvement, Production Digital Twins improving production planning and manufacturing, and Performance Digital Twins capturing, analyzing, and acting on data while a visual representation of physical objects is in operation.

Digital transformation is what fundamentally alters transportation networks and systems in urban settings, thus creating new and enhanced mobility options for people and goods.

6.5 S.M.A.R.T Cities

We are living in a digital age that is revolutionizing our urban lives in a way we never dreamed possible, which is the reason why the ability of a city to seamlessly integrate multiple technologies, cross-domains, and processes defines its smartness.

S.M.A.R.T cities can be seen as living organisms, just like the human body. It is composed of a System of functions comprising multiple subsystems with centralized Monitoring and constant cross-implication Analysis in real-time. Having an exceptional capacity for Resilience—the ability to rapidly recover and prepare for future shocks—whether economic, environmental, social, institutional, or of any other kind—the city will flourish. And a vast Transportation system flows through it.

To make our cities smarter, no isolated system can operate alone. To make better decisions, distribute resources more efficiently, identify problems and correct them quickly, and prevent and fix malfunctions effectively, urban stakeholders, the entire urban ecosystem, and its infrastructure must share their data in real-time as well as share history data. Data sharing, among other data-driven decisions, can streamline traffic, enhance mobility, add efficiencies, save energy, reduce emissions, and improve air quality. In the digital age, smart cities and urban mobility are becoming increasingly data-driven and dependent on connectivity, the Internet of Things (IoT), automation, electrification, and Artificial Intelligence (AI). Therefore, there is an increase in digital literacy and the creation of smart mobility services is revolutionizing our urban transportation systems (Reddy et al. 2020).

In the wake of technological developments, cities around the world will have to undergo radical changes in their transportation infrastructures, networks, and systems, and city officials, mobility providers, as well as individuals will have to adapt to this new reality.

Urban living attracts people for many reasons, including a mix of cultures, job opportunities, easy access to amenities, and better mobility. The implementation of smart mobility solutions must therefore consider not only isolated concerns such as environmental, spatial, and economic factors, but also community requirements, personal preferences, and well-being.

6.6 Well-Being and Transportation

Many cities are publicly committed to improving citizens' well-being at the policy level, yet most people find city life stressful despite the overall goal of urban policies to improve social welfare. It has been found that urban living and urban mobility, in particular, affect mental health in significant ways. Understanding urban well-being requires a more detailed understanding of space, time, and context, and integrating objective and subjective data can present significant challenges (Schwanen and Wang 2014).

Traditionally, welfare in the transportation sector has been measured based on objective indicators such as travel time and costs, crashes, injuries, and environmental impacts using cost–benefit analysis (CBA). In current policy-assessment methods, willingness-to-pay/accept data is used to quantify well-being impacts, whereas a newly proposed social welfare function (SWF) data model uses an interpersonally comparable well-being measure (Adler, 2019).

It was recognized that taking a multidisciplinary approach to urban planning, urban design, and policymaking is important for the success of urban mobility initiatives. Several transportation agendas have gained traction around the world in recent years, including walkability (Litman 2017), transportation justice (Martens 2016), accessibility, and social inclusion (Keseru and Randhahn, 2023). A growing amount of attention has also been paid to how subjective experiences of transport contribute to overall well-being as well as travel enjoyment. Thus, in addition to urban mobility accessibility, inclusivity, equity and just, and other environmental considerations, planning for a healthier travel environment that reduces urban stress and thus improves well-being is essential.

However, it is important to note that cultural preferences, gender differences, and local policies all result in different conditions and implementations.

6.7 Transportation Meets Mobility

First and foremost, humans are walkers. Over the course of history, humans have continuously developed new modes of transportation on land, at sea, in the air, and space. From the Latin word meaning 'across-carry', transportation refers to the movement of people and goods. It covers modality options for both passenger and freight transportation. Mobility, however, can be defined as the ability to freely move and

be moved. Mobility is something you have, whereas transportation is something you do.

The introduction of mass-production automobiles in the early 1900s created a need for new social norms, new infrastructure, and new vehicle designs to reduce their negative impacts on society. As we move into the global urbanization era and urban environments become denser and more complex, it is more important than ever to develop more accessible, inclusive, efficient, just, and eco-friendly ways to move people and goods.

Urban mobility and transportation planning for future smart mobility including urban travel subjective well-being (SWB); robots, drones, and connected, automated, shared, and electric (CASE) vehicles; as well as human–machine interaction (HMI) considerations are currently being worked on. Planning budgets, social preferences, ownership levels, and the like may impact approaches to addressing existing challenges and conceptualizing urban smart mobility of the future.

6.8 Smarter Mobility

According to recent forecasts, global mobility demand is likely to continue to grow for the foreseeable future. The global smart mobility market is expected to reach $70.45 billion by 2027, growing at a CAGR of 20.2% (2020–2027). Transportation accounts for the largest share of greenhouse gas (GHG) emissions and the largest percentage of energy consumption in the world (Smart Mobility Market 2020).

Urban environments are experiencing several trends when it comes to smart mobility through the use of digital technology and data. As cities aim to become smarter, city stakeholders and policymakers recognize the importance of smart mobility in making cities more livable, safer, and more sustainable.

Global trends and local initiatives that are driving today's urban smart mobility revolution.

6.8.1 Walkability

A preferred mode of transportation for urban mobility is walking. In the digital age, walkers use their smartphones for navigation, music, and communication, making their walks smarter.

Walkability agendas (the quality of walking conditions, including safety, comfort, and convenience) and walking (the activity) in general are being promoted due to the potential for multiple health benefits, an increase in well-being, and mobility fulfillment in urban environments.

Living in a city offers greater access to mobility and higher living standards, but it also poses greater risks of chronic stress. Walking, the physical activity the motile mobility of pedestrian is known to impact emotion, reduce stress levels,

and improve health in general. Local governments promote walkability and aim to increase walking rates to reduce congestion and air pollution, mitigate greenhouse gas emissions (GHG), and thus improve public health.

Cities around the world are (re)designing streets using Geodesign methods, tactical urbanism, and urban renewable development projects to create a greener, healthier, and more livable neighborhoods with a focus on walkability (Ashery and Steinlauf, 2022).

6.8.2 Micromobility

In urban mobility, micromobility is a new trend, a diversification of urban transportation for individual users and short distances, that is growing exponentially since 2018.

Micromobility is defined as vehicles weighing less than 350 kg and going no faster than 45 km per hour. Bicycles, e-bikes, kick scooters, e-scooters, scooters, skateboards, one-wheeled balancing boards, and four-wheeled electric microvehicles are all covered by this definition. In a broader sense, micromobility can be considered a component of sharing economy. The term sharing economy refers to an economic model using Internet-based applications to facilitate the sharing of goods and services.

Commonly micromobility can be docked or dockless, meaning having designated parking and/or charging stations, or they can be picked up and dropped off at any location within the service zone. It is praised for its flexibility, affordability, ease of use, freedom from parking hassles in dense urban areas, and solving the first-last-mile problem easier. It also offers an extended commute range. As a result, people can live, work, and play in more places and can get to parts of the city that are otherwise inaccessible via foot. Thus, mobility patterns and travel behaviors are changing because of micromobility, making cities more environmentally friendly.

Despite this, a growing number of cities, such as West Hollywood, CA, USA, London UK, and Singapore, have banned micromobility electric scooters (e-scooters) due to safety concerns, and some cities have actively blocked e-scooter introduction to their cities (e.g., Columbia, SC, USA). Renting e-scooters has been banned in Paris by its citizens, as of April 2023, whereas in Tel Aviv, Israel the municipality is investigating ways to improve the safety of micromobility vehicles while working with the Israeli National Road Safety Authority.

While the impact of micromobility is being studied to better understand the role it plays in shaping smart cities, its integration with public transportation, and its infrastructure planning implications, it was recognized that it promotes new urbanism with post-car roadmaps and 15-min city plans. These aim at enhancing seamless multimodalities travel and address the first-mile-last-mile (FMLM) access problem by improving the accessibility to established public transportation.

6.8.3 The 15-Min City

The 15-min city plans are well aligned with walkability agendas. These are based on integrated approaches to sustainable urban living to ensure that amenities and services can be reached within 15 min of walking or cycling within an 800-radius perimeter (Moreno et al. 2021).

The concept of a 15-min city, which is based on creating neighborhood areas where people can easily reach all of their needs within 15 min by walking, riding a bike, e-scooter, or sharing private or public transportation, ultimately leads to improved quality of life for its inhabitants.

Creating such shared mixed-use spaces fosters feelings of community, improves sustainability, enhances livability, and reduces unnecessary transportation. As a result of reducing unnecessary traveling, the community can achieve its full potential, and public transportation becomes more feasible.

This strategy is implemented in both new neighborhoods and urban renewable development projects worldwide.

6.8.4 Transit-Oriented Development (TOD)

TOD is recognized via effective land use and transportation integration where rapid and frequent transit service is available. The term TOD describes a type of urban development where the majority of residential, commercial, and leisure uses are located within walking distance of public transportation stations and mobility hubs (Knowles et al. 2020). It seeks to increase the use of public transportation by reducing the dependency on private cars and promoting sustainable urban growth. Local governments, however, are challenged by the first-mile and last-mile problem, in other words, how to make sure that people can easily get from their homes to public transportation stations and from the station closest to their final destination with ease, comfort, and safety.

High-speed rail (aka bullet train), Hyperloop transport, and Maglev (magnetic levitation) high-speed rails are disrupting traditional public transportation made up of buses, underground, light trains, and railways. Also, the introduction of robotic, automated, and electric vertical takeoff and landing (eVTOL) taxis will contribute to the future evolution of transportation.

6.8.5 Mobility as a Service (MaaS) or Mobility on Demand

With mobility as a service, car ownership is replaced by accessibility to multiple modes of mobility on demand. Cities throughout the world are experimenting with

various features to promote mobility as a service (MaaS) and increase public transportation trips via incentives on the one hand and various restrictions on the use of private cars, parking, and congestion toll on the other (Jittrapirom et al. 2017).

Mobility hubs and unified digital applications can help provide peer-to-peer smooth commutes using a combination of public and private mobility options. Via access to a wide range of digitally integrated mobility options, including bus, shuttle, taxi, high-speed rail, tram, subway, carpooling, shared cars and shared micromobility, airplanes, and ferries, MaaS lets commuters map, book, and pay for seamless trips between their origin to destination using different modes of transportation.

6.8.6 Shared Mobility

With shared mobility, such as Zipcars, e-bikes, e-scooters, or ridesharing trips, urban space could be more efficiently utilized, traffic congestion could be reduced, and more walking and micromobility trips could occur (Machado et al. 2018). This will reduce parking demand, energy consumption, and emissions, as well as enhance livability and environmental sustainability in urban areas.

Digital mobility applications such as Waze and Moovit and on-demand mobility services such as Uber allow cities to work toward offering smarter inter-modality mobility user experiences that leverage the digital revolution and are part of the newly introduced shared economy. Shared mobility which has become more common in dense urban areas is disrupting traditional vehicle ownership. Furthermore, it creates new jobs and e-commerce business models focused on optimizing shared mobility usage, and distribution of these vehicles based on the travel patterns during different hours and days of the week.

While it is being promoted in many cities worldwide through innovative strategies and policies, some commuters are hesitant to use shared mobility because it usually requires multimodal transportation modes for an origin-to-destination single trip. Also, due to the problem of the first and last miles, it is a less preferred travel choice.

6.8.7 Mobility Hubs

For switching between modes of transportation safely and conveniently, newly designed mobility hubs are aiming to improve traveler experiences, enhance their quality of life, and connect multimodalities seamlessly. Mobility hubs are therefore becoming crucial urban facilities for the smooth convergence of multimodality point-to-point transportation.

Typically, a network of mobility hubs should offer access via a digital application to various mobility options having coordinated schedules and with connections within walking distance. As well as facilitating mobility, mobility hubs can also promote development in the built environment.

However, for mobility hubs to be strategically situated, traditional traffic models are no longer enough. An effective mobility hub is not just determined by its location, but by its design as well. For a mobility hub to serve its purpose better, it must not only serve as a multimodality inbound and outbound switch but also provide commuters with a pleasant travel experience, which creates new challenges in their design and implementation (Arnold et al. 2023).

6.8.8 Electrification

It might surprise some to learn that the first automobile was electric. Therefore, vehicle electrification is only reemerging in urban transportation with the introduction of the latest battery technologies, new car manufacturers (OEMs), and new business models.

Even though this technology may lead to substantial benefits such as reduced energy use and CO_2 emissions, for it to fully reap the benefits it may bring, its electric power production must be strongly shifted away from fossil fuels in favor of renewable energies. Furthermore, electric vehicles (EVs) pose new challenges to the grid, to the safety and sustainability of batteries, to the creation of new charging technologies, as well as to optimization of parking land use in public charging stations (Yong et al. 2015).

Aside from creating new business models, the electrification revolution calls for urban planning considering the location and optimization of charging station implementations and the adoption of new social norms, adapted to these vehicles as they are quiet on urban roads.

6.8.9 Automation

As automated vehicles (AVs) become ubiquitous and integrated into urban environments, the urban mobility ecosystem faces disruption (Alessandrini et al. 2015). Ultimately, fully automated self-driving vehicles powered by Artificial Intelligence (AI) promise to eliminate human error and make roads safer. In the era of advancements in AI, integrating driverless vehicles in a mixed urban transport network has proved to be harder than anticipated. Although much money, time, and effort have been invested in AI, it has not been able to solve the problem of reliably navigating our most unpredictable urban transportation networks.

Traveling by AV may be more affordable and allow commuters to make the most of their time. However, AVs will more importantly provide mobility opportunities to groups who have been excluded from participating in public life due to mobility restrictions (e.g., people with disabilities, children, the elderly, or those without a driver's license). Nevertheless, they have implications for pedestrians that require further study (Specktor et al. 2023).

In addition to technical drawbacks, lack of new policy, and ethical considerations, it has been argued that AVs will be widely spread only after major reforms are made to urban infrastructure allowing smart cities to communicate with these vehicles in a timely and automated manner.

6.8.10 Intelligent Transportation System (ITS)

In today's interconnected data-rich environment, intelligent transportation systems (ITSs) process and share information to ease congestion, enhance traffic management, and increase transportation benefits to commercial users and the public in general (Gohar and Nencioni 2021). ITS leverages digital devices, sensors, and cameras, as well as analysis, control, and communication technologies to improve mobility, safety, and efficiency.

By using mobility ITS, the shortest route between origin and destination is determined by considering factors such as distance, time, and energy consumption. Monitoring and managing transport system performance through traffic signals, transit operations, and emergency maintenance are possible with these apps. Apps that provide advisories and warnings reduce crashes. When congestion data is available in real-time, it can assist in making more informed decisions regarding alternative routes, alternative modes, and rescheduling trips, which can result in more environmentally friendly travel.

ITS data sharing is generally beneficial to transportation and mobility networks and systems. Yet, it can also be used as a tool for making city-wide data-driven decisions, welfare improvements, and financial transactions within multiple cross-implications applications.

6.9 Together, the Elements Form a Whole

It is through Geodesign that the above-described technologies and concepts can be brought together. Utilizing Geodesign allows interdisciplinary cross-implications to be addressed in the context of smart mobility in any urban environment. Geodesign and smart mobility planning could achieve incredible results since both are geared toward creating a better world, one that adapts to changing processes more effectively. Among their many similarities is their use of design thinking, their reliance on geographical science and information technology, and their consideration of people and human factors as well as sustainability. Smarter urban mobility systems can be successfully implemented by embracing a fundamentally holistic approach.

In the era of exponential urbanization, transportation smart mobility planning and urban design are crucial, but there is no single value proposition that can work for all cities. In the age of today's technology, urban mobility projects are delivered more

efficiently through better data and social media, simulation and forecasting tools, and the inclusion of innovation, design, and policymaking planning processes.

There is however a disconnect between those who benefit from transportation and urban mobility investments and those who suffer as a result. Often, projects are stopped simply because a convincing case cannot be made about their benefits and individuals lack a clear answer to the 'What's in it for us?' question.

Urban planning involves designing and coordinating all the components that make up an urban environment, such as the built and landscape environment, public spaces, pathways, transportation, and mobility options. Historically, limited transportation options or poor roads hindered urban growth; today it is a lack of good mobility options and poor smart mobility services.

Analyzing the urban fabric of any city can give us insights into organic urban development and mobility's effect on the city. Urban growth is largely driven by mobility around major roads (and rivers), which impacts urban design. Besides a variety of urban design elements, including landmarks, paths, edges, districts, and nodes, connectivity, accessibility, and centrality are essential concepts for understanding urban morphology and street networks, both of which impact urban transportation and set the stage for smart mobility.

A city's layout is characterized by its collection of blocks of different sizes and shapes, which together define its connectivity of infrastructures. When it comes to connecting urban areas, T-junctions provide a lower level of connectivity than X-junctions do. Also, there is less connectivity between junctions when there is a long distance between them.

Four measures of centrality can be taken into consideration when understanding street networks. Nodes are ranked according to their edges. Each node's number of edges defines its centrality or importance. Geodesic distance determines a node's closeness and centrality to other nodes. Higher importance is associated with nodes that are close to each other. The number of paths connecting one node to another is referred to as the betweenness centrality. A node that can connect to another node, is of greater importance. The Eigenvector centrality measure assigns scores to nodes. It is possible to create a transportation system index by balancing the network accessibility (node score) with the land use at each mobility hub (place value).

The creation of mobility hubs will take advantage of existing infrastructure such as station platforms, airports, and bus stop to improve the smoothness of mobility and provide more options for active transportation. Smart cities' intelligent, adaptive, and efficient infrastructure will enable real-time traffic flow monitoring, management, and optimization. Contextual urban design requires the development of interconnected mobility hub networks for the integration of smart mobility services.

In the given context (Flint Ashery and Stadler 2021b; Flint Ashery 2022), Fig. 6.1 shows the proposed Geodesign plan for 2045, and Fig. 6.2 depicts the shadow analysis for June 21, 2023. The analysis of shadows can provide implications not only for urban design, but also for urban mobility planning in these neighborhoods. For example, shaded areas can encourage interaction and collaboration in public places, offering thermal comfort, and making walking more pleasant in warmer weather.

Fig. 6.1 Geodesign workshop for Ezrat Torah and Ramat Shlomo neighborhoods: (1) The proposed plan for 2045

Due to the complexity of urban planning and the multifaceted implementation of new mobility, instrumental interventions that use Geodesign methodologies and tools can be effective in facilitating negotiation in planning (Flint Ashery and Steinitz 2022). Furthermore, our understanding of spatial networks of streets can be enhanced through social network analysis utilizing Geodesign. In Geodesign, all the elements mentioned above can be integrated both bottom-up and top-down, holistically considering the entire urban smart mobility system creating a new mobility landscape to enhance mobility, equity, and sustainability.

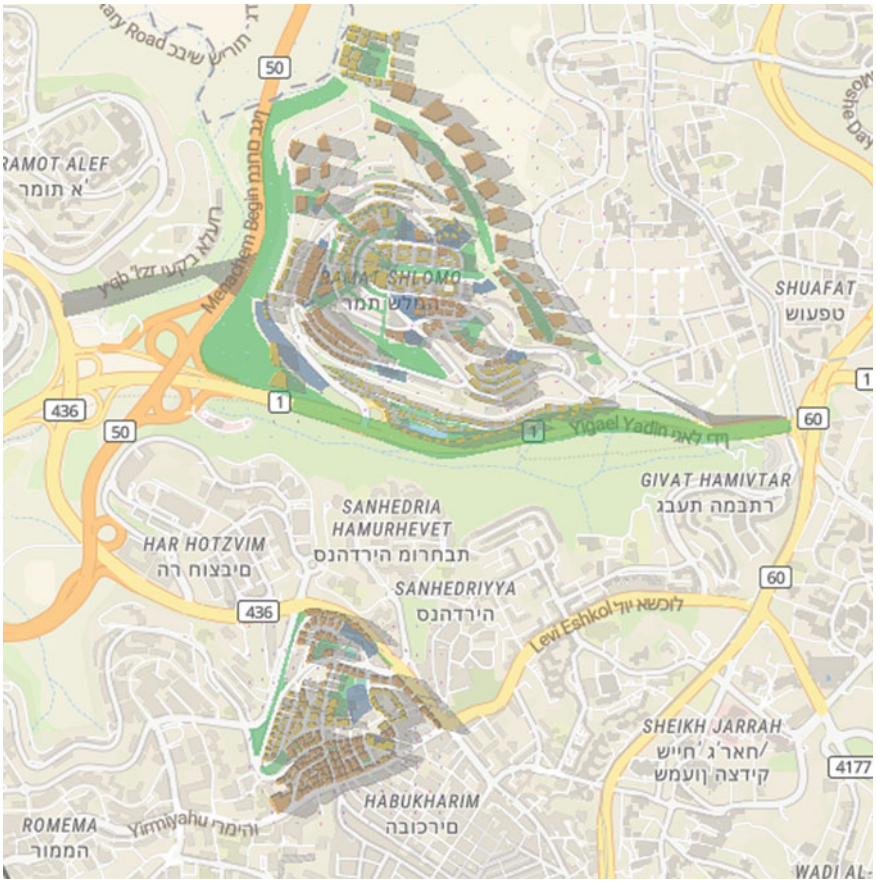

Fig. 6.2 Geodesign workshop for Ezrat Torah and Ramat Shlomo neighborhoods: (2) Shadow analysis for June 21, 2023

6.10 Conclusion

The new mobility landscape including smart mobility services, future mobility hubs, and other urban design elements contributes greatly to the attractiveness, livability, and functionality of urban areas and, hence, societal well-being.

The planning and design of urban smart mobility systems can be facilitated and presented well through Geodesign elements and layered visualization explorations. A holistic approach to smart mobility includes:

- Mixed-use development with easy access to public facilities and services.
- Self-sustaining communities where residents can work, live, and play.
- Economic support for local communities.

- A wide range of mobility options, including public transportation, mobility as a service (MaaS), active commuting, and walkability.
- Mobility hubs at nodes and places of high value.
- Smart mobility applications that are user-friendly.
- A decline in ownership and use of private vehicles.
- Infrastructural improvements.
- Keeping the impact on the environment to a minimum.
- Implementing transportation justice and overcoming poverty in transportation.
- Vision Zero is a driving force for achieving zero causalities.
- Enhancement of well-being and quality of life.

With the practical introduction to smart mobility presented in this article, urban and transportation planners are encouraged to utilize Geodesign methodologies and actively consider ways to meet the UN's Sustainable Development Goals (SDGs) for increased convenience, affordability, and comfort while simultaneously promoting accessibility and digital mobility inclusion in urban smart mobility implementations with a holistic perspective.

Because smart mobility is multidisciplinary, it requires collaboration between stakeholders from a range of disciplines and constant dialogue between users, industry experts, decision-makers, and policymakers. As part of smart mobility's integration into urban environments, users' goals, needs, and preferences as well as business opportunities, constraints, and limitations toward digital mobility services must be better understood. Thus, an integrated Geodesign approach is highly recommended. A Geodesign approach can make urban planning and design cross-disciplinary and inter-sectoral, advancing smarter mobility and furthering the advancement of urban living.

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Chapter 7
Facilitating Walkability in Hilly Terrain: Using the Geodesign Platform to Integrate Topographical Considerations into the Planning Process

Miri Jano Reiss and Anat Tchetchik

Abstract Walking is the healthiest, most natural, environmentally friendly, and egalitarian way of moving in space, and it plays an important role in urban life. Since walkability has become a key factor in New Urbanism, research on this issue has emphasized walkability analysis, examining the many global examples of urban spaces that reflect planning for walkability. However, the literature does not adequately cover the issue of walkability in hilly terrain. Previous studies have shown that walking on an incline may require more effort but can shorten the walking distance. When planning for hilly terrain, winding roads are used to reduce the incline. But winding routes lengthen the distance between junctions, reducing connectivity and walkability. A short distance between junctions creates connectivity in space, which is a key factor in walkability. The goal of this study is to examine whether and how digital planning practices can be implemented to promote walkability in a hilly neighborhood, despite the challenging physical circumstances. For this study, we invited students and professionals from various fields of urban design to participate in three planning workshops using the Geodesign platform. The findings indicate that walkability principles can be integrated into planning for hilly terrain, thus creating a walkable space in hilly areas. The study also found that Geodesign's structured, methodical process of discussion and negotiation supported inclusion of topographical considerations for promoting walkability in the planning process.

Keywords Walkability · Hilly terrain · Healthy urban planning\design · Public space and well-being · Topographical incline · Neo Urbanism

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7.1 Introduction

Planning for walkability is one of the principles of Neo Urbanism and a key factor in modern urban renewal. In *The Death and Life of Great American Cities*, Jane Jacobs (1961) asserted that the increased use of private vehicles and planning that prioritizes them has eroded the urban fabric, reducing opportunities for pedestrians to walk in the city and use the urban space in a manner appropriate for people instead of cars. Her observation is supported by studies that were conducted in the major US metropolises (Leinberger et al. 2014), as well as government programs for improving neighborhood walkability, which aim to meet environmental, health, and transportation goals (Talen and Koschinsky 2013). Cities that have set a goal of creating high walkability indices have witnessed increasing property values for apartments, offices, and commercial spaces (Pivo and Fisher 2011).

The "health map for the local human habitat" lists high accessibility on the walkable network to these services and creation of social and community interactions as key factors in human health (Barton and Grant 2006), emphasizing the connection between health, well-being, and the individual's physical living space.

Walkability and connectivity are both fundamental concepts in Neo Urbanism. The relationship between these concepts and health stems from the use of physical activity for movement instead of mechanized means, as well as the reduced use of vehicles, which lowers pollution (Iravani and Rao 2020). Any improvement in the individual's ability to access and implement these systems improves health and well-being. As a result, over the past two decades, walkability has become a top item on the urban planning agenda (Newman 2020).

Several objective factors of the walking environment influence walkability. The literature suggests several elements from the field of planning and design that influence walkability, including distance, shade, design, safety, and security. Another such element is the topographical incline, relevant in hilly cities, as it adds effort to walking. Further, the pedestrian's perception of distance depends on the effort involved in walking. Perceived effort depends more on the incline of the path than on the walking speed (Zadra and Proffitt 2016). The relative incline of a neighborhood influences the individual's decision to conduct physical activity in the urban space, including walking (Sun et al. 2015).

Much research in this field has documented the contribution of the built environment and the public space to the individual's health and well-being, both directly and indirectly, through designing social, economic, and environmental conditions (PHE 2017). Although many studies have addressed the contribution of urban planning to walkable space, the literature reveals a gap regarding the influence of the topographical component on walkability in urban space. This research gap exists even though topographical incline has a fundamental influence on walking effort and thus represents a major consideration for the pedestrian in deciding on the mode of movement through space. Deeper research on this issue can broaden knowledge on policy and planning for walkability for hilly cities, to encourage residents to choose walking as

a transportation method (Sun et al. 2015). In addition, there is no methodical examination in the literature of the connection between an inclined path and the perception of distance and effort involved in walking for various types of land use designations. The literature also lacks a methodical examination of implementation of planning practices that ensure walkability in hilly terrain through land use designations.

Shields et al. (2021) differentiated between two measures in the literature on walkability. The first measure addresses the micro-level and focuses on design and physical characteristics of the built environment. The second measure addresses the macro-level and focuses on the urban space including crowding, mixed-use, and connectivity of the walking infrastructure (Clifton et al. 2007; Park 2008; Cubukcu 2013). In the literature on the effect of characteristics of the built environment on movement (Park et al. 2018), topography is not addressed. Similarly, micro-approaches, including factors such as topography, micro-climate, safety, and aesthetics, are not thoroughly addressed (Dovey and Pafka 2020). Surprisingly, the literature does not examine the effect of topography on walkability, although topographical incline is a factor that magnifies walking effort.

Sun et al. (2015) is one of the few who have examined the relationship between incline and active movements. In a study conducted at the campus of Hong Kong University, they found that the incline is a significant factor in the attractiveness of non-mechanized movement. They support another study showing that people tend to prefer walking that requires a minimal investment of effort (Hunter et al. 2010). If we wish to encourage active movement and walkability when planning new spaces and urban renewal in hilly cities, we must relate to the topographical dimension.

Aside from the research on walkability in general, studies that examine the relationship between topographical incline and walking have shown that as the percent incline increases, walking distance is shortened. A study conducted in Vienna showed that for an increase of one percent in incline, walking was ten percent less attractive (Meeder et al. 2017).

Employing former research findings in an urban plan can contribute to the literature by embedding research insights regarding walkability in hilly cities into the planning processes. The aim of this study is to integrate these findings and to bridge the knowledge gaps related to planning and design for walkability in hilly areas. To do so, the current study will examine how to implement digital planning and design tools to promote active transport on inclined routes, with an emphasis on walking. I will do so by reexamining land use designations during the planning process to include incline and distance as factors in walking access and through design that improves the walking experience and reduces effort in walking on the inclined route.

7.2 Literature Review

7.2.1 Definition of Walkability

The many definitions of walkability share two common features:

1. The extent to which the design of a space encourages people to remain there and enjoy various activities. This understanding of walkability focuses on the intangible qualities of aesthetics and pleasure (Bradshaw 1993; Lo 2009).
2. The extent to which walking in the space is possible, focusing on physical characteristics such as security, comfort, and accessibility (Krambeck 2006; Abley et al. 2011).

Despite the numerous definitions of "walkability" in the literature, there is no unanimous agreed-upon definition of this term among scholars and practitioners. Walkability is generally defined in terms of two aspects: (1) "The degree to which space is built in ways that encourage people to be outdoors and enjoy themselves, to dine, shop, etc. within a given area. This represents a qualitative perspective, which regards walkability as a 'quality'" (Bradshaw 1993; Lo 2009); and (2) security, economy, convenience, and other factors determining the degree to which the public space is accessible and receptive to walking (Abley et al. 2011; Krambeck 2006).

Our study adopts the following definition of walkability: "The extent to which characteristics of the built environment and land use may or may not be conducive to residents in the area walking for either leisure, exercise or recreation, to access services, or to travel to work" (Leslie et al. 2007, p. 114).

7.3 Factors Contributing to Walkability

In addition to the multitude of definitions, the literature offers a variety of indices and criteria for a walkable space. Shields et al. (2021) identified over eighty-five variables used in studies to define walkability indices. Common indices in the literature are the number of public transportation stations and the distance between them (PHE 2017), density of residential buildings, mixed-use, sidewalk width, accessibility, distance to commercial centers and services, distance between junctions, aesthetics, security, personal safety, economic feasibility, and comfort (e.g., Leslie et al. 2007; Krambeck 2006; Frank et al. 2010; Blecic et al. 2015; Singh 2016; Wang and Yang 2019). These criteria influence the measure of walkability of the space. The literature provides extensive discussion of walkability's influence on urbanism that is social, economically feasible, sustainable, and healthy. Studies examining the impact of urban planning on walkability have identified the environmental factors that contribute to a higher walkability level (Ewing and Cervero 2010; Handy et al. 2005; Pikora et al. 2003). These include connectivity as well as the location of parks near residences, forming part of the urban physical space and contributing to increased walking rates.

We conclude that when the urban physical space supports walking based on these parameters, walking rates will increase.

Today, walkability is considered part of the urban transportation system (Mam et al. 2019).

Several studies have addressed the relationship between walkability and active transport. Active transport relates to physical activity as a means of transport and includes travel by foot, bicycle, and other non-motorized vehicles. Active transport also includes the use of public transport, as it involves walking or biking to reach public transport stations.

- Public transport—Taking public transport involves walking to and from public transport stations, and thus, its use also increases walkability. As the number of locations accessible by public transport increases, its efficiency grows, and with it, the likelihood that residents will use it. Access to public transport has been identified as one of the environmental characteristics that influences walkability (Koohsari et al. 2018).
- Biking—Biking is a type of active transport that involves physical effort. It also reduces greenhouse gas emissions, as it is an alternative to motorized transport. It is relatively low cost, which means that it is accessible to a broad range of socioeconomic levels. Creating a safe and convenient biking infrastructure also meets the goal of creating a walkable space. In addition, a positive correlation has been found between walkability indices and biking as a transport method (Grasser et al. 2017).

Despite the thriving discourse in the field of walkability, these studies have not sufficiently investigated topographical incline as a factor influencing walkability. Empirical knowledge on the relationship between walking and incline is sparse, and the existing planning tools based on this knowledge are limited in number. Other issues in the field of walkability, such as safety, aesthetics, connectivity, and shade, are well-documented in the literature and addressed by practical planning tools. For example, planning of intersection density, which enables connectivity and is implemented through grid-based routes, is a central component in planning for walkability (Fonseca et al. 2021). But grid outlines are a challenge for planners of hilly cities. While gridlines enable maximum connectivity (Moran 2009), hilly terrain offers less possibility for this type of route, because roads curve along altitude lines to minimize incline.

In planning for walkability, planners of hilly cities must also consider the reverse relationship between percent incline and walking distance. Studies have shown that an increase of one percent in incline reduces walking distance by 12.97%. Research in Vienna indicated that an increase of one percent in incline reduces the distance walked by 10%.

The current study aims to demonstrate whether and how we may implement planning practices that will increase walkability in areas of inclined terrain. Given the conclusion of previous studies that greater inclines mean shorter walking distances, city planners with appropriate tools should be able to plan walkable spaces for hilly cities. On the macro-level, for example, services, institutions, parks, public transport

stations, and other elements can be positioned based on the relationship between distance and incline, to enable pedestrian accessibility. Methods and practices that improve the walkability index may also be integrated, such as connectivity, increased density, and mixed usage.

On the micro-level, this study will suggest use of vertical mechanical means to maximize the walking experience. Vertical mechanical means are elements that enable movement between various heights in a mechanical manner, such as escalators, wheelchair lifts, elevators, and inclined elevators. Such methods may be used where the incline is particularly steep and leads to frequently visited destinations. This will enable the general population to walk without taxing physical effort. In addition, we will show how design can improve the pedestrian experience—for example, by creating and developing interest points, including benches for rest, and adding shade for relief from the heat in the summer months.

7.4 Study Framework and Hypothesis

This study aims at offering critical insights to help bridge the gap between concepts used in the Geodesignhub planning platform (www.geodesignhub.com), the spatial planning process (Steinlauf-Millo et al., 2021), and facilitating walkability in hilly terrain, based on three case studies of the Talpaz neighborhood in Jerusalem. Our research is based on three virtual workshops conducted in 2021 for students of geography and urban planning, and urban planning professionals. The participants used the Geodesignhub platform to create proposed revisions for the Talpaz policy plan of the Israel Ministry of Housing and Jerusalem municipality (2021 revision).

In examining the Talpaz policy plan, we found that the many entities involved in the planning process—including urban planners, policymakers, infrastructure and transport authorities, residents, and architects—faced difficulties in proper implementation of design principles. In operational terms, these entities encountered challenges in developing informed decision-making processes and in leveraging the new digital sources of information that are increasingly available to support a variety of planning considerations, including walkability.

To explore an alternative planning method designed to help the planning entities overcome these challenges, we decided to have the workshop participants use the Geodesignhub platform to make their proposed revisions to the policy plan. Geodesignhub is a map-based collaboration software that facilitates negotiations between planning teams. The software enables teams to create and share their planning activities and leads them through a process of consensus forming. It is often used as a mediation tool to resolve different approaches and conflicts between stakeholders. Generally, this type of work is done manually and is extremely time-consuming, involving many meetings and deliberations along with technical analysis work. Geodesignhub offers a digital alternative to improve the efficiency of this process (Flint Ashery and Steinitz 2022).

In designing the workshop process, we relied on conclusions from previous studies of the relationship between walking distance and topography slope. We also considered the distance–slope relationship in land use programs and design factors. We integrated these elements into the workshop process through use of the Geodesignhub planning tool (Flint Ashery and Steinlauf-Millo 2021). Then, using the three workshops as our data, we examined how planning practices can facilitate walkability in hilly terrain.

Research question: Can explicit links between planning principles and walkable conditions in hilly terrain foster practices that promote creation of walkable public spaces?

Methodology: In this study, we conducted three planning workshops using the Geodesignhub digital platform, to examine ways of incorporating topography considerations into the planning and design process.

7.5 The Research Field

For the location of our study, we selected the Talpaz neighborhood (Talpiyot Mizrach) in Jerusalem (Fig. 7.1) due to a combination of circumstances. First, the municipality of Jerusalem is currently developing a new, large-scale policy plan for employment, tourism, transport, and urban renewal for this neighborhood. Second, Talpaz is characterized by hilly topography and a high slope percentage (7%–29% at some of the roads we checked).

The Talpaz policy plan objectives include formulating a regeneration policy for the neighborhood, designating high-density areas, defining building characteristics,

Fig. 7.1 Jerusalem Municipal GIS, satellite image of the neighborhood

empowering low-income communities, and increasing walkability. The policy plan aims to add 8000 housing units by 2030, based on projected demographic growth. To reach these objectives, the plan specifies several land uses: high-density mixed-use spaces, public open spaces, green spaces, public institutions, commercial areas, and housing. Other land uses, such as employment, water infrastructure, agriculture, and tourism, were not specified for the purposes of this study.

7.6 Workshop Participants

For this study, we organized three virtual planning workshops, with twelve participants each. In the first workshop, the participants were urban planning students. Participants in the second and third workshops were professionals in the fields of urban planning, sustainable development, planning policy, urban design, and architects. These professionals are responsible for preparing recommendation reports to the Jerusalem planning approval authorities (local planning committee and district planning committee). To integrate public engagement practices and represent residents' interests and needs, the twelve participants in each workshop included one neighborhood urban planner and one local community representative from the neighborhood. The participants thus represented diverse considerations and fields, such as public institutions, environment, economy, transportation, services, and leisure.

7.7 Using Geodesignhub

As described above, Geodesign is a map-based collaboration software that facilitates negotiations. Following Geodesign methodology, the participants were divided into four interest groups: community, environment, policy, and economic development. Each group aimed to meet the policy plan goals regarding walkability promotion and the participants' individual fields of interest. The workshop began with an overview of the policy plan and the objectives that the participants were expected to achieve by the end of the workshop. We presented research findings and practical principles of planning and designing for walkability in hilly cities to each group. To test the hypothesis, the participants were expected to incorporate these principles during the workshop. The Geodesignhub platform enabled multi-disciplinary deliberation for increasing walkability, according to the policy plan goal.

The example below (Fig. 7.2) shows how Geodesignhub enables planning for land use by defining color-coded polygons, while tracking progress toward the policy plan goals.

The workshop workflow followed Carl Steinitz's framework for Geodesign (2023). The workshops began with a pre-workshop planning phase to understand and describe the territorial processes which characterize the geographical context.

Fig. 7.2 Land use polygons as depicted in Geodesignhub

As preparation for the workshops, we prepared maps that reflected various geographical infrastructures. Digital evaluation models were used to analyze the impact of the policy plan requirements, aiming to achieve an agreed solution by negotiation within several design cycles.

Each workshop began by defining the goals of their proposed plan, including walkability. The workshops proceeded according to the following work phases:

- Phase I—Participants were divided into four interest groups (community, environment, policy, and economic development) of three participants each. Each sub-group proposed a plan that met the goals.
- Phase II—Two sub-groups were combined into one, to form two groups of six participants. Each new group incorporated the two Phase I plans into one new plan. This was conducted by negotiation.
- Phase III—The two groups from Phase II were combined into one group. The united group incorporated the two plans from Phase II into one final plan, based on negotiation and the plan goals.

In all, three workshops were held with twelve participants each.

Below is the final plan (Fig. 7.3) that was agreed on by the unite community and government groups at the second workshop (professionals):

Following completion of the three workshops, we documented the process and compared the results, to learn how hilly topography can be considered in planning for walkability. As walkability findings from former research were integrated into the plan through the Geodesignhub platform, the results of the workshop plans indicate the feasibility of realizing walkability criteria in a policy plan for hilly terrain.

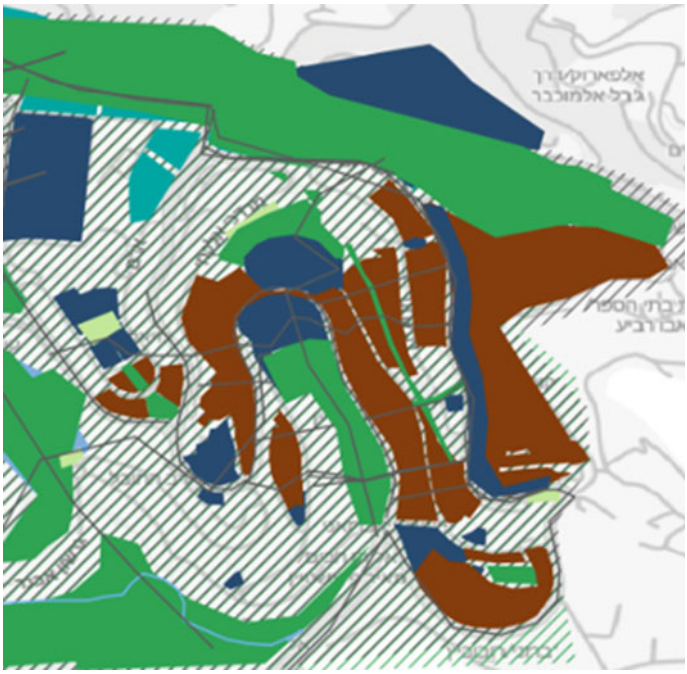

Fig. 7.3 Proposed plan by unite community and government groups as shown on Geodesignhub

7.8 Research Methods and Data Sources

7.8.1 Research Field

Jerusalem is a hilly city in a mountainous landscape. In terms of average slopes per space unit, it ranks 158 out of 197 municipalities in Israel, with the lowest average slope in the first ranked city (Central Bureau of Statistics 2017). Jerusalem suffers from a segregated neighborhood development that encourages automobile use instead of walking, a phenomenon known in the literature as transit-adjacent development (TAD). The growth rate of private car ownership in Jerusalem between 2004 and 2016 was 6.5%, while the rate of population growth was only 2%[1] (Jerusalem Institute for Israel Studies 2019). An increase in car use increases traffic congestion and polluting emissions as well as sedentary behavior. The mountainous landscape and automobile-oriented urban development make walkability promotion a great challenge in Jerusalem. Thus, this city makes an interesting case study for examining the effect of topographical slope on walkability. Moreover, Jerusalem is Israel's largest city by both area and population, with 10% of Israel's total population.

[1] Also, travel in Israel in 2016 rose by 4.4% compared to 2015 (Central Bureau for Statistics 2017).

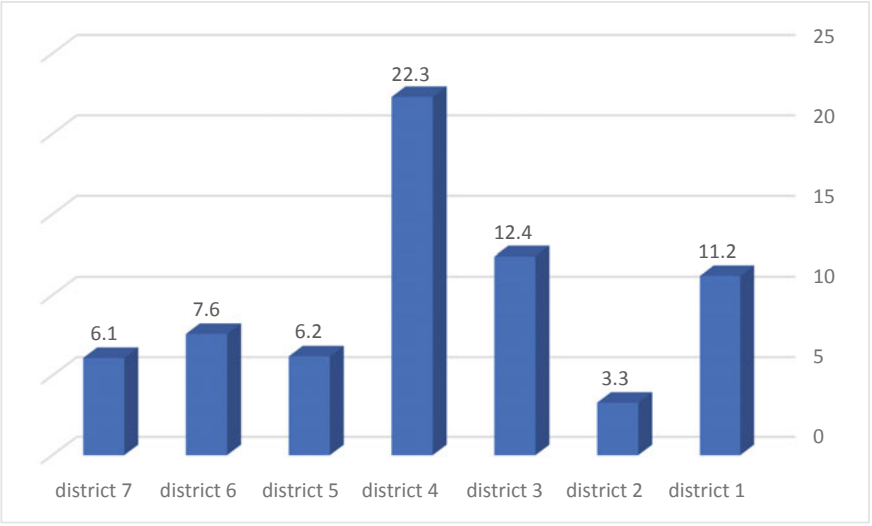

Fig. 7.4 Percentage of residents who use walking paths, by district. *Source* Health profile of Jerusalem, Municipality of Jerusalem (2015)

According to a neighborhoods' survey (Jerusalem Municipality, Division of Strategic Planning and Research 2016), 60% of the respondents enjoy physical activity in public spaces, with the majority choosing running or walking. Jerusalem's health profile (2015) also shows a connection between the residential environment and the active lifestyle of its residents. Based on the city's seven operational districts, Fig. 7.4 below shows the percentage of residents who use walking paths. District 4 has the greatest number of residents who use walking paths. The main characteristic of District 4 in relation to residential environment is that most of the Railway Park (an axial park about 7 km long, inaugurated in 2013) passes through it.

The city of Jerusalem originated at the historical core of the Old City. Following the 1967 war, satellite residential neighborhoods developed around this center, and these are mostly cut off from the urban fabric. Talpaz is one of those satellite neighborhoods, located northeast of the city's main urban fabric. This zoning policy, along with other planning modes, became the prime cause of subsequent fragmentation of neighborhoods in Jerusalem.

In December 1917, the British military occupied Jerusalem, ending four centuries of Ottoman rule. With the intention of preserving Jerusalem as the holy city of the three monotheistic religions and transforming it into a modern city, the British began to implement urban planning methods. The first publication of such plans is McLean's 1918 planning map for the western side of the city, showing a grid of streets connecting monuments and governmental institutions.

During the British Mandate (1918–1947), western architectural and town planning guidelines were implemented in Jerusalem. Emphasis was placed on preserving the historical sites and planning the northwest and southwest axes for future urban

development. British planners such as Patrick Geddes (1919), Charles Robert Ashbee (1922) who suggested a zoning system to the city, Clifford Holliday (1930), and Henry Kendall (1944)—all had a significant impact on planning in the city. The 1968 policy plan for Greater Jerusalem also incorporated these principles, despite the city's many political changes since the British plans (Efrat 1993).

McLean's plan was not adapted to the hilly topography (McLean 1918). Therefore, in 1919, Patrick Geddes was commissioned to prepare a new plan for the city. While both plans preserved the Old City and its surrounding green belts on the eastern side, they differed on the western, modern side. Geddes' scheme follows a fluid and concentric pattern, adapting to the existing urban fabric and hilly topography.

Henry Kendall's land use map (1944) for Jerusalem reflected both modern and pre-Mandate urban planning practices. Kendall's 1944 scheme has endured over the years as the only planning guidelines used to form the current shape of the fragmented city.

Today, the following factors sustain enclavism in Jerusalem:

1. Zoning.
2. Retention of the neighborhood unit as a primary planning organizer.
3. Lack of integration of the interstitial space between neighborhoods.
4. Lack of urban design and planning directives from local and district planning councils.

Historical planning principles prohibited construction in valleys and developed primary transportation routes there, greatly contributing to Jerusalem's fragmented urbanism. Neighborhoods that developed in the early-twentieth century are characterized by continuous urban fabric. But neighborhoods built after the mid-twentieth century are disconnected from the historic core. This fragmented urbanism as an outcome of the hilly terrain conflicts with the ideal of connectivity, which is vital for encouraging walkability (Ellis et al. 2016).

Creating a regeneration plan for a fragmented urban area such as Talpaz provides an opportunity to embed connectivity and encourage walkability. Talpaz is situated in the outer regions of Jerusalem and is not part of the built urban fabric of the city. Further, it is characterized by hilly terrain. By choosing this location for the study, we examine the incorporation of planning and design practices that encourage walkability and connectivity in a hilly area that is disconnected from the urban fabric.

7.9 Findings

Below I will present the workflow of the three workshops and describe the planning practices suggested by the participants to encourage walkable space in hilly terrain. As noted above, the participants in Workshop 1 were urban design students who represented various interests. The participants in Workshops 2 and 3 were professionals from the fields of urban planning, architecture, environmental planning, planning policy, and local neighborhood representatives. This created an encounter between

local and professional interests. The final plans that were authorized by each group represent the various interests of the relevant stakeholders, according to the plan goals as defined in the policy plan. These goals defined an addition of 8000 housing units and accordingly, additional areas for uses such as green spaces, commerce, employment, and public institutions. The final plans that were agreed upon by each of the three groups resembled each other, with a particularly high degree of similarity between the final plans of Workshops 2 and 3. To give a sample of the specific findings, we will focus below on the final plan of Workshop 3.

By displaying the spatial analysis of the planning area, the Geodesignhub platform also enables presentation of topographical data on the terrain. This permitted the workshop participants to analyze their plan three-dimensionally during the planning process. This way, they were able to integrate the topographical route conditions into their planning considerations and propose planning that facilitates walkability in the space. During the three workshops, the participants used various planning practices to encourage walking movement in relation to the topographical route of the planning space. The practices they used addressed the relationship between incline distance and height to land uses, improvement of connectivity, and implementation of design elements for encouraging walkability. Participants also implemented design practices for integrating complementary active transport, such as adding biking routes and improving public transport.

Despite the hilly nature of the neighborhood terrain, a micro–macro treatment of the space enabled the groups to suggest a comprehensive neighborhood plan that reached the goal of 8000 additional housing units. As mentioned above, macro-level planning focuses on the urban space, including crowding, mixed-use, and connectivity of the walking infrastructure. Micro-approaches focus on design, addressing factors such as aesthetics.

On the macro-level, the proposed plans included solutions for the various types of land use specified in the policy plan, including increasing the inventory of public institutions and creating walkable space. The groups also integrated the percent incline into their plans for the land use sites and walkable spaces, as well as for the main neighborhood arteries. As the terrain incline between residential areas and public institutions increased, they gave greater preference to locating public institutions near housing sites.

On the micro-level, three-dimensional spatial analysis enabled exact positioning of urban elements, such as mechanical vertical means, to improve accessibility in locations with a very steep incline. Using the Geodesignhub platform method for defining polygons, workshop participants integrated design features to improve walkability—for example, by adding benches and shade.

The three workshops created plans for facilitating walkability in the neighborhood that accounted for the steep incline, while focusing on both macro (urban planning) and micro (design) aspects, as described below.

7.10 Urban Planning

In this macro field, participants focused on addressing the challenging topography by considering land use planning, reducing walking distances, and enhancing connectivity to destinations. When analyzing the land use locations and the distances between them, planning included the relationship between distance and incline percentage. As the incline increased, planning attempted to shorten the walking distance between destinations, such as between living areas and destinations such as schools, commercial centers, and playgrounds. An additional practice was mixed-uses in high-density construction. This practice concentrates land uses and users in a limited area, so that the distance between the various uses (public institutions, services, commerce, etc.) is short, thus serving a high number of users and encouraging walking to these destinations.

In each of the three workshops, the participants emphasized their preference for the practice of high-density mixed-uses. As shown in Diagram 1, the quantity of terrain allocated for high-density mixed-uses in all three workshops was very high in comparison to the area allocated for textured construction of lower density. Workshop 1 planned 116,045 m^3 of high-density construction as compared to 13,966 m^3 of perimeter block residences. Workshop 2 planned 307,396 m^3 high density as compared to 39,355 m^3 of perimeter block, while Workshop 3 planned 222,601 m^3 high density as compared to 3783 m^3 of perimeter block.

Workshop 3 participants implemented the following planning practices to create space that encourages walking: designing high-density and mixed-use areas, locating land uses to shorten the walking distance between residential buildings as the incline

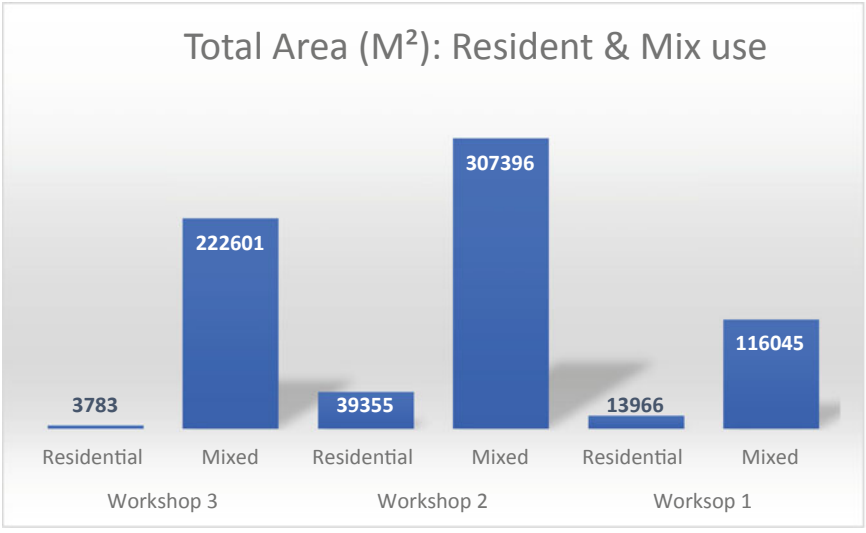

Diagram 1 Comparison of mixed-use and high-density areas with residential zones

increases, and planning a green walking framework that increases connectivity to destinations inside and outside the neighborhood.

The Workshop 3 final design (Fig. 7.5) appears below:

Below is a description of how these planning practices were implemented in high-density areas of the site:

Northeast site—This site is characterized by a very high incline percentage on the north–south axis. The design integrates high-density and mixed-use construction. In addition, the design includes green routes and walking paths that traverse the site, and vertical mechanical means from east to west, in the direction of the incline. These increase walkability to destinations outside the site, public institutions, and public

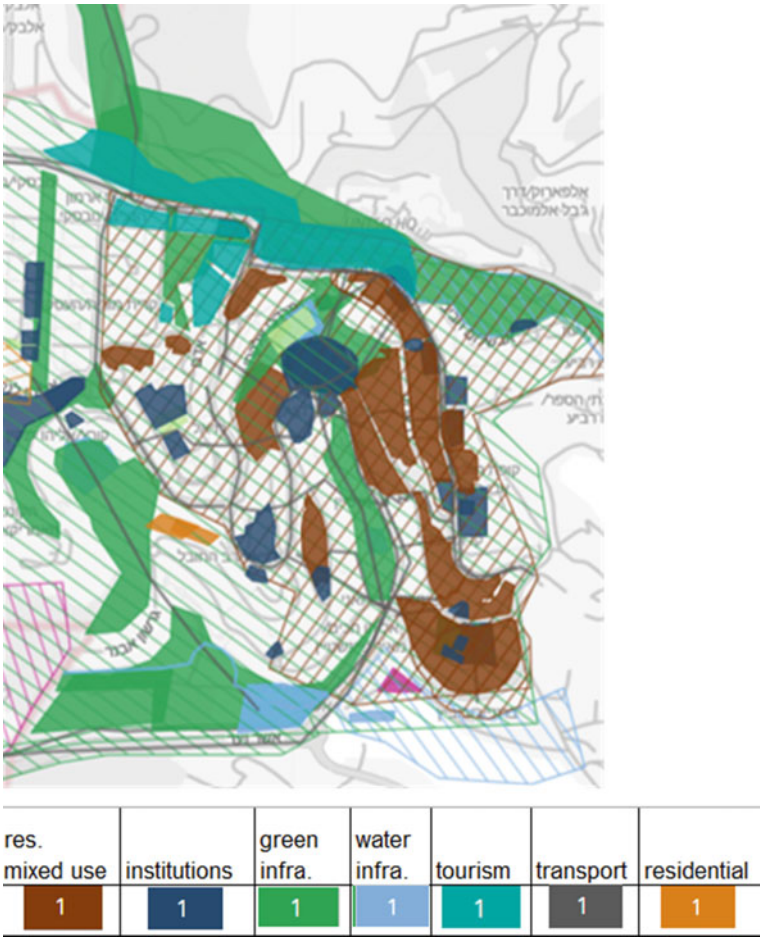

Fig. 7.5 Final plan as designed by Workshop 3 (professionals)

open spaces in the neighborhood center. A bicycle path was planned as an additional connective means to other areas in the neighborhood.

Southeast site—This site is far from the public, communal, and commercial services in the neighborhood center. It is also separated from the neighborhood topographically because it is located on the slope of the hill. Due to the difficulty of walking up the steep incline that connects this site to the neighborhood center (in some sections the incline reaches 29%), the site is inaccessible by foot from the rest of the neighborhood. To overcome this obstacle, the planners integrated two polygons for public institution uses, in addition to the public uses already integrated in the high-density/mixed-use construction. One of these polygons is relatively small. The other is larger and is located in the northern part of the site. It connects to the northeast site and thus serves both.

The tools that the planners used to encourage walkability in the neighborhood are: locating local functions near residential buildings through mixed-use, adding public uses and connecting to the northeast site, adding public open spaces, and placement of vertical mechanical means that ease the transition between different heights. We will focus on these tools below when we examine design. To increase connectivity through sustainable transportation, the participants added the above-mentioned bicycle path that connects the site to the northern part of the neighborhood, where additional services are located. They also planned a new public transportation line that connects the site with destinations inside and outside the neighborhood.

The participants planned a system of longitudinal green spaces as part of the transportation framework. To encourage walking to destinations inside and outside the neighborhood, they planned an infrastructure of public open spaces that connects residential areas, institutions, and commerce, as well as leading outside the neighborhood. In the neighborhood center, they planned a significant green space to serve as a central route, with pedestrian paths branching off it in all directions and vertical means where topographical differences create a non-traversable obstacle. The green space is located in the valley between two hills and connects to all the surrounding areas: spaces on southeast and east of the neighborhood, the cluster of public institutions and commercial spaces on the north, and longitudinal green spaces on the south and north, the landscaped promenade, neighborhoods to the west, and the central public transportation route outside the neighborhood to the west. Making the transportation route accessible is important in the context of active transport, since a future light rail line is planned along this route as a unique mass transport service in the city. As mentioned, walking is an important means of accessing public transport, as part of the complex of efficient active transport.

Four small high-density/mixed-use spaces—In addition to the two large sites, the planners defined four smaller sites near existing public institution centers, green areas, bicycle paths, and walking routes, including vertical means and green routes that connect destinations inside the neighborhood. The participants added high-density/mixed-use construction in these locations to ensure that neighborhood services were within walking distance.

7.11 Design

On the micro-level, Workshop 3 participants integrated several physical elements into the space to create better connectivity and improve the walking experience. These included vertical transport modes, green spaces, heritage and landscape sites, shade and benches, and a green border. Below we will describe these elements in detail:

Integrating vertical mechanical transport modes in the public space—By including transport modes such escalators (mechanical) and staircases, two goals were achieved. The first of these was overcoming differences in topographical inclines to enable efficient continuity of movement. The participants integrated these means primarily where the need arose to create a new connecting route between destinations—for example, between residential areas and commerce and service areas, where the incline is over 7%. The second goal achieved was creating new routes, including mechanical, which leads to additional intersections in the planned space. As found in the literature review, one of the factors that creates connectivity is high frequency of intersections in space. Hilly terrain requires planning roads that curve along the natural altitude lines, which increases distance between intersections and reduces connectivity. To overcome topographical disparities, new intersections and meeting points were created, which improved connectivity and the ability to move efficiently between origin and destination point. In Workshop 3, three such means were integrated, resulting in the creation of six new intersections in the public space.

Adding green spaces to improving the walking experience—To improve the walking experience, the workshop participants included polygons of green spaces and longitudinal green routes. Workshop 3 planned a green infrastructure that included longitudinal green space in the neighborhood center, two community parks, and three polygons for leisure and sports activities to serve as a neighborhood focal point.

Promoting heritage and landscape sites to increasing interest in the public space—The participants planned for development of important heritage and landscape sites: the western slope overlooking the Judean Desert, the lower Herodian water source, and the promenade overlooking the sacred sites of the Old City. In Workshop 3, five heritage and landscape sites were planned for preservation and development.

Applying a policy of shade and benches—The Geodesignhub platform supports applying policy to polygons that the participants create. The participants agreed to apply a policy to the entire neighborhood terrain of placing benches to serve as stopping and resting points. This relieves the effort involved in walking in general, and in particular, the additional effort required to walk on an incline. In addition, the participants applied a policy of planting trees as a natural shade element to reduce the heat released into space, reduce solar radiation, and beautify the space. These factors improve the walking experience in terms of climate, health, effort, and aesthetics.

Adding a green border—The designs included plans for a green border along both sides of the existing main road south of the neighborhood, to adapt this route for walking. This will create an additional route to serve residents of the southern part of the neighborhood when they exit toward the west.

7.12 Active Transport

In the training session at the beginning of the workshops, we presented walkability as one of the three types of active transport and asked the participants to promote this option as part of the workshop. We explained the benefits of encouraging active transport, while emphasizing walkability as a means of movement between origin and destination points and as a means of reaching public transport stations to support the use of this mode. Accordingly, analysis of the workshop outcomes is related to active transport, including walking, biking, and public transport.

The Workshop 3 final design implemented the following elements:

The general approach to active transport included adding tactical biking trails (created by widening existing vehicle routes), bus lines, and light rail lines. Some of the biking trails were planned along altitude lines to enable comfortable riding in topographical terms. Some biking trails were positioned along inclined routes, connecting parts of the neighborhood that are separated by sloping topography. Use of inclined routes for biking was implemented due to the expanded use of electric bicycles, which enables comfortable biking on high inclines. For walking, the green infrastructure was planned as part of the neighborhood transportation infrastructure. As part of this, the participants planned walking paths that connect destinations inside the neighborhood with points outside, toward a main transportation route on the west. To enable more efficient public transportation, Workshop 2 participants added more public transport lines and a light rail in the neighborhood.

In total, Workshop 3 participants planned seven bike paths and nine walking routes, including routes that lead to distant destinations and are thus appropriate for leisure and sports purposes. The participants also added a new bus line and a new light rail line. As mentioned, a green border was planned along two main roads leading outside the neighborhood.

Connectivity—To promote use of active transport, particularly walkability, Workshop 3 participants gave preference to improving connectivity between destinations and between entrance routes to destinations in the planned space. Improving connectivity was accomplished through a range of actions in the following fields.

Planning—Expanding the available destinations such as commerce, services, and public institutions, that are located near residential and high-density areas.

Active transport—Creating walking and biking paths, improving accessibility of public transport, and adding lines.

Design—Adding vertical means to create new routes and junctions—some mechanical, to ease the effort involved in ascent and descent of large variations in height; and increasing the number of required destinations, such as commerce, services, and public institutions.

7.13 Discussion and Conclusions

In examining whether and how we can plan for enhanced walkability in hilly terrain, we must relate to three-dimensional space. On the one hand, we must analyze incline as a factor that influences transportation routes, while on the other, as a factor that increases the effort required for walking. Previous studies in the field of walkability in hilly terrain have shown that as the incline percentage increases, walking distance is shortened. Other studies have indicated that hilly terrain requires roads that curve along altitude lines. Curved roads lengthen the distance between intersections, which reduces the level of connectivity in space. In turn, the level of walkability is also reduced.

To recall our research question, we asked whether planning principles that encourage walkability can be implemented in hilly terrain to improve walkability in a hilly city. The findings of our three planning workshops indicated that planning for walkability can be implemented in hilly terrain, when relating to space three-dimensionally. By integrating the relationship between inclines and distances in planning and design of the space, we must address macro- and micro-aspects.

In planning on the macro-level, the participants suggested several practices for implementation. The first was implementation of intensive high density, including mixed-use, which are two common measures of walkability. Another planning practice is locating land uses to shorten distances between residential areas and destinations in the neighborhood (public institutions, parks, commerce, etc.), while emphasizing shortening distances for streets and routes where the incline is greater than 7%. These practices are intended to encourage walking as the mode of reaching destinations. Another practice has focused on planning and creating a range of possibilities for sustainable transport: biking paths, new public transport lines, walking paths within the neighborhood, and paths that connect the neighborhood to popular destinations outside it. In addition, the participants invested in making public transportation accessible, which also increases walkability, since use of public transport requires walking between the origin point to the public transport station and back. To overcome the topographical variations and thus reduce the effort involved in walking on steeply inclined routes, the planners incorporated vertical mechanical means such as wheelchair lifts, escalators, and inclined elevators. These means create movement axes that connect between streets and destinations inside the neighborhood. As mentioned, this reduces the effort involved in walking on inclines and improves connectivity in space by increasing the number of junctions. Improving connectivity improves the ability to maneuver in space, which increases the level of walkability.

In the micro-level field of design, the participants suggested policies for creating shade throughout the neighborhood, to reduce the temperature in hot weather and reduce the solar radiation to which pedestrians are exposed. Another policy applied to the neighborhood was positioning benches to create resting points. This moderates the walking effort required and maximizes the number of individuals of a broad range of ages and health conditions who walk through the neighborhood. In addition to general design principles for the neighborhood, the participants designated specific areas with design elements for shade and rest. These make walking easier and more pleasant. Implementing this practice included enriching the neighborhood's green infrastructure, through community parks, pocket parks, public parks, sports fields, and landscape, nature, and heritage sites. These were planned to serve as focal points for leisure and sports activities in the neighborhood. Further, the workshop participants have related to the incline percentage in decisions relating to the positioning of land uses and design elements. Implementing the design elements considered the location of the steepest inclines, to improve the aesthetic aspect of walking on an incline (creating parks), to moderate the effort required in walking on an incline (adding benches), and to moderate the climate (adding shade, mainly trees).

We asked how the use of the Geodesignhub platform enabled integration of topographical considerations in planning for walkability. We found that the structured process of Geodesignhub workshops enabled relation to topographic variations in the planning process, due to the graphic digital platform that simulates the proposed planning status at each stage. In addition, the platform gave quantitative information at each stage against the policy plan goals as defined at the outset. In this manner, the participants were able to begin the general planning of spaces in relation to the existing inclines in the neighborhood and the desired land uses. They were also able to integrate the distance–incline relationship in planning the distances between the different land uses. Similarly, they calculated the distances between the residential areas and destinations such as public institutions, public spaces, commerce, and other uses, through planning a new green infrastructure, bicycle paths, and efficient public transportation, in addition to the existing transport routes in the neighborhood. On the micro-level, the platform permitted focusing on design elements that can overcome topographical variations through implementation of vertical mechanical means, and on making walking more pleasant through green routes, shade, and benches.

In the first stage of each Geodesignhub workshop, each interest group suggested its own plan for the neighborhood. In subsequent stages, interest groups used structured negotiation to reach agreement on a final plan. This structure enables the interest groups to express their particular values, along with the quantitative goals of the plan, such as number of housing units, employment areas, and public institutions. In the introductory stage of the workshops, we presented to the participants the research findings that connect incline and walking distance and the advantages of planning for walkability. We proposed means to improve walkability that could be integrated into the plans. We also informed the participants of the quantitative goals of the plan and the added value of planning for walkability that we aimed to test, seeking to create a connection among each interest group to the subject of our study. Eventually, creation of this connection was translated into integrating topographical

considerations in planning for walkability, along with the other interests that the participants were instructed to promote in the proposed plan. In the later stages, when the groups worked together and negotiated the issues promoted in the plan and of each interest group, walkability became a consensus. The discussion focused on the desired methods of implementing walkability and not on whether it was needed. Use of the system that defined clear goals for the plan and a structured framework of negotiation created consensus on the planning approach that reached beyond each group's particular interest. In each of the three workshops, the final plan reflected adoption of planning and design practices that aimed to encourage walking and active transport both inside and outside the neighborhood, despite its almost complete disconnection from the built texture of Jerusalem and location on hilly, sloped terrain.

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Chapter 8
Geospatial Analyses of the Geological and Geographical Impacts upon the Settlement and Evolution of Bet Safafa from a Small Village to an Arab Suburb of Western Jerusalem

Joel Roskin and Rotem Elinson

Abstract Using geospatial analyses complemented by ground-truthing, we investigate several factors that possibly influenced the evolution of the residential, agricultural and open areas of the village of Bet Safafa. We suggest that the geological conditions that were unresourceful with regard to flowing water and mediocre for agriculture were not factors that led to the establishment of the village. The location of the village by the periphery of western Jerusalem, slightly above the Refaim valley that since 1892, hosted the Ottoman railway to Jerusalem, and beneath the ancient-to-modern north–south route of the Judean Highlands is suggested to have been an important factor governing settlement sustainability and development until today. Since 1948 and 1967, the poor agriculture merit of the lands straddling the village has matured into attractive zones for the development of housing in the form of a unique Arab suburb of western Jerusalem.

Keywords Geological and geomorphic impacts · Geospatial analysis · Ottoman village initiation · Israel · Judean Highlands · Modern Jerusalem

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8.1 Introduction

8.1.1 Geographical–Historical Background and Research Goals

The village core and now town of Bet Safafa lay in the southeastern Jerusalem Hills, which is part of the Judean Highlands. It is only ~ 4 km south on ancient Jerusalem (Fig. 8.1a) and at the western edge of modern Jerusalem. Bet Safafa is straddled between two major axes—the east–west late Ottoman railway founded in 1892 along Nahal (Nahal means ephemeral stream) Refaim and the north–south 'Way of the Patriarchs' along the National Watershed of Israel (Fig. 8.1b). This axis, now known as Road 60 (Fig. 8.2a, b), comprised the transportation artery of Biblical times until today.

The establishment time and motivations of the village are not clear, and may they be geographical, environmental or socially driven. It may have been established in 450 AD by Arabs from the Gaza Strip and Transjordan (Othman 2006). However, narratives suggest an earlier nucleation.

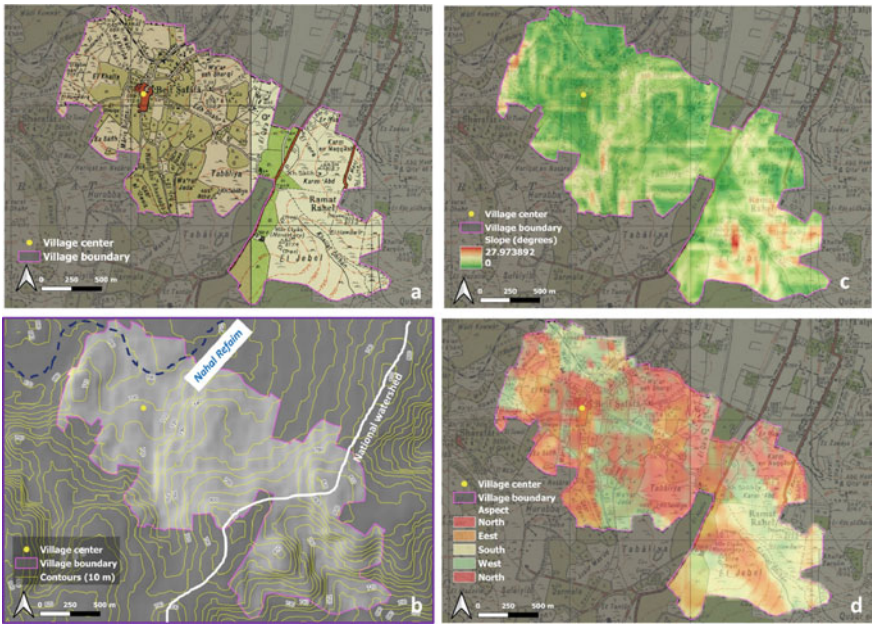

Fig. 8.1 Geospatial analyses' maps. **a** British parcellation of the village of Bet Safafa in 1945 noting land ownership, crops and water cisterns. **b** Topographic map, national divide (white line) and Nahal Refaim. The gray is the village area along the Bet Safafa ridge. **c** Slope map of Bet Safafa ridge. **d** Aspect map

Fig. 8.2 Oblique Google Earth images of Bet Safafa today—in yellow polygon. **a** Eastward view demonstrating the modern sprawl of buildings along the Bet Safafa ridge between the Refaim valley and the national watershed. **b** Southern looking view with main roads and their number marked in yellow. Note deepening of the valley on right side of the image

In 333 BC, the Jewish residents of Jerusalem, then a small town, are understood to have met Alexander the Great coming from Gaza in the environs of Bet Safafa. Led by Shimon Hazadik (Rabbi Simeon the righteous) wearing white clothes and requesting peace, Alexander accepted and pardoned them from paying tribute. The name of the village has been attribute to this founding story and not environmental or

social factors. The term Sufi emphasizes the direct personal experience of God and may reflect the Godly, white appearance of Shimon. The clarity and purity—'safa', may possibly led to the name Beit Al Safa or 'house of purity'. Eventually the name Bet Safafa was embedded.

Bet Safafa is one of several small Arab villages that in the early-twentieth century, existed in the basin of Nahal Refaim. Agricultural terrace construction in hinterlands of many of these villages was commonplace during the Early Ottoman period (sixteenth–seventeenth centuries A.D.) (Ron 1966; Gadot et al. 2012; Kisilevitz and Turgeman-Yaffe 2018; Walker 2022). Wheat, groats, varied agricultural produce, olive and fruit trees, vines, goats and beehives have been reported to be the subsistence of nearby Manahat in Early Ottoman times (1596 AD) (Hütteroth and Abd al-Fattah 1977; Kisilevitz and Turgeman-Yaffe 2018). Historical maps show that this region was devoid of natural Mediterranean maquis, probably due to overgrazing of open areas between agricultural fields. Near Bet Safafa there is not evidence of abundant agricultural terraces that could have supported the inception or growth of Bet Safafa, in contrast to some neighboring villages.

Applying GIS-based geospatial analysis along with a study of the villages' geology and geomorphic properties, this study analyzes the relations between the Ottoman core village of Bet Safafa with its natural and agricultural environment (see Elinson 2016). The analyses also may serve as a substrate for attempting to understand the responses of the village to modern geopolitical changes, namely the split in 1948 between the newly established State of Israel and the Jordanian occupation of the West Bank and eastern Jerusalem in the central highlands of the Land of Israel (Judea and Samaria). The past/natural layout of Bet Safafa is also hypothesized to have partly influenced the spatial developments of the village into a small town.

8.2 Methods

Geospatial analyses and map production were performed in Qgis software applying several vector and raster analysis tools, following observation and interpretation of time series of aerial photographs. Historical 1:20,000 scale maps from 1943 and 1944 (Talpiyot 17–12 from 1943, Bethlehem 16–12 from 1944) download from https://palopenmaps.org/en were georeferenced in Qgis. The village boundary layer was digitized based on the historical maps. Statistics were calculated for the village boundary from 1943 and 1944, using zonal statistics tools.

Contours, slope, aspect and hillshade layers of the village lands were created from the SRTM DEM layer of NASA (NASA JP 2013). The geological formation GIS layer (Fig. 8.3) at a 1:50,000 scale (Sneh and Avni 2011) was downloaded from the Geological Survey of Israel website. The data and results was partially ground-truthed by two field excursions by foot.

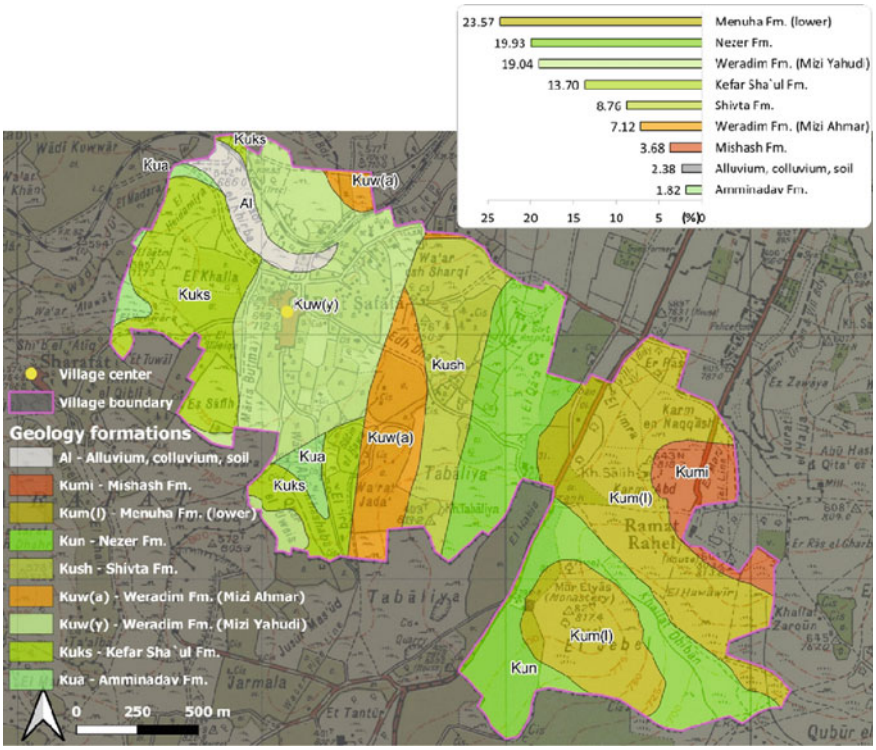

Fig. 8.3 Map of geological formations and in inset—percentage of each geological formation in the full village area of Bet Safafa

8.3 Study Area

8.3.1 Geography and Historical Geography

Bet Safafa is situated in the upper reaches of Nahal Refaim that comprises a tributary of Nahal Soreq that is the main drainage system in the Judean Hills (Katz et al. 2011; Roskin et al. 2022). Beneath Bet Safafa, the Refaim forms a broad and very moderate valley that was utilized for the route of the railway founded in 1892, to Jerusalem. Here the wadi has very low erosive and fluvial power. Further downstream, the wadi is more canyon-like with higher fluvial energies that can transport coarse bedload making this part of the Refaim valley, possibly less suitable for agriculture (Fig. 8.2b).

The historical and core part of the village at 730 m asl is nestled in a topographic saddle of a ridge (Bet Safafa ridge) that moderately slopes northwesterly from the national watershed at 810 m to the Refaim valley at 680 m (Figs. 8.1a–c and 8.2a, b). While most Ottoman villages are along slopes, the physical setting of the village is slightly different and may reflect distinct reasons.

The village lands of Bet Safafa are quite limited as they are fully surrounded by lands owned by adjacent villages—Jerusalem to the northeast, Tsur Bahar in the southeast, Bet Jala and Sharafat in the southwest and El-Malha in the northwest. Bet Safafa is one of several Ottoman villages that straddled the upper Refaim valley and underwent a unique and significant modification due to the 1949 Israel–Jordan armistice line that ran above Nahal Refaim in order to keep the railroad in Israeli territory (Fig. 8.2b). Bet Safafa was divided with its urban margins and fields in the Refaim valley, becoming part of the newly established State of Israel.

In 1949, nearby villages had different fates than Bet Safafa. The village of Walaje, centered around a layer spring on the northern slope of the Refaim, was uprooted and the residents were relocated to the southern slope (Braverman 2021; Yechezkel et al. 2022). The village of Manahat was captured by the Israel Defense Forces and the villagers did not return. The Arab villagers of Batir—the ancient Jewish town of Betar, ~ 10 km downstream the Refaim became under Jordanian control, but the villagers were allowed access to their fields in the Refaim valley, despite being on the armistice line (Murray 2021).

8.3.2 Geological Setting

The regional relief of the environs of Bet Safafa is initially dictated by the Syrian-Arc tectonic system (Wdowinski and Zilberman 1997) followed by the uplift of the Judean Highlands in several pulses throughout the Neogene and Early Pleistocene (~ 2 million years ago) in response to the Dead Sea rifting. This uplift in turn formed the national watershed between the Dead Sea and Mediterranean basins (Begin and Zilberman 1997; Bar et al. 2016). The last pulse of uplift was about ~ 100–350 m (Ryb et al. 2013; Bar et al. 2016). Tectonic quiescence and base-level stability have existed from the middle Pleistocene to the present (Ryb et al. 2013). The stability has enabled a wide range of geomorphic, pedological and prehistoric-driven processes to operate on the study area. In the last thousands of years, these processes are often in conjunction with ancient human settlement (Crouvi et al. 2018; Barzilai et al. 2020; Roskin et al. 2022).

The tectonic uplift of the Judean Hills dictated the development and change of many drainage systems originating in Transjordan that were disconnected by the Dead Sea rift. The westerly draining wadis of the Soreq drainage basin from the national watershed crossing Jerusalem toward the Mediterranean Sea such as Nahal Refaim are at first in a moderate relief (Crouvi et al. 2018) and then deepen to the west (Roskin et al. 2022). Bet Safafa is situated near this transition along Nahal Refaim (Wadi el-Werd) (Fig. 8.2b).

8.3.3 Climate

Bet Safafa is within the semiarid Mediterranean climate zone. The winter (November– March) is characterized by a series of storms originating over the Mediterranean Sea, generating an annual average of precipitation of ~ 550 mm. Snow may occur once a winter. Precipitation amounts significantly decrease east of the village toward the margins of the Judean Desert. Winter is preceded and followed by short transitional seasons, autumn (September–October) and spring (April–May). Then occasional rains occur, as well as very hot episodes. Summer is hot and dry, with daily maximum temperatures averaging 29 °C in July and August (Goldreich 2012).

8.3.4 Soils

The spatial distribution of soils in the area of Bet Safafa closely follows its lithology and topography (Singer 2007). Two main soil types are present. Dominant reddish silty loam Terra Rossa (luvisol in the FAO classification) soils overlie the area's hard limestone and dolomite bedrocks such as where the village is located. These soils are rich in clay minerals (> 50–60%) and are carbonate-poor that have enhanced water retention and are ideal for Mediterranean agriculture (Yaalon and Ganor 1973).

Gray Rendzina soils (pale rendzinas) are rich in carbonate and are formed on the dominating soft limestone, chalk and marl outcrops, mainly where calcrete is devoid. The carbonate-rich Rendzinas and their soft underlying chalk strata have been successfully terraced into agricultural productive fields in ancient times and even today (Zgaier and Inbar 2005).

8.4 Results

8.4.1 Village Core, Slope and Relief

The GIS mapping shows that the lands of the village of Bet Safafa in 1944 covered 3.32 km^2 (Fig. 8.1a, b). The rest of the owned lands were for crops and grazing. About 10% of the village's lands had Jewish ownership. The 1944 British village statistics reports that the built-up part comprised only 71 Dunams (a Dunam = 1000 m^2) (Table 8.1) which appears similar to the mapped area on Fig. 8.1a. The built-up area is small-medium in relation to the other villages along the Refaim valley.

The slopes of the Bet Safafa ridge are well-distributed and have an average inclination of ~ 7.32° (Fig. 8.1c, d) making pedestrian and even wheeled transportation feasible and agriculture on large parts of the ridge. The village core is at the flattest part of the ridge slope (Fig. 8.1c).

Table 8.1 Land use and ownership data from village statistics of 1945: a classification of land and area ownership in Palestine

1945 Bet Safafa land usage	Arab area (Dunam)	Jewish area (Dunam)
Irrigated and plantation	1004	26
Olive groves	400	0
Planted W/cereal	950	199
Built up	71	0
Arable	1954	225
Non-arable	898	
Total area	2814	391

8.4.2 Spatial Distribution of Geological Formations Along Bet Safafa Ridge

The agricultural, open and built-up lands of the Bet Safafa ridge run along the full southern slope of the Nahal Refaim valley. The lands are upon a wide range of marine carbonate rocks of the upper half of the Late Cretaceous Judea Group, and the lower part of the overlying Mt. Scopus Group (Fig. 8.3). Nine geological formations have been mapped along the Bet Safafa ridge (Sneh et al. 1998). The formations appear as strips generally running parallel to contour orientations along of the ridge.

Upslope and downslope the village core of the Bet Safafa ridge, soft and light carbonate rocks dominate. Bedded chalky limestone of the Kefar Shaul Fm. comprises the basal part of the ridge and covers 13% of the area of the 1944 village. Bedded limestone and massive chalk of the Nezer (%20%) and Menuha (%23.5%) Fms. respectively, build the upper parts of the ridge (Fig. 8.3).

The soft carbonate lithologies host thick, impermeable calcrete coatings, locally termed ‘Nari’. Though not mapped, calcrete is common mainly along ridge backbones in semiarid Mediterranean climates (Ackermann et al. 2008). Calcrete surfaces are not suitable for agriculture but generate copious runoff from rain that drains into local soil pockets and adjacent soils and there enhances vegetation growth (Ackermann et al. 2008). The edge of calcrete deposits usually at the edge of concave slope tops gives way to break-off of calcrete blocks. But let alone this, the strata and moderate slopes make the Safafa environs, safe from significant rock fall compared to further downstream the Soreq basin (Katz et al. 2011).

A hard and massive chert layer forms the surface by the national watershed at the eastern part of the village area (Fig. 8.3). The village core structures are distinctly upon hard dolomites and limestones of the Weradim Formation (Mizi Yehdi) that roughly comprises 20% of the total administered village area (Fig. 8.3).

The massive strata of the Weradim Formation lead to the development of Lapies’ morphologies. Lapies are weathered carbonates consisting of etched, fluted and pitted rock pinnacles separated by deep grooves. This rugged surface is formed by the karst solution of rock by water containing carbonic and humic acids. The Lapies’

morphologies are separated by open areas of Terra Rossa soil pockets allowing spatially limited and disconnected rainfall-based agriculture. Recent studies have suggested that these pockets may have sustained ancient 'patch' agricultural practices prior to the development of agricultural terraces (Davidovich et al. 2006; Gibson and Lewis 2017).

The positioning of the buildings of the village upon the Weradim formation along with the most spatially dense and continuous agricultural plots suggests that the rationale of the settlement of Bet Safafa was a small village with small and adjacent agricultural plots. In this formation, adjacent to the historical village core, existed agricultural plots with widths of ~ 100 m. These may have mainly served for household sustenance. These plots are smaller than those up- and downslope the ridge that are usually several hundreds of meters wide. However, these, in many cases, remained unattended, until modern times (Table 8.1).

No springs exist in the environs of Bet Safafa. Rainwater was therefore collected in plastered cisterns (Fig. 8.1a). Altogether, agriculture was limited to classic rainfall-fed crops (Table 8.1). The moderate slopes and their rock and soil cover curbed the development of significant runoff in the village lands.

The Refaim valley hosts a thick sequence of fine-grained sediments (Crouvi et al. 2018). Along this segment of the Refaim, a 50–200 m wide valley infilled with a mixture of fine fluvial gravels and slope wash combines to form arable soils. However, the village possessed only several plots in the valley, probably due to land ownership reasons.

8.5 Discussion and Conclusions

8.5.1 Relation Between the Geology and the Village Pattern

The geology of the lands of Bet Safafa was inferior concerning water availability and water storage in relation to villages downstream the Refaim upon other geological formations that sometimes possessed several small layer springs. The location of Ottoman villages upon the Weradim Fm is not common in the Highlands of Israel. Villages are usually upon hard and bedded limestone formations that yielded springs (Elinson 2021).

Terracing is also common on hard carbonate strata that allowed for quarrying durable stones to construct terrace walls. Agriculture in Terra Rossa soils that have less carbonate than those on soft carbonate rocks may also explain the focus of the village upon the Weradim formation. This may explain why a large proportion (~1/3) of the lands of the village were not utilized for agriculture (Table 8.1) and may have served for grazing.

Thus, the location of Bet Safafa in relation to the geological traits of other villages in the region (Elinson 2016) appears to be unique and requires an explanation. The

purity associated with the possible source term of the village 'safa' is speculated to have originated by the noticeable abundance of light-colored lithologies around the village.

8.5.2 Relation Between Geographical Factors and the Village

We propose that the pre-1948 village of Bet Safafa possessed several anthrogeomorphic attributes that helped complement a limited agricultural economy and livelihood not based on a perennial water source (though the British laid a pipe to the village). The location of the village straddled between two major axes—the east–west late Ottoman railway and north–south ancient to modern Way of the Patriarchs along the National Watershed (Figs. 8.1 and 8.2). During the British Mandate, the villagers (probably) have engaged with nearby urban centers of Bethlehem and Jerusalem for complimentary jobs. The railway path also exposed the villagers to modernization. The poor natural resources also made the village extremely sensitive to geopolitical, economic or climate change, while in contrast, the peripheral location between two cities and the railroad provided avenues for socioeconomic mobility.

Since 1948 the lower part of the village and its main utilities including the railway, a town center and prime agricultural fields/gardens in Nahal Refaim became part of Israel. The moderate slope beneath the village core was easily built-up in affiliation with the construction of new neighborhoods of the expanding western Jerusalem. The proximity of village to western Jerusalem influenced the development of the village.

The upslope (upper) part of the village that became part of the Jordanian occupation found itself at a spatial dead-end of the area of the Jordanian Kingdom, stripped of its strong links to the nearby cities. This polar situation probably bred a growing rift between the Jordanian and Israeli town subsectors.

After 1967, the reopening of the north–south Patriarch axis in the form of Road 60 dictated upslope expansion of the village toward this artery. This modern expansion of the village was not dictated by geotechnical constraints and the moderate slopes eased road construction. Today homes and buildings cover the previous open and agricultural expanses of the village (Fig. 8.2a, b). The linear spatial nature of the moderate sloping ridge of the villages lands has made Bet Safafa an attractive location for detour roads and eventually main roads and transporting arteries that in turn have centralized the town.

To summarize, a small village with limited resources and confined between many other towns and village lands has overcome geopolitical change due to its comfortable morphology, location between urban centers and proximity to main roads and developed into a modern and unique Arab suburb of Jerusalem.

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Chapter 9
Life Cycle Assessment of a Regenerative Reuse Design

Laura Riegle

Abstract As population in Israel exponentially increases and urban development adapts to meet housing needs, new building construction in Israel continues to proliferate. With ambitious goals and a binding commitment to the UN to reduce carbon dioxide emissions, it is imperative that Israel implement innovative techniques to follow through on the country's responsibilities. One of the most promising methods to do so is regenerative building design and adaptive reuse. Current research in the field predominantly focuses on adaptive reuse of heritage buildings and proves a method of choosing appropriate uses for historical buildings. This chapter proposes a regenerative building design for mixed-use, residential, and commercial buildings that result in (1) a holistic building complex providing all occupants with access to outdoors, fresh food, medical needs, and social interaction, (2) CO_2 emissions reduction figures in Israel's construction sector. Using a Life Cycle Assessment (LCA), it is established that the proposed design emits 30% less carbon dioxide than Israel's current building practices.

Keywords Building reuse · Life cycle assessment · Life cycle analysis · LCA · Adaptable reuse · Sustainable construction · Green construction · Green building construction · Urban reuse

9.1 Introduction

In the past decade awareness to the urgency of the climate change crisis has been widely recognized in the international arena. Greenhouse gas emission targets have been established for 194 countries in order to ensure a sustainable future (United Nations, 2023). Cities worldwide are expected to play a central role in the national climate goals, Israeli cities are subject to increasing social and environmental pressures and need assistance to meet these ambitions. One of the pertaining problems of Israeli cities stems from the characteristics of Israeli buildings; Within 20 years there

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will be more than one million apartments in Israel that were constructed 60 or more years ago. Existing urban renewal cannot address the need for safe housing while reducing construction emissions at the rates necessary to support growth in current times. The result is thousands of individual apartments being destroyed every year as part of eviction for construction and TMA 38. In addition, the recent epidemic raises concerns about crowding, loneliness and food security, which highlights the urgent need for efficient and deep urban planning reuse for mixed use buildings.

Current research surrounding building reuse predominantly pertains to the reuse and repurposing of heritage buildings. Many articles outline the best practices for frameworks that have been developed to preserve heritage features while choosing an appropriate new building use. Research providing carbon emission savings using a reuse method, however, pertains to the reuse of residential buildings. This research demonstrates that reuse of residential buildings saves approximately 30% of carbon emissions compared to typical building practices in Israel. Economic savings will be established using the carbon savings figures by expressing the social cost of carbon savings in each scenario.

The overarching goal of the project is to introduce the potential for carbon emission reduction using the proposed building reuse method. The proposed model integrates existing buildings rehabilitation into the urban renewal method and transforms them into public buildings while integrating analytical tools. According to the proposed model, existing residential buildings in a grid urban planning layout will be repurposed and integrated into a new construction complex. Incorporating community services within the building complex reduces the need for driving and guarantees access to necessary services for elderly and disabled occupants. Community spaces and access to outdoors enhances quality of life, and the green roofs help to reduce the urban heat island effect. The model promotes equity while reducing carbon and promoting the social, economic, and environmental well-being of generations to come. These initial figures help to estimate the impact of reuse and legitimize its necessity in the industry. Governmental and municipal policies can be established with carbon reduction targets based on adaptable reuse of existing buildings. The model is flexible in that it is adaptable to any country with similar base buildings such as the U.S. and Germany.

9.2 Theoretical Background

Carbon emissions constitute a major global health challenge, hampering economic growth and sustainable development. The 2030 Agenda for Sustainable Development recognizes carbon emissions as a major challenge for sustainable development, which includes a target of reducing environmental risks, related to climate factors, air pollution, radiation, noise and light pollution, housing, and design quality factors or quality factors related to the work environment. These influences have a substantial impact on health and well-being and may trigger the occurrence of non-communicable diseases (NCDs) through a variety of direct and indirect pathways.

It is thus increasingly important to quantify correlations and causalities between the escalated environmental risk factors and the growing incidence of carbon emissions (Stocker 2014).

Current estimates of carbon emissions' burden due to environmental risks are extremely likely to be underestimated due to long lag times, their multifactorial nature (they present numerous interacting toxic exposures), and complex pathways or difficulties in assessing exposures. It is thus of utmost importance to quantify correlations and causalities between carbon emissions and escalated environmental risk factors. However, the detailed implications of the carbon savings potential of building reuse and its socioeconomic impacts are yet to be fully investigated or explicitly and adequately explained.

Available evidence indicates that carbon emissions could be tackled by focusing on prevention planning strategies. In doing so, the main challenge lies in the fact that environmental risks are driven by policies in sectors outside of health care, such as urban planning and design, transport planning, energy sector, thus bringing a considerable need for a cross-disciplinarity perspective across the aforementioned sectors. However, in the last decades, national focus has been largely on economic growth through technology, production, and consumption. From the years of 2000–2019, global gross domestic product (GDP) has increased by 60% (World Bank 2023), coupled with a roughly 27% increase in global population. As long as economic growth continues to be driven by fossil fuels both factors will foreseeably continue to increase and have a direct correlation with carbon dioxide emissions. As the effects of climate change worsen, national and international focus has broadened to include reducing local and global carbon emissions. The International Energy Agency (IEA) urges a decrease of carbon emissions by 60% by the year of 2050. With the current rate of annual carbon reduction at about 1.1%, major changes in current practice are needed to reach carbon reduction goals (Mohmmed et al. 2019).

Approaching the climate crisis requires action in the most polluting sectors. The building sector accounts for approximately 39% of global CO_2 emissions on an annual basis (Ahmed Ali et al. 2020), and in the fourth assessment of the Intergovernmental Panel on Climate Change (IPCC), it was reported that by 2030, building related emissions will increase by 26% (Sizirici et al. 2021). In Israel alone, fuel consumption increased by 15% from 2010 to 2015 in the manufacturing and construction industries predominantly due to cement production. This chapter uses Life Cycle Analysis (LCA) to model building reuse as a means to reduce carbon emissions in the building sector, a technique that is highly applicable to Israel's fast-growing construction sector (EPA 2023).

9.3 Conclusions from International Research

Currently, the countries with the highest emissions related to construction and demolition are China, India, USA, Japan, and Canada. Between these countries, it has been concluded that 45–80% of emissions originate from scope 3 activities which include materials used in construction and transportation (Onat and Kucukvar 2020).

It is widely estimated that capital investments in the construction sector are expected to increase by 40–70% between 2020 and 2040 due to population growth and the rapid urbanization processes (Oxford Economics 2017). As a result, by 2050 global cement consumption is expected to increase by 12–23% (IEA 2018a), while global steel production is expected to increase by 30% (ETC 2018). Despite this, all economic sectors must reduce emissions to meet the Paris Agreement goals. The need to avoid lasting negative consequences (de Coninck et al. 2018) has stimulated many studies in the field of calculating carbon emissions and the potential for reducing greenhouse gas emissions (Ma et al. 2019; Huo et al. 2021). The literature identifies that the construction and operation of buildings are responsible for 36% of global energy consumption and 39% of greenhouse gas (GHG) emissions (IEA 2018b). While most of this data refers to the operation of the building, the construction phase also has a significant impact on reducing the use of carbon and reducing emissions (mitigation). According to the UK Green Building Council (UK-GBC 2018), the construction industry uses more than 400 million tons of construction materials per year, most of which have a negative impact on the environment. Of these, 60 million tons go directly to the landfill just because of over-ordering, incorrect ordering, or poor handling and breakages (Corner 2023).

Of the various means of reducing carbon emissions, reuse is considered to be a preferable approach as it does not require additional industrial processes like recycling, which also contribute to emissions. Recycling activities include collection, sorting, transportation, recycling, and disposal (Onat and Kucukvar 2020). Current research is largely focused on incorporating alternative materials in building design. Replacing concrete with timber as the primary structural component of buildings, for example, has the potential to reduce carbon emissions by 68% (Minunno et al. 2021). This approach should be considered in building design, but must also be analyzed with considerations for deforestation and transportation across regions or countries. Reuse, when possible, should be used as a primary development tactic in green building design.

Various countries have developed and extensively studied green building rating tools (GBRTs) to promote sustainable development of the construction industry, pointing out that the challenge in promoting the economic and physical viability of such an integrated design lies in the combination between the research arena and the policy arena. Such a combination has already been expressed in building standards, the best known being the American LEED (Leadership in Energy and Environmental Design) standard, which created a principled series of rating systems in the areas of planning, construction, operation, and maintenance of green buildings. The LEED-NC V4 standard contains requirements for significant reduction of

directly and indirectly measured Carbon Footprint. Despite criticisms about the lack of flexibility in adapting it to different places, this standard is at the forefront of the discussion on ways to improve energy efficiency. It proves that the implementation of energy renovation in statutory programs and the formulation of an incentive plan for the restoration of buildings may be economic despite the high economic costs and low investment returns of the restoration of existing buildings compared to demolition and rebuilding (USGBC 2023).

9.4 Israel's Carbon Commitments and Targets

In September of 2015, Israel committed the country's Nationally Determined Contributions (NDC) under the Paris Climate Change Agreement and the binding treaty was ratified in November of 2016. The carbon reduction goals were updated in July of 2021 to include a 27% reduction in carbon emissions between the years of 2015 and 2030 and net zero carbon emissions by 2050. The major target sectors outlined in the plan include transport, waste, electricity generation, energy intensity, industry, and climate impacts of goods and services (FAOLEX 2021). The construction industry largely contributes to waste in Israel. In the year of 2020, 6.3 million tons of construction waste were produced in Israel and projections estimate that figure to reach to reach 7.5 million tons by 2030 (MOEP 2022). The Israeli government has recognized the importance of green building with the requirement that all new buildings meet the Israeli environmental construction regulation, 5281, or receive a more stringent certifications such as Leadership in Energy and Environmental Design (LEED) by USGBC. Developers have also recognized the environmental and financial benefits of green building design with 101 projects having current LEED certifications in Israel at this time. The relevance of material reuse and waste prevention has grown exponentially in previous years and is expected to continue (USGBC 2023).

However, the cities of Gush Dan and the center of the country suffer from housing pressures and increasing infrastructure loads. Most of the country's population is concentrated in these areas. They are characterized by old buildings created as ad hoc housing solutions with pressure for quick completion. According to CBS data, 400,000 apartments in Israel were built prior to 1960 and they make up about 15% of the apartments in Israel. Another 730,000 apartments are 40–60 years old. Apartments are mostly located in 3–4 story buildings on stilts. In the buildings, concrete is used as the skeleton, and concrete blocks or Silkat are used as the walls. The latest State Comptroller's report (2021) identified 4,840 buildings in Israel in urgent need of immediate repair. Residential buildings can survive for decades, but without proper regulation and maintenance the life of the building is significantly shortened. The housing committees invest most of the tenants' money in cleaning the building and not in maintaining its systems or foundational integrity. The older the buildings and the less affluent the population that lives in them, the more neglected the issue of maintenance. This matter is particularly relevant to Tel Aviv-Yafo. As

areas are gentrified, elderly people or those with limited mobility remain in expensive areas in old buildings. When the municipality issues notice to tenants regarding discovered construction defects, the majority of the responsibility for repair is left in the hands of the tenant. Costs of renovation can be hundreds of thousands of shekels or more. These renovations, which are done at the expense of the tenants, refer only to the deficiencies that the municipality has identified, and it is likely that more deficiencies exist. This problem is expected to worsen in the event of an earthquake. In addition, the population density in the central areas makes these buildings a target of rocket fire and tenants lack access to shelters to use as a protected space.

Despite the low quality of the buildings, the growing demand and rising housing prices indicate that living in these locations is considered desirable. Furthermore, the expected demographic growth in Israel is expected to exacerbate the already high housing demand and infrastructure pressures. The Authority for Urban Renewal is well aware of these problems, and since the existing residential density is relatively low (about 15–20 units per dunam), it offers a variety of avenues of intervention in urban areas, including TMA 38 and urban renewal, which includes building clearance, upgrading and rehabilitation of residential complexes, commerce or existing infrastructures within the existing urban tissue, as well as a densification-building plan. According to the data of the Authority for Urban Renewal, by 2020 building permits were granted in Israel for a cumulative total of approximately 31,000 units according to TAMA 38 and approximately 18,000 units as part of urban renewal. These programs contribute to the fact that the construction sector is responsible for approximately 50% of all greenhouse gasses emitted in the state (State Comptroller Special Report 2021).

9.5 Adaptive Reuse of Heritage Buildings

Adaptive reuse of buildings is becoming increasingly relevant in the Global North, predominantly for heritage buildings. Choosing an appropriate building for the intended use can be challenging as it involves a multitude of factors such as physical, economic, social, cultural, and environmental aspects (Bottero et al. 2019). Assessing the viability of preserving unique heritage elements in such buildings along with the structural needs of the use type and current building codes also poses challenges. The Multi-Criteria Decision Making Method (MCDM) has been used in the process of adaptive reuse of heritage buildings to overcome these challenges. The first application of the MCDM method was in 2006 in the journal "Building and Environment" by Ipekoglu B. and has been refined in the following years to become a commonly used method in the field (Nadkarni and Puthuvayi 2020). The MCDM method is composed of the following steps: (1) determine the objective, (2) determine the decision-making criteria and alternatives to those criteria, (3) develop a system for weighing the importance of each criteria and rank their importance, (4) use the criteria to develop building alternatives, (5) assess the performance of the alternative and rank the alternatives, (6) choose the best alternative (Nadkarni and Puthuvayi

2020). Some criteria used in the method include: the building's physical condition, location, financial possibilities, building lifetime, social value, artistic value, and feasibility of future change. These criteria are relevant to most heritage projects and are analyzed based on the proposed use of the project to form the groundwork of the proposed alternatives. Alternatives are then proposed such as in the case study of Sapieha Palace in Vilnus, where the historical site was proposed to be repurposed as one of the following: (A1) a tourist information center and museum, (A2) a research center exploring historical heritage, (A3) a hotel and conference center. In this project, the criteria were separated into groups: (G1) economic benefits/expenses of change, (G2) influence to social environment, (G3) impact on natural environment, (G4) historical–cultural value of preservation, (G5) technological–architectural possibilities. Experts were then provided with a survey to weigh the importance of each group so the alternatives could be properly analyzed (Pavlovskis et al. 2019). The versatility of this systematic approach allows it to be used in various fields such as energy, sustainability, tourism, and conservation.

Despite the accumulated information, many municipal authorities still lack the knowledge that would enable the formulation of policies to deal with dangerous buildings while meeting carbon emission targets (Wang et al. 2019). Thus, the municipality of Tel Aviv-Jaffa, which leads diverse renewal moves, incorporated a statement regarding carbon goals into the outline plan. Despite the intention to start with calculations of greenhouse gas emissions, the distinction between Life Cycle Analysis (LCA) targets and carbon targets embodied in construction is lacking.

9.6 Social Cost of Carbon

The impacts of anthropogenic carbon release are not limited to the environmental sector, and they also impact social and economic spheres. In 2020 alone, 389 significant natural disasters occurred resulting in $171.3 billion of economic loss. Approximately 90% of those natural disasters were a result of climate change (Wang et al. 2022). In the academic and political spheres, a social cost of carbon (SCC) has been developed to be imposed on policy change as an addition to policy change budgets. Damage models of the USA estimate SCC to be $51 per ton of CO_2, while academic integrated assessment models (IAM) continue to develop regionally and per country (Longden et al. 2022). Some sources claim that IAMs are an inappropriate method of estimating SCC per country and posit a survey method based on SCCs shared socioeconomic pathways (SPPs) and representative concentration pathways (RCPs) (Wang et al. 2022). Various models account for a range of projected economic losses in agriculture, human health, impacts on biodiversity, and infrastructural repair (Tol 2019; Pindyck 2019; Wang et al. 2019).

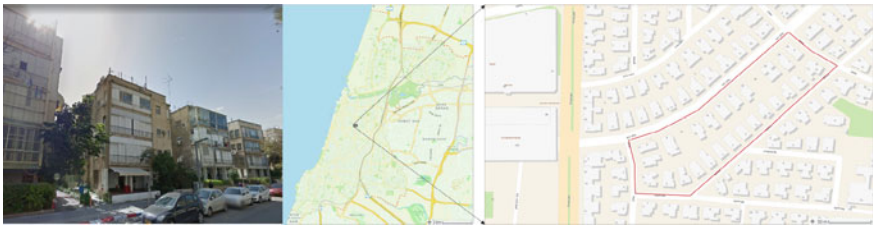

Fig. 9.1 Bloch superblock test case: The project will support the existing infrastructure and add to it with the aim of **(a)** meeting housing needs; **(b)** increasing mixed uses; and ensuring; **(c)** food security; **(d)** greening urban areas; and **(e)** reducing emissions from the construction sector. Four scenarios will be presented to provide a comparison between the carbon emissions of various building practices

9.7 Methods

The project will focus on a cluster of buildings between streets (building blocks, Fig. 9.1), integrate a new building into the existing fabric, and provide an assessment regarding the reduction of emissions from the construction sector.

Scenario 1: The Carbon Footprint of Existing Buildings represents the carbon emissions released in the construction of four-story base buildings. These buildings are representative of the buildings that are to be reused in the proposed building design. The carbon emissions in Scenario 1 are subtracted from the total sum of carbon emissions in the construction of the proposed design, as the need to construct the base buildings is not necessary due to reuse.

Scenario 2: The Carbon Footprint of Business as Usual represents the carbon emissions of both base buildings and high-rise buildings using the standard materials in the Israeli market.

Scenario 3: The Carbon Footprint of Buildings Using Green Building Principles represents the emissions produced by constructing the base buildings and high-rise buildings using recycled and local materials.

Scenario 4: The Carbon Footprint of Construction Using the Proposed Design represents the emissions produced by constructing the high-rise buildings using recycled and local materials. The carbon emissions of the base buildings are not included in this scenario as they are reused.

9.8 Reused Base Buildings

A group of 20 base buildings (Fig. 9.2) will be renovated and used as exterior buildings for the new construction residential high-rise buildings. Each base building is four stories high. Buildings with similar heights organized in a grid urban plan are the ideal buildings to use as the base buildings for this complex. These buildings will be structurally reinforced and renovated for service-oriented applications such

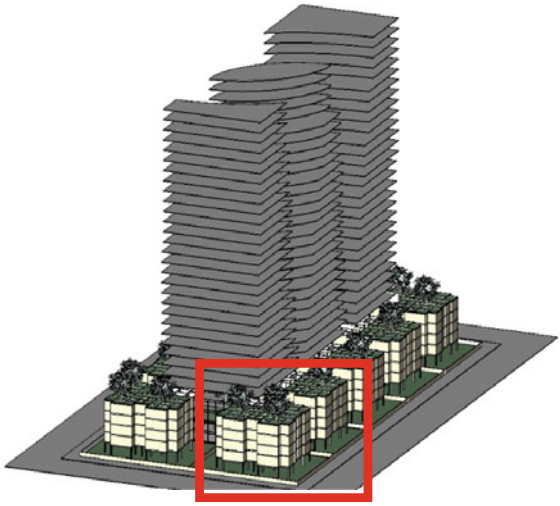

Fig. 9.2 Group of 20 base buildings will be exterior to the new construction residential high-rise buildings. Each base building is four stories high. Buildings with similar heights organized in a grid urban plan are the ideal buildings to use as the base buildings for this complex. These buildings will be structurally reinforced and renovated for service-oriented applications such as community centers, grocery stores, pharmacies, kindergartens. The roofs of the buildings will provide green spaces to occupants

as community centers, grocery stores, pharmacies, kindergartens. The roofs of the buildings will provide green spaces to occupants.

Building reinforcement is particularly important to ensure that the iron in the foundation of the building is sufficiently strong to support the entire building. This is especially true in coastal cities and countries where humidity and airborne salt particles erode materials at faster rates. We will use the existing municipal construction data to examine the possibility of reinforcing specific old residential buildings to allow for them to carry an additional 10% of loads (Fig. 9.3). Each roof of the reinforced buildings will house a green roof. These buildings will be used as public areas, services, commerce, and employment. In order to allow access to the green roofs, we will examine models that will allow maintaining a system of slopes (ramps for wheelchairs) for accessibility around the buildings through commerce. According to the assessment of the Ministry of Infrastructure, retrofitting processes that include renovation and energy efficiency in existing buildings constitute 94% of the total reduction potential. Extending the life of existing buildings has signification carbon savings potential.

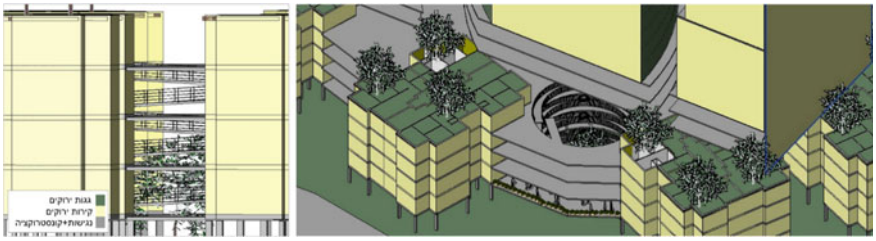

Fig. 9.3 Right—demonstration of the connections between the green and constructive systems between the existing buildings that will be converted into public buildings and their surroundings. Left—a system of slopes to increase human interaction and accessibility to public areas and green walls

9.9 New Construction Buildings

The six new construction residential buildings (Fig. 9.4) will be positioned at the center of the building design. The materials used in construction will be locally sourced and incorporate recycled content as outlined in Sect. 9.4: Methodology. Balconies will be available to occupants on each of the 20 floors and occupants will have access to the base buildings through the residential buildings.

The project will be based on construction data (historical ETA and detailed maps, a GIS layer that includes data about the year of construction of buildings from property tax data as well as existing information about at risk buildings) that exist in the PA's databases. Analyzing the data with advanced tools will make it possible to estimate the carbon cost of the existing buildings, help policymakers to plan solutions that suit

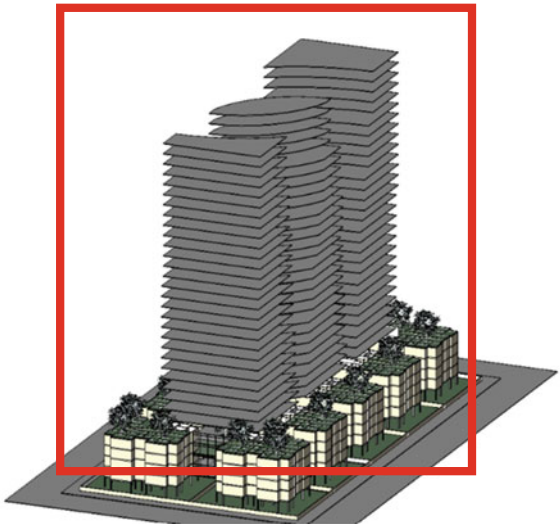

Fig. 9.4 Six new construction residential buildings will be positioned at the center of the building design. The materials used in construction will be locally sourced and incorporate recycled content as outlined in Sect. 9.4: Methodology. Balconies will be available to occupants on each of the 20 floors and occupants will have access to the base buildings through the residential buildings

the specific needs of the local communities, and contribute to a more livable urban environment in the future while reducing greenhouse gas emissions.

A Life Cycle Assessment (LCA) was conducted to measure the embodied carbon that would be released during the construction of each scenario. One Click LCA was used to quantify the environmental impacts of materials throughout their lifecycle including extraction, manufacturing, transportation, use, and final disposal or recycling. Preliminary research has been conducted measuring the embodied carbon of four scenarios. The research aspires to include the carbon emissions released if the base buildings were to be demolished in Scenario 2 as well as the carbon emitted by reinforcing the base buildings in Scenario 4.

9.10 Scenario 1: Carbon Footprint of Existing Buildings

Scenario 1 represents the current four-story base buildings. The materials used to establish the base buildings are as follows: the quantities below account for 20 buildings with four levels each, as this is the proposed design project scale.

Material	Description	Location	Quantities
Concrete	Ready-mix 0% recycled content	Israel	2340 m^3
Aluminum	Aluminum profiles, 50% recycled content	UK	29 tons
Glass	Float glass 0% recycled content	Israel	5.8 tons
Steel	Reinforced steel 80% recycled content	Egypt	400 tons

9.11 Scenario 2: Carbon Footprint of Construction in Accordance with Israel's Typical Building Practices

Scenario 2 considers the materials needed for the full scope of the project including the 20 base buildings described in Scenario 1 and the six high-rise buildings. The materials in this scenario are modeled with standard Israeli building materials exhibited in Scenario 1, with additional quantities to account for the newly constructed high-rise portion of the design.

Material	Description	Location	Quantities
Concrete	Ready-mix 0% recycled content	Israel	18,740 m^3
Aluminum	Aluminum profiles, 50% recycled content	UK	155.8 tons
Glass	Float glass 0% recycled content	Israel	165.2 tons
Steel	Reinforced steel 80% recycled content	Egypt	645 tons

9.12 Scenario 3: Carbon Footprint of Construction Using Green Building Principles

Scenario 3 considers the materials needed for the full scope of the project including the 20 base buildings described in Scenario 1 and six high-rise buildings. The green building standard of recycled content is derived from research conducted by Alfa Sustainable Projects, a green building consulting company based in Israel.

Material	Description	Location	Quantity
Concrete	Ready-mix 10% recycled content	Israel	18,740 m^3
Aluminum	Aluminum profiles, 50% recycled content	Israel	155.8 tons
Glass	Float glass 0% recycled content	Israel	165.2 tons
Steel	Reinforced steel 100% recycled content	Israel	645 tons

9.13 Scenario 4: Carbon Footprint of Construction Using the Proposed Design

Scenario 4 considers the materials needed for six high-rise buildings. The four-story base buildings described in Scenario 1 are not included in the quantities as they will be reused. The green building standard of recycled content is derived from research conducted by Alfa Sustainable Projects.

Material	Description	Location	Amount
Concrete	Ready-mix 10% recycled content	Israel	16,833 m^3
Aluminum	Aluminum profiles, 50% recycled content	Israel	142.8 tons
Glass	Float glass 0% recycled content	Israel	159.4 tons
Steel	Reinforced steel 100% recycled content	Israel	311 tons

9.14 Carbon Emissions During Demolition

Carbon emission values will be modeled for Scenarios 2 and 3 to include the CO_2 emitted during demolition of the base buildings. Emissions related to demolition will include transportation of site waste (predominantly soil) and demolition equipment (type of equipment and hours operated). Demolition waste of the building materials will not be modeled as the full life cycle of the materials is accounted for in the embodied carbon LCA.

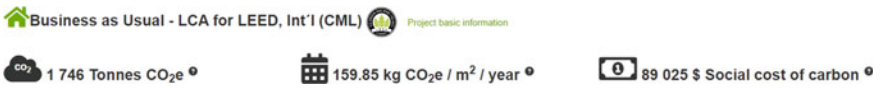

Fig. 9.5 Life cycle assessment results of the materials used to construct the base buildings

9.15 Reinforcement and Renovations

Carbon emissions will be calculated for the additional materials used for reinforcement and renovations of the base buildings using One Click LCA.

9.16 Findings

The business-as-usual approach of construction for 20 residential buildings resulted in 1,746 tons of carbon emissions and a social carbon cost of $89,025 (Fig. 9.5). Because Scenario 1 uses the least amount of material, the emissions and social cost of carbon are the lowest of all four scenarios, that does not, however, imply that Scenario 1 is an environmentally friendly building solution. Residential buildings in urban areas with only 3–4 stories use valuable land and house fewer people than the average urban residential accommodations. The existing buildings in and of themselves are not damaging, however; the ratio of housing area to land use area is quite low, leaving a large unused potential. If the carbon emissions of the building were to be divided into emission per tenant the results would be similar for Scenarios 1 and 2. The existing buildings in Scenario 1 are considered to be the worst-case scenario as the carbon emissions per capita are high, and the housing area to land use are is low.

9.17 Scenario 2: Carbon Footprint of Construction in Accordance with Israel's Typical Building Practices

The Israeli standard approach in the scope of the proposed building design produces 11,404 tons of carbon emissions and a social carbon cost of $581,617 (Fig. 9.6). This building practice is the most common in Israel at this time. With continuous waves of immigration and a rapidly increasing population, new buildings are rapidly being erect in urban areas. If building design remains to emit at the rate of 11,404 tons per 20 buildings, the emission targets Israel has set will be in jeopardy.

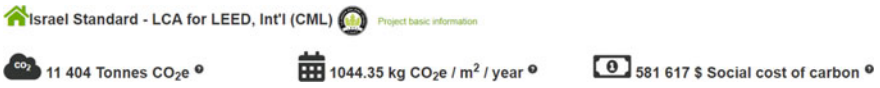

Fig. 9.6 Life cycle assessment results of Scenario 2: carbon footprint of construction in accordance with Israel's typical building practices

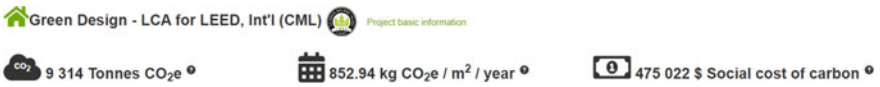

Fig. 9.7 Life cycle assessment results of Scenario 3: carbon footprint of construction using green building principles

9.18 Scenario 3: Carbon Footprint of Construction Using Green Building Principles

The green building approach (Fig. 9.7) in the scope of the proposed building design produces 9314 tons of carbon emissions and has a social carbon cost of $475,022. Between Scenarios 1 and 2, there is an 18% reduction in carbon emissions. This difference is significant and will only become increasingly so as innovations of more environmentally conscious materials are produced. Using materials with recycled content and innovative design is a key accompanying factor in the proposed building design and should be constituently re-examined as innovative products and techniques enter the market.

9.19 Scenario 4: Carbon Footprint of Construction Using the Proposed Design

The green building approach in the scope of the proposed building design produces 8,026 tons of carbon emissions and has a social carbon cost of $409,331 (Fig. 9.8). Using the strategies of reuse and recycled and local materials for construction, Scenario 4 has the lowest carbon emissions of the three scenarios (Scenarios 2, 3, and 4). The high-rise mixed-use approach ensures low emissions per capita while providing tenants with everything they need inside of the complex, reducing the need for driving. Demolition emissions are also saved as the base buildings are reused in this scenario.

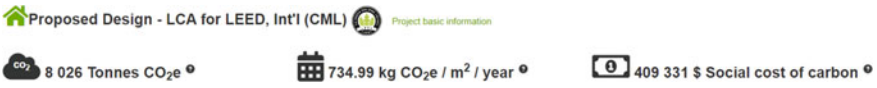

Fig. 9.8 Life Cycle Assessment results of Scenario 4: carbon footprint of construction using the proposed design

9.20 Scenario Comparison

Figure 9.9 depicts the CO_2 emissions released during the construction of Scenarios 2, 3, and 4. The highest emissions depicted below are in Scenario 2, Israel's typical building practices. By using local and recycled materials, such as in Scenario 3, Israel can reduce the carbon emitted during building construction by 18%, and using green building materials in combination with adaptive reuse (Scenario 4) yields a reduction of 30% from the current state of building to the proposed design.

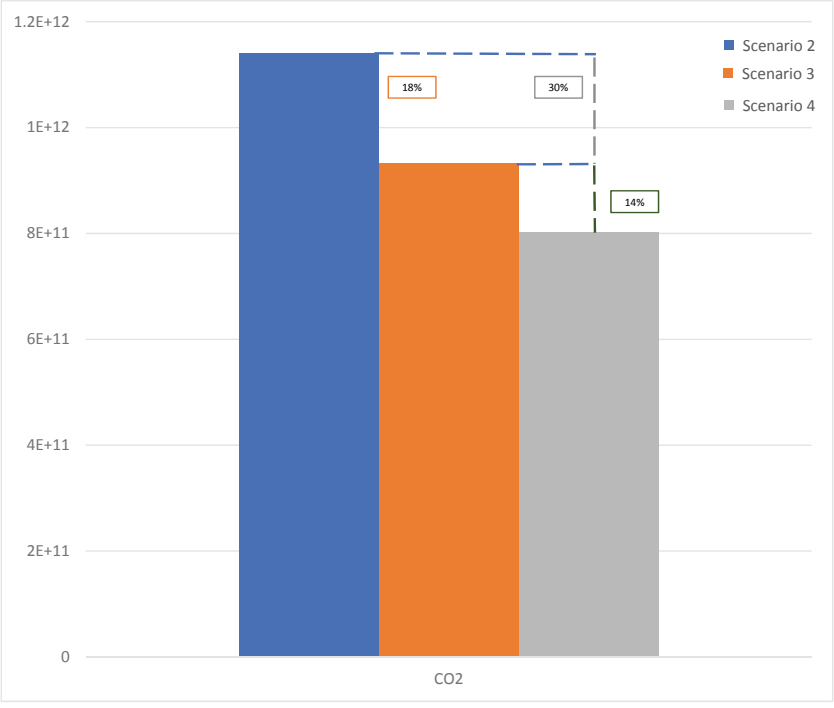

Fig. 9.9 Comparison of the CO_2 emissions involved in the construction of Scenarios 2, 3, and 4

9.21 Conclusion

Rapidly reducing CO_2 emissions in Israel will not be achieved by taking action in any one sector. All of the highly emitting sectors, including the construction sector, must incorporate innovative technologies and techniques. The proposed design presents a plethora of opportunities to work collaboratively with multiple fields such as governance, city planning, and private investors. The most advantageous approach is to advance environmental, economic, and social horizons in a holistic and simultaneous manner (Flint Ashery, 2023).

The research provided in this chapter will also be adapted to an online interface, allowing planners to model the carbon emitted in various potential building designs. The interactive Geodesign Tool will enable planners to make smarter climate decisions in real time (Flint Ashery and Steinitz 2022; Flint Ashery 2022). By inputting material origins (i.e., recycled content and material extraction and transport flows), governments, municipalities, and private developers will have the opportunity to compare carbon figures during the design stage. Governments will have the ability to model and form achievable and specific regulations for municipalities and developers to follow or provide subsidies on favorable materials and building techniques. Municipalities can use the tool to understand the required origins of each major material type that goes into development projects such as concrete, steel, and glass and how reuse can help to achieve carbon reduction goals. Developers will have specific figures as to how much carbon is reduced in projects for social responsibility and marketing.

The tool will allow users to input building designs and compare the carbon emissions between (1) a business as usual approach, (2) a building with recycled and local materials, (3) building reuse techniques. By entering the estimated volume and model of concrete, steel, and glass of a building, along with material origins, users will have real-time carbon emission figures that they can compare per square meter. They will also be able to understand per project how many carbon emissions will be saved by using adaptive reuse techniques.

The challenges of climate change are forcing all countries to re-evaluate their practices. This research has the potential to be implemented in any country with similar grid-shaped design and low-rise base building such as the USA and Germany. Such countries have great potential for carbon reductions due to a multitude of local green building materials. The proposed design and the Geodesign Tool will provide measurable results before construction takes place.

Acknowledgements The proposal for Scenario 4 was developed in collaboration with Flint-Ashery, S., and Yaniv, H. (2023).

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Part IV
Geodesign in the Social Sciences and Humanities

Chapter 10
Complexity Theory as the Meeting Point Between Urban Planning and Psychoanalysis: Joy in Beit Safafa

Esti Dinur and Shlomit Flint Ashery

Abstract Similarities between the human being and the city, which is the result of human activity, seem natural: the city is a man-made creation, it can be seen as an extension of one's private self, and as such, it has a self, resilient or vulnerable, sick or healthy. Planning is the glue that binds our expertise together to create a better future for the public's joy. In this article, we discovered new aspects of the relationship between joy and the spatial structure of a peri-urban area. Beit Safafa is a relevant example of the impact of development pressure, both as a social practice and as a response to trends in modern urban society, on the neighbourhood's structure. The research highlighted the accumulated impact of the relationships between the object and the subject–between the therapist and the patient, the planner and the plan as well as between the individual users and the urban fabric as a whole. Using a digital planning support system of Geodesignhub and consistent with complexity theory, this study focuses on four planning strategies, their characteristics and composition and explains the motivation and reasoning for multi-system comprehensive planning.

Keywords Joy · Complexity theory · Psychoanalysis · Urban planning · Kohut · Beit Safafa

10.1 Introduction

The ideal pole in the psychology of the self raises our eyes to the *ideal* and enables us to build the self of the individual. The ideal is related to being connected to the other, to the past, to what is beyond oneself, and to the cosmos (Izard 1977). The ideal start with the vision of a whole that wants to do good with itself and to be good for its inhabitants rather than with the shortcomings, the vulnerability and the defects that

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need to be corrected. Joy is the vision, a utopian expression of the healthy structure of the self. As an ideal of wholeness, it is not connected to a lack but to a holistic being. Unity is crucial to development, holistic functioning, and flow (Danner et al. 2001). Our self is healthy if there is enough empathy towards us or when the person and his environment connect with the ideal. Joy can be supported if we do not focus on where we come from, but rather on where we strive to go. Kohut (1977) describes the importance of empathy as oneness with the world. Kohut refers to a search 'imbued with joy' implies a search that is not just directed to the object, but also open physically and mentally to the space (1985, p. 247). Joy, according to Kohut, stems from an environment which allows us to flourish, fosters creative directions and is happy in our development. Aside from the immediate human environment, what is the role of physical urban space in building and supporting joy?

A growing body of research explores the relationship between sustainability and happiness relating to the concept of sustainable happiness, which holds significant potential for individual and community well-being (O'Brien 2008; Flint Ashery 2014, 2017). Social happiness, as the type of behaviour that leads to desirable quality of life, plays a significant role in the life of individuals and urban planning (Bokharaei et al. 2018). In particular, subjective well-being is regularly used as a policy measure for social progress, with proponents promoting the idea of the 'happy city' (Kent et al. 2017). While previous studies have considered the impact of specific aspects of the built environment on components of subjective well-being, the literature on joy as an essential component of subjective well-being is lacking. The joy that comes from holistic planning is based on the protections, compromises, and sublimations of man in relation to his passions, friends, and culture. It is planning that addresses the urban systems together and improves the quality of life of an individual within his environment. It is planning that begins with the destination we aspire to and examines how using the land uses creates an environmental experience of well-being and contentment for individuals.

According to various studies on the effects of joy on the human being, joy contributes significantly to creativity, productivity, fruitful collaboration, flexibility, extending our range of attention and acceptance, integrity, and a sense of security for health and longevity. However, despite its potential impact on residents, the emergence of joy in the psychoanalytic as well as in the planning literature, and its effect on the neighbourhood as a whole, has received little attention. How come these professions disengaged with joy when they assist people's existential experiences? How can we explain the hidden but sweeping disappearance of joy from psychoanalytic and planning discourses in which it takes place? We can explain this absence from the psychoanalytic literature by the fact that psychoanalysis originated as a response to a pathological problem, as a way to alleviate, facilitate, or understand it. Presumably, most of the investment goes to these areas because patients seek treatment as they are distressed, thus the obvious and understandable response would be to dig into the pain. Despite its potential impact on the total population and the whole urban space, the effects of joy have received little attention in the planning theory and practice and generally have been attributed to happiness, which is closely associated with human-nature relations, community relations, and sustainability. This

work aims to address the conspicuous lack of high-resolution studies that identify the role of physical urban space in the building and supporting joy, contending that in order to examine these processes, one must refer to the social system that drives the local process and the set of values from which it is draws its strength.

This study sheds light on the role of neighbourhood planning in building and supporting joy. The study focuses on Beit Safafa, a well-established Arab Muslim village in the metropole of Jerusalem. The main conflict is the gap between the planning policy for Beit Safafa itself, that has been approved in 2015 and a comprehensive building policy alongside the light rail train for the entire city, which might change the rural attributes of Beit Tsafafa and Sharfat. While the entrepreneurs seek a higher number of new dwellings and rise above six floors, the residents are worried about losing their way of life. We use Geodesign, an iterative design method, to use stakeholder input (residents, municipal planners, NGOs), geospatial modelling, impact simulations, and real-time feedback to facilitate holistic decisions, resolve conflicts between different points of view and build a 'joyful' future for Beit Safafa 2040. Drawing on the complexity theory allows reference to mega-complex systems, which emphasizes an all-encompassing context, the 'texture of the whole' (Sella 2014). This concept, located both in the psychoanalytic discourse of self-psychology and contemporary intersubjective psychology and in urban discourse, represents progress in the advanced analysis of joy in urban planning with far-reaching implications for planning policy.

Our first objective is to remove barriers through comprehensive design, which refers to integrating the planning systems as a means to unite the built fabric. Our second objective is to recognize Beit Safafa as part of the entire city and promote connections between its various parts, as well as between the neighbourhood and its surrounding areas, which will allow Beit Safafa to grow by connecting and matching. Our third objective is to propose a plan for strengthening local identity through reliance on existing social-spatial components and maintaining the village's unique identity within the entire matrix. Our fourth and final objective is to plan Beit Safafa's inspiration for economic development and social welfare, as well as environmental preservation, so its uniqueness and character will contribute to the entire city. As this paper offers the only data on comprehensive planning of joy, the findings add to the literature on the effects of specific aspects of the built environment on joy, as an important component of subjective well-being.

The rest of the paper has the following structure: Sect. 10.2 presents a theoretical background, followed by Sect. 10.3 describing the case study and the methods. Section 10.4 describes the results, including Mudita Connective planning; planning for strengthening existing power sources; the residents' perspective, and how 'inspiring joy' planning for Beit Safafa's unique character will benefit the entire city in terms of economic development, social welfare, and environmental protection. The paper concludes with a discussion and summary.

10.2 Theoretical Background

10.2.1 Joy in Psychoanalysis Discourse

Classical psychoanalysis has a paradigm of depth: The mind is perceived as layered, from the conscious to the pre-conscious and then the unconscious. Acknowledged models convey the perception that the mind is constructed by layered structures that have accumulated over time (Bion 1962; Vermote 2015). This perception is searching for the palimpsest that lies beneath, bringing the unconscious to consciousness. Within the psychoanalysis value position, depth, truthfulness, pain, and suffering are entwined. Simplicity can easily be perceived as superficial, meagre, one-dimensional, and associated with naivety and frivolity (Greenson 1962; Buechler 2002, 2010). But it can also be used to express complete, holistic, unbroken innocence (Canarelli 2010; Newcombe 2010; Weizbard 2010). Erel (2020) describes 'the life energy that drives the process of development of the self-nucleus', includes, in addition to satisfying impulses, elements of vitality, playfulness, and creativity, which become central to Winnicottian thinking (see Winnicott 1971; Eigen 2013). "The simplicity of the spirit", says Ricard (2005), "is accompanied by clarity of intuitive knowing"... "consciousness … goes deeper and deeper into the experience, behind mental constructs and behind the veil of your emerging tendencies".

Freud (1890) motivation theory posits that unconscious psychological forces, such as hidden desires and motives, shape an individual's behaviour. The source of the individual's motivation is his passionate impulsive satisfaction or sublimation. The realization of this motivation brings pleasure. Kohut, however, argues that the source of human motivation is an expression of the self (Kohut 1974b; Kohut and Wolf 1978) and of a potential nuclear programme: "Joy relates to experiences of the total self" (1977, p. 60), resulting from the sense of cohesion (1974a, L8. 116). Kohut used to call the psychology of the self 'psychology of the depths' (Kohut and Elson 1987; Kohut 2009a, 2009b, 2009c, 2013). He speaks of a life of "passion and joy" (1985, p. 147), of a "deep sense of joy" (1977, p. 69). The appearance of expressions of joy in therapy can be indicative of other, archaic, deep experiences that undergo resuscitation in the empathic matrix, not necessarily through understanding and awareness, and connect to an initial fusion as it was (p. 250, 263). Heisterkamp (2001) describes Kohut as the founder of psychoanalysis of joy, who defines human development as self-construction through joy, while anxiety is associated with disintegration. Tamir (2012) sees joy as one of the three cores of human essence, along with hope and responsibility, which form the substrate for narcissistic self-nuclearity.

The different manifestations of the selfobject are deeply embedded within the complexity theory, which have gained increasing prominence in the psychoanalytic discourse of self-psychology and contemporary intersubjectivity. This concept deals with mega-complex systems and emphasizes the totality of an all-encompassing context, the 'texture of the whole' (Heisenberg 1959, p. 96) that becomes 'Lived complexity, at its deepest level … undivided wholeness akin to Zen states' (Sucharov 2013).

Joy accompanies the process of moving forward to the next desirable and natural development. In Buddhist thought, meditative practice expands our ability to serve in the four virtues, demonstrating that it is possible and essential to cultivate joy (Ricard 2011). Kulka (2005, 2010) distils the meaning of joy: "Kohut" he describes, was "on the verge of placing the concept of joy as a conceptualization, as a kind of watershed between process development and complex development, which were separated by the magnifying empathic matrix". The tragic person Kohut describes is the one who fails to live his or her ideal nucleus, or whose environment prevents it. Kulka (2012) continues to develop Kohut's idealized concept, calling it the 'Psychology of space' and describing a grandiose world, as a distinctly structured world that transcends boundaries towards wholeness. We are in constant motion between these, open closed open (Haber Mosheiov 2013), finite and infinite (Green 2008). Is it possible to say that a happy person is one who lives in accordance with his/her potential nucleus in an environment that allows such living? Bacal (1985) explains how appropriately tailored empathy can deeply enhance development. A special virtue of empathy is the intention to be for the other not as an object, but for her or him as a selfobject (Stern 2010, 2018). Bollas, in his article on 'The psychonalyst's celebration of the analysand' (1991), explains that treating the negative strongly is the therapist's 'safe ground'. Leaving this safe ground is crucial to therapy. Therefore, it can sometimes be necessary to venture away from the known, the structured, and the expected, to express effort and creativity.

10.2.2 Joy in Urban Discourse

Most urban writings used the term happiness, rather than joy, to describe how social relationships, community amenities, and environmental conditions contribute to the lives of residents (Layard and Layard 2011; Leyden et al. 2011). A community's socioeconomic characteristics may also affect its social cohesion (Flint Ashery 2020). More educated, wealthier, and older people tend to be more socially connected than less educated, younger people (Wilson 2012; Rohe and Lindblad 2013). Connectivity and social capital among residents may help communities resist threats such as crime and recover from disasters (Seidman 2013; Flint Ashery 2019). Overcoming threats and crises can play an important role in bolstering residents' sense of agency, social ties, and happiness (Cloutier and Pfeiffer 2015). The ability to connect with others may greatly influence our overall health and well-being, as well as our long-term well-being (Hawton et al. 2011). Relationships that connect individuals with their communities can also build social capital, where we can use our relationships to gain knowledge and obtain resources (Coleman 1988; Flint-Ashery and Hatna 2021).

Community characteristics shape social and capital relationships (Flint Ashery 2023a). Among these are the physical conditions of the built environment, including housing design, density, street connectivity, mix of land uses, and public spaces (Duany et al. 2001; Freeman 2001; Mason 2010). Residents' subjective well-being may be directly affected by neighbourhood amenities like green space and transit

access. There is evidence that green and natural environments promote well-being (Akers et al. 2012). Having access to green spaces or wide open spaces that allow for exercise may boost happiness. Campbell and Wiesen (2011) describe open spaces that make people happier as 'restorative commons'. Among them are parks, community gardens, botanical gardens, building exteriors, and rights of way (Wells and Laquatra 2009). Seeing green may drive some of these effects, as seeing green makes people feel at peace (Akers et al. 2012). Green environments may also indicate fertility and food availability, which may be deeply engrained in us to seek out in order to survive.

Complexity theories of cities (CTC) is a domain of research that applies to cities the various theories of complexity that originated in the sciences. Alexander (2021) shows that properties such as value and wholeness that throughout most of the twentieth century were treated as subjective and thus 'non-scientific', should form the theoretical core not only of architecture but of the current sciences of complexity—in general and in connection with cities, urban planning, and design. Additionally, the complexity and malleability of these spaces may promote wonder and exploration, which may contribute to well-being and joy (Campbell and Wiesen 2011). In spite of the potential link between community characteristics and happiness, Joy is generally not seen as a goal of community development or achieving social justice or economic growth (Vidal 1996). Sustainability sciences are enhancing community development by applying new principles. The 'three pillars' of sustainability are the environment, the economy, and social equity. It has now become clear to community development practitioners that achieving these goals involves negotiating among competing desires and outcomes (Campbell and Wiesen 2011). Additionally, they are increasingly mindful of the importance of being culturally competent and engaging residents in their practices (Sue 2006).

More recent investigations concern logical expressibility in other areas of complexity theory such as optimization and counting. Geodesign (Steinitz 2012), a cutting-edge planning approach that is rooted in the history of planning practice, has become one of the most popular approaches for sustainable planning and design activities after 2000s. Planners tend to think of design at a site scale, but Geodesign covers a variety of scales, bridging the gap between the regional and the local contexts (Flint Ashery and Steinitz 2022). This is important because to be practically effective and politically prudent, Smart Growth plans need to make sense across a spectrum of scales and disciplines. This ranges from design, urban design, community planning, town and city planning, and regional planning, up to planning for mega-regions. From a digitalization context, as the projects get more complex with more stakeholders, communication, and coordination become critical (Sigalov-Klein et al. 2024).

We use here the Geodesignhub platform, a digital web-based workflow based on a systems approach. Enabled by rapid advances in digital technology Geodesign is an iterative design method that uses stakeholder input, geospatial modelling, impact simulations, and real-time feedback to facilitate holistic decisions and smart decisions. It provides a framework and set of tools for exploring issues from a transdisciplinary perspective and for resolving conflicts between different points of view.

It is designed to foster collaboration and negotiation among professionals and their clients, and among teams of professionals.

10.3 Geodesigning the Future for Beit Safafa

Beit Safafa is a well-established Arab Muslim village in the metropole of Jerusalem. The village was divided after the 1948 war between Israel and Jordan, splitting families and households. After the Six-Day War, both sides were spatially reunited, but the scars remain. Today Beit Safafa is included in Jerusalem and is known as a well-established neighbourhood, where most of its' residents are Arab Muslims.

The planning policy for Beit Safafa, which was approved in 2015, adds 5400 new planned dwellings, 13,310 dwellings and approximately 60,000 residents by 2030, allowing buildings between 3 and 6 floors. The main conflict is the gap between the planning policy for Beit Safafa itself, that has been approved in 2015 and a comprehensive building policy alongside the light rail train for the entire city, which might change the rural attributes of Beit Safafa and Sharfat. While the entrepreneurs seek a higher number of new dwellings and rise above six floors, the residents are worried about losing their way of life. A deep public engagement is critical to moving forward.

Building the future for Beit Safafa 2040 (Fig. 10.1), residents, municipal planners, NGOs, and students talked about how social hierarchies are translated into socio-spatial patterns, related to specific urbanization paths, property allocation mechanisms, the creation of the built environment, and planning regulations, and how they affect the reproduction of social inequality. We use Geodesign, an iterative design method, to use stakeholder input, geospatial modelling, impact simulations, and real-time feedback to facilitate holistic decisions and resolve conflicts between different points of view (Steinlauf-Millo et al. 2021; Flint Ashery 2023b). It should be noted that although there are polygons in other systems that may fit more than one investment direction, to simplify the idea we have almost completely separated the systems in the printed maps shown here (unlike the digital version). Therefore, if there are overlaps between the polygons on the map, i.e. adjacent or overlapping areas (such as a conservation site within a green area), the representation in the printed maps avoids confusion and overlap and presents the most relevant system.

10.4 Results

Joy represents the psychology of wholeness, of simplicity in its highest essence and the removal of pain does not necessarily lead to joy (Emde 1991; Seligman 2002). Nevertheless, we wanted to confirm this 'common knowledge' for Beit Safafa. Here are some additional investment planning options that certainly give rise to many more.

Fig. 10.1 A comprehensive planning to Beit Zafafa

10.4.1 Mudita Connective Planning

The ability to have pure joy at the success and good fortune of others. Mudita is a pure joy unadulterated by self-interest and is significant as one of the four Buddhist virtues (Immeasurables or brahmavihārās, Kornfield 2007). According to this concept, you don't need to be the "master of the joy" in order to enjoy it. Actually, it can sometimes

be difficult even for therapists, to recognize and celebrate others' happiness and achievements when we are facing tragedy ourselves. Particularly when the patient's source of joy brings us face to face with a painful wound of our own, or situations that can lead to narcissistic harm, such as a patient who is happy to end treatment, for example (Tamir 2012). We will relate the concept of Mudita to the notion of connective planning. The high level of transformational ability of therapists may be found in the world of planning when conflicting interests are met, with the planner taking part in the conflict as a mediator. In the case at hand, Beit Safafa is located between the neighbourhoods of Katamonim, Pat, Gilo, and Talpiot. For years, the neighbourhood was an ethnic and cultural enclave whose development was hampered by conflicting land uses, such as the industrial area of Talpiot and the development of the ultra-Orthodox space at its age.

Despite being the only Arab neighbourhood located within the 1967 borderline, considering the neighbourhood as an integral part of the entire city and promoting connections between its parts, as well as between it and its surrounding neighbourhoods and the city as a whole, will allow Beit Safafa to develop by linking and matching (Fig. 10.2). Such a constructive manner may contribute to the cultural-spatial prosperity of the neighbourhood and address broader spatial issues. The construction of mixed-use buildings near major arteries and railways as well as in employment centres and parks, future development will provide housing improvements as well as future housing for the next generation. The proposed energy policy includes a partnership in the supply and distribution of energy, and the development of energy independence through the establishment of solar, and photovoltaic systems. Selling energy out may create a basis for socioeconomic cooperation towards future energy challenges. In the proposed planning, public transportation and shuttles will be prioritized in the centre of the village, electric buses will be used and inner and surrounding neighbourhood bike paths will be built as well as new roads will be upgraded. The proposed projects and policies will allow residents to actively engage in inter and intra-neighbourhood activities such as cycling to Gilo's music centre. Green roofs will cover the arterial road that separates the parts of the village so that it can be traversed safely by pedestrians.

10.4.2 Planning for Strengthening Existing Power Sources

Being able to see the patient's visible and hidden sources of joy. It is based on the principle that joy is the hidden, pure original innocence, the true essence of human experience. If so, what should we pay attention to? What should be our flashlight's focus? In order to promote free associations, a wider and more comprehensive beam of light is needed, which does not leave the light in the dark. Since the influence of the subject's attitude in perception has become a cornerstone in understanding the therapeutic process, a tendency towards one direction while being blind to the other can create an actual bias. Focusing exclusively on the difficulty will fill the psychic world with it. Also, seeing the denial element of joy, if it exists, does not

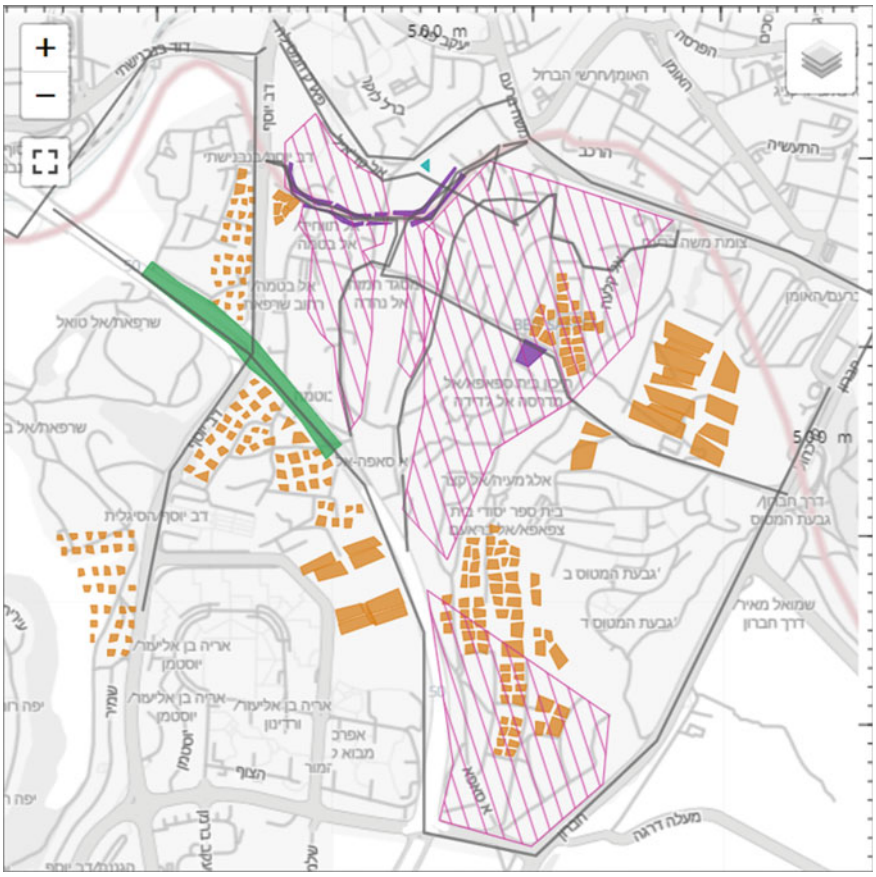

Fig. 10.2 Mudita connective planning for Beit Safafa 2040

need to obscure the possibility of connecting to these forces, the vitality, and the merit inherent in their necessity to hold the self (Kohut and Seitz 1963).

In planning Beit Safafa's future for 2040, we focused on the task of strengthening existing power sources considering identity issues (Fig. 10.3). Despite the importance of comprehensive planning that encompasses Beit Safafa as being part of the urban complex of Jerusalem, maintaining its unique identity within the entire matrix is equally important. Interviews with key figures in the neighbourhood suggest that the struggle for forming and preserving local identity and pride in the face of the surrounding Jewish population, the dissolution of traditional values in the face of modernization, and the selective assimilation of Western values in the face of disintegration are constant challenges.

Fig. 10.3 Planning for strengthening existing power sources

The desire to strengthen local identity through reliance on existing spatial social components has led to a diverse range of planning proposals concerning the mobilization of hidden forces that could serve as agents of renewal. The proposed conservation policy takes into account the need to strengthen the existing centre and define a village core. Preservation of the village core and the nearby archaeological sites will serve as anchors while the village museum and a natural nature area for southwest conservation will serve to strengthen local identity.

The expansion of approved public buildings was accompanied by proposing of additional local cultural, sports, and community institutions. In addition to the building structures, green complexes were also proposed, which will accompany the basin project, which includes orchards and cooperative agriculture, and Tantor Park in the south of the neighbourhood. In order to meet market demands, additional low-density construction was proposed in the sensitive internal areas. The proposed agricultural policy, which aims to preserve the agricultural landscape near the village core, aims to strengthen existing power sources for the future. Maintaining

food security in order to alleviate future challenges is achieved through a cooperative agriculture project, which entails the construction of terraces and agricultural gardens within existing olive groves. The village's transportation policy provides an area without vehicles in the village core.

10.4.3 Removing Barriers by Planning for Beit Safafa 2040

The removal of barriers can be accomplished by identifying and working with the dynamics of the patient and his or her environment that disables joy, as well as working with a position that views happiness as an ethical violation. It can be seen, for example, in post-traumatic families where there are heavy losses or great suffering, in which joy is felt and considered as betrayal and abandonment of the sufferers or their memory. Taking this psychoanalytical approach to planning Beit Safafa, we refer to the neighbourhood as a whole, without functional or municipal boundaries between its various sub-areas (Fig. 10.4). We are working to remove barriers of a painful memory of years of disconnection, of scars that have not merged between the sub-communities within this environment. The proposed comprehensive design (Fig. 10.1) refers to the ten systems together as a means of unifying the built fabric through shared uses. Therefore, the planning proposes covering main arterial roads in the neighbourhood so that people can meet in the central areas and walk safely, taking advantage of the moderate slopes in the area. Examples include the archaeological garden project which connects the past to public functions in the present and Sharafat Park which mediates the spatial functions that take place in different parts of the neighbourhood (the green polygons). Commercial and employment areas offered along the Jerusalem Light Rail, within Dov Yosef Street, are accompanied by a commercial front with the intention of removing socioeconomic barriers and encouraging employment among residents of Beit Safafa in these areas, which are connected by public transportation to the entire city (the purple polygons). Especially when disconnection and repression are the barriers to connecting past and present, the preservation of archaeological sites can open up those channels and bring the past into the present in a meaningful way.

10.4.4 Inspiring Joy

Kast (1991), emphasizing the importance of joy to our everyday lives, asks: Can joy be induced? Could joy be abundant? Inspiration is related to inducements. Thinking of joy as a state of contentless consciousness, one does not necessarily have to speak it but be in it. Permission for joy is required, so that joy may also be allowed to clearly appear in therapy. Related to this is the need to remove the dynamic and moral barriers regarding patients, and professional judgement. Removing guilt, and shame, and removing the experience of responsibility as a burden. Is it possible to

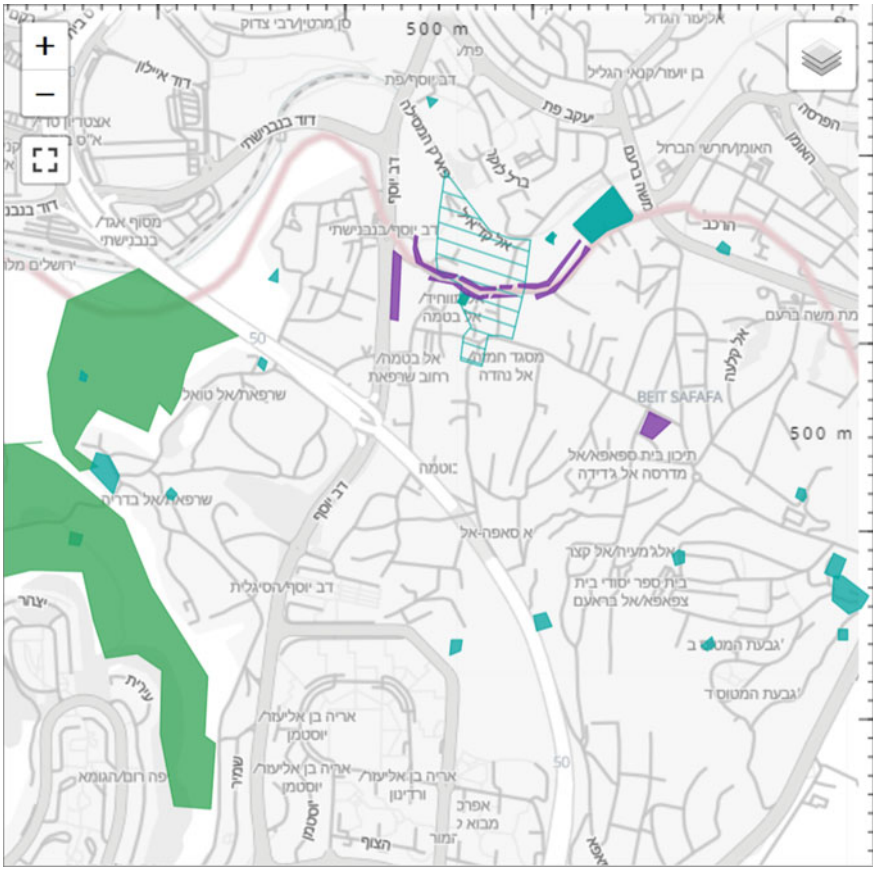

Fig. 10.4 Removing barriers by planning for Beit Safafa 2040

release the connection between responsibility and burden, as the default connection? Can it be possible to connect responsibility and lightness? Shall two walk together?

Winnicott distinguishes speech about a parent's capacity to be in a state of pleasure and joy: "The mother's joy she can count on", as Abram (1996) defines it. The mother's pleasure in her infant is a crucial aspect of her ability to hold. Winnicott brings a full basket of recommendations and encouragement: "Enjoy being thought important. Enjoy letting other people look after the world while you are producing a new one of its members. Enjoy being turned in and almost in love with yourself, the baby is so nearly part of you". Take care of your infant, enjoy their discoveries, and enjoy the long list of other joys and excitement Winnicott (1949) recommends to the mother. He argues that this pleasure, Joy, is vital to the baby, and it cannot be taken for granted, unlike physical activities such as feeding and washing clothes: "… enjoy yourself! If you are there enjoying it all, it is like the sun coming out, for the baby. The mother's pleasure has to be there or else the whole procedure is dead,

useless, and mechanical". It is imperative that mothers be able to enjoy contexts independent of their babies in order to experience motherly joy. There are so many parallels between parental care and therapy care. Can this parallel also be applied to the planning of human living spaces?

A movement can be directed to the patient (mirroring selfobject) or exists within itself (idealized selfobject). Both are not self-evident: An empathic attitude usually identifies with being reactive to the patient's mindset. Sometimes, however, it may be necessary to also be in an empathic state that initiates and establishes consciousness—a mental dynamic activity that blows wind and creates a new experience. In Jewish Kabbalah, it was found that admiration is intrinsically linked to emotional action. Also, with the focus on unconscious communication, Winnicott considers that the ability to communicate does not rely, initially, on language acquisition, but on a preverbal interaction through 'mutuality'. Inspiration is also conditional upon the ability to be in it, to return to it, that the movement of the air—visible or hidden—will allow the presence of joy.

Through the opening of a food and ornamental market, we hoped to expose city residents to the local culture that had developed over generations in Beit Safafa (Fig. 10.5). On the conservation front, there is currently a protected archaeological site that is not used by the locals for fear that tourism would harm their identity if it were opened up. In order to increase empathy for the other and balance the desire to preserve local culture and connect with neighbours, it was proposed to preserve the Burj archaeological site for the local population and to preserve an ancient winepress archaeological site adjacent to the main road for a wider audience. It was proposed, with the input of community members, to build a number of small hotels near the archaeological site conservation project and the small conservation site in the centre of the village so that the number of visitors could be monitored. Likewise, bilingual school is expected to attract students from nearby neighbourhoods. Thus, the uniqueness and character of Beit Safafa will benefit the entire city in terms of economic development, social welfare, and environmental protection.

10.5 Discussion and Conclusion

In this article, we discovered new aspects of the relationship between joy and the spatial structure of a peri-urban area. Based on the study to date, it is clear that the literature on user-space relationship still has some important gaps. Addressing the theory of complexity while bridging the gaps inherent in it between joy and planning makes it possible to fill the theoretical gap. Complexity must include all those elements—connectivity, strengthening existing power sources, removing barriers, inspiration—that will enable us to understand the social system in question from outside the system itself, which does not necessarily lead to joy, to reveal its gaps and complete them. In particular, symmetry-breaking that deteriorates systemic homogeneity is caused by missing or incorrect connections whose origin cannot be explained solely in terms of joy.

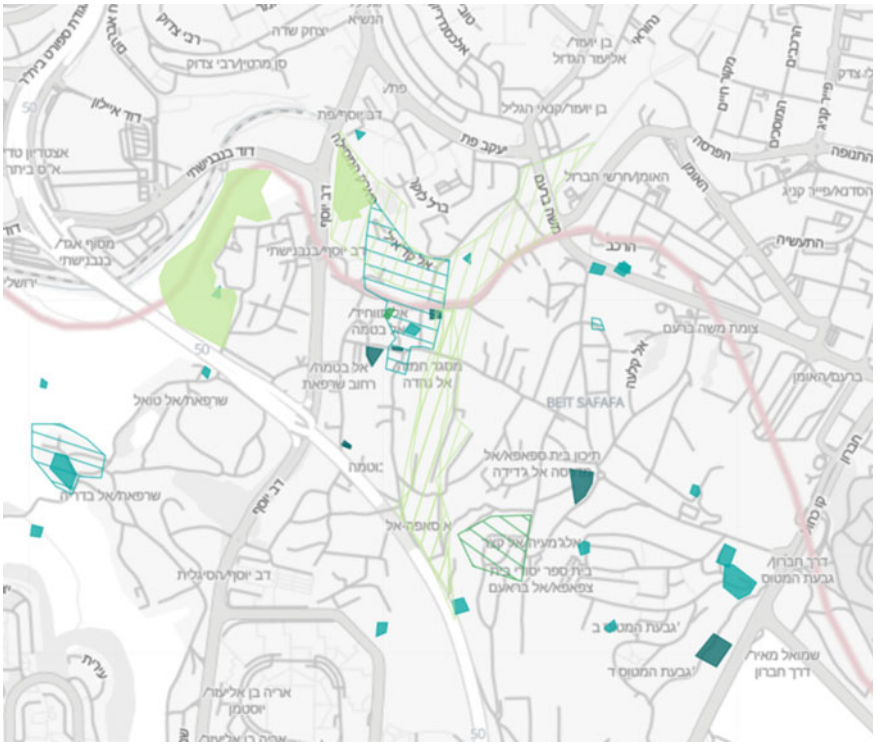

Fig. 10.5 Inspiring joy

Joy has a strengthening and preventive function (Seligman 2002) and is like a 'universal vaccine', helping us bear our negative emotions as they arise (Buechler 2010). Kohut describes how joy characterizes the child's own experience while he develops. The child who enters the developmental stage, the child who steps forward, the child who succeeds in the developmental task (1985, p. 133), and the one who reaches self-fulfilment of the three components of the narcissistic sector in his personality (1977, p. 57). A parent's proud smile can instil a person with confidence and a sense of self-worth, sustaining the person throughout his lifetime (Alvarez 2012).

The look that sees us up close and inside, the mirroring, allows us to experience uniqueness from the otherness. (See Levinas 1989). We are not 'other' to each other, but each of us is special in our own way. We are a unique show within the fabric of life. Moving between realization, 'breaking forth' in Kulka's words, and back to the infinite potential. The vital importance of the presence of the 'other', a presence whose characteristics arise from the context, is the foundation of human, personal, and collective experience. A conception that does not see primary narcissism as a separate narcissistic bubble, a closed energetic system with the 'other' being outside of it, but a holistic, all-encompassing being, in which the initial experience is a oneness connection with the world, and between the world and the individual.

The Kohutian 'other' is not the one outside the bubble, separate and distinct, nor does it adhere to the phenomenological definition of the other: everything that is not me. It is an otherness which is not experienced as outside. This 'other' is outside of me, yet it is experienced as if it were me. Both 'other' and 'myself' at the same time- this is the self-object. The experience of 'otherness' can take many forms: person, object, party, idea, culture, or occurrence. It is crucial to our psychological development; we are born into it and our identity grows and is shaped by it.

The 'other' is an unfixed context. As a perpetual urban dynamic, it is always in affinity. Its qualities can be characterized through the perspective of its movement: movement towards, which constitutes the one-time self, and movement beyond, which transcends beyond the self. Empathy and these two selfobject formations, mirroring and the connection to an ideal figure, are the channels of preservation of the initial connected experience. When a person feels internally and deeply understood by the other and is able to blend in with the other's power and direction, the experiences of connection necessary for his growth are constantly present, at evolving levels of maturity.

Since the 1970s, complex systems and connectivity theories have emphasized the broad context and dynamics within systems. Effective insights were derived from sociology, economics, law, and public policy, distinguishing between the system—identifying its components—and the processes—the forces shaping those components. In the field of planning, there is an increasing critique that planning is subjective, does not reflect pluralism, and sanctifies the mechanism at the expense of the essence and is therefore blind to its complexity. In the same way as network theory, complex systems theory has not evolved from vision to tool. Complex research has vague implications at best, and there are issues with the production and distribution of space. In this study, the concept of Modita is related to the concept of comprehensive planning while maintaining urban context. In Beit Safafa, architects design buildings, planners focus on procedures, and the urban design fall between the chairs instead of being the connecting link. Knowledge gaps are created in the neighbourhood that are not filled by complementary knowledge bodies.

Kohut devoted his life to the search for the way in which psychoanalysis can bring a person back from his otherness, from a place where they are neither of themselves nor of anyone else. That the world is not yours, nor are you a part of it. This can be a horrifying crisis. When the movement towards us does not occur, or when we are unable to move beyond ourselves, we abandon the other, and then the *experience of otherness* appears, and when it increases, the *experience of alienation* is added. The experience of alienation is a consequence of the loss of context attachment. It may even produce otherness that seeks its removal. Thus, identifying the native Arab population as a foreign and undesirable minority, thereby creating a substrate of mutual existential threat, greatly challenges the movement towards the other.

The other's disregard for us causes us outwardly alienated, causing us to be *otherness to ourselves.* This is an initial state of mind in which there is threatening dualism within the individual. It can be experienced from within as an otherness of secret,

criticism, or perversion. It can manifest itself in different degrees of isolation, disconnection, rejection, or dissociation. These experiences can be very difficult and debilitating. Kohut argues that in the absence of joy the impulses become isolated, the self becomes depressed, and it seeks to sustain itself through a 'search for hopeless pleasure' (1985, p. 278).

The experience of the otherness in the world of planning may be experienced by the public when the municipal authority pays lip service to public participation procedure. The public is alienated from planners who use professional jargon and are inaccessible to them, and as a result, do not share with them the vernacular knowledge that is at their disposal, nor are they involved in the decision-making process. The decision-makers, on the other hand, have little real knowledge of the population, and their decisions are not technology-based on real data. The weak lose out as there is almost no local knowledge involved in planning. They are usually the disorganized individuals who are outwardly alienated from their home city. As a result, the planning system is incapable of recognizing and responding, missing insights that are only possible at the micro-level. The inability to reach planning agreements slows and cumbersome planning, and land usage competition determines spatial reality.

According to Kohut, joy characterizes the experience of the self, reaching a psychological balance between being an initiation-focal and the ability to devote to expanding oneself (1977, p. 42). Joy is the result of an empathic matrix, and it plays a significant role in the formation of this matrix. Expressions of joy in therapy can suggest liberation from the injured areas; they can signify the beginnings of structural change—the emergence of compensatory structures (1985, p. 263)—which strengthen existing power sources. In Beit Safafa, the desire for strengthening local identity through using existing spatial social components has led to a variety of planning proposals related to the recruitment of covert forces that can facilitate renewal. Based on the idea that joy, through identity, is the hidden, pure, original innocence, the true essence of human experience, the proposed preservation policy was developed. Seeing the visible and hidden sources of joy of the 'patient' takes into consideration the need to strengthen the existing centre and define the village nucleus.

Joy, according to Kohut, characterizes the reaction of the selfobject that matches the development of the child, often corresponding to his appropriate developmental stages.

Joy is a key component of being a selfobject that sees both the grandiose and the transformative, including motherly joy in her son's future development, that is, in the construction of his virtual self (1977, p. 48).

Enlightenment is the appearance of mental health. It forbids, restraints, regulates and refines, and thus also allows for a complex existence, based on the defences, compromises and sublimations of man in relation to his passions, friends, and culture. Rationality sends us to maturity, judgement, seriousness, conflict resolution, and self-observation.

The workshop presents a collaborative and transparent method for planning that relies on management and negotiation frameworks. Compromise lies in understanding the full scope of the complexity and positively impacting the negotiations. Only the better alternatives are left after negotiations. The feedback process can be

used to update the planning scenarios and management of the existing situation: If excessive bureaucracy exacerbates gaps, then the demonstrated planning tool can be used to curb them. A digital process makes it possible to strike a balance between competing interests, satisfying needs, and interests within a holistically managed system.

The proposed planning development promotes urban renewal and real estate development while balancing professional knowledge with local knowledge. Decisions will be taken at the lowest possible level through local management. In order to avoid stagnation and opposition, powers will be transferred to residents. Providing residents with knowledge, power, ability, and authority through a clause that allows residents to determine what they are interested in will allow them to offer a development plan. Planning should avoid freezing the existing situation to remove barriers to the painful memory of years of disconnection and of scars that didn't merge between the sub-communities. This plan, therefore, will define development with planning referring to the entire neighbourhood.

As Kohut points out, joy is essential to the essence of a parent, to the atmosphere in which the parent lives and inspires. Therefore, it is a key element to being the parent, the caregiver, and an idealized self (1985, pp. 190, 194). Thus, the experience of the otherness is presented to us—the therapists, the planners—as a prayer, request, or demand to approach it. This is the call of the patient's otherness, that we will not abandon him to his alienness. Liability is related to resuming an interrupted flow. *Towards the restoration of dynamics or the starter for the return of self. For the constant renewal of movement beyond the self and toward the otherness.* The uniqueness he needs is a continuation of this dynamic. As original as they may be required, *finding and inventing ways* to constitute something of the presence essential to her or him is to dare step outside the lines and into the spaces.

Similar to the concept of otherness, the multilayered idea of the selfobject is not fully understood. Patients are immensely motivated to find, create, and sometimes invent such selfobjects otherness for themselves. Selfobject is a presence in motion, a presence that seeks. As the patient succeeds in teaching the therapist about the path that leads to him and leads the therapist to be a selfobject to him, his otherness diminishes. That is the movement toward, which constitutes the self in its one-time uniqueness, which is always arising and constitutes our movement as therapists, beyond ourselves. A movement can be directed to the patient (mirroring selfobject) or exists within itself (idealized selfobject). Both are not self-evident: An empathic attitude usually identifies with being reactive to the patient's mindset. Sometimes, however, it may be necessary to also be in an empathic state that initiates and establishes consciousness—a mental dynamic activity that blows wind and creates a new experience. The search for the presence of others' self is a fundamental life force. If we persist, we will find it hidden from view. There are those who seem to have given up hope and movement while others are not willing to give up on the hesitant movement of approximation. There are those who protest and there are movements, individual or collective, that arise spontaneously when it becomes impossible to tolerate the non-motion towards and from us.

Kast (1991), emphasizing the importance of joy to our everyday lives, asks: Can joy be induced? Could joy be abundant? Joy is an experience of contentless consciousness, not something one speaks about, but rather, experiences. There is a need to remove dynamic barriers and increase professional judgement in regard to the subject. Is it possible to release the default connection between responsibility and burden? In a therapist and patient relationship, or as a mother and baby, or as a planner and city, can we bring the vitality and joy rooted within us and our relationship with the world into our roles? The answer to this question has to do with our decision to undertake these roles and our intention to influence life to be worthwhile and enjoyable. Consistent with complexity theory and towards the "tool phase", this study focuses on four planning strategies, their characteristics and composition and explains the motivation and reasoning for multi-system comprehensive planning. However, while the descriptive complexity theory assumed that certain fixed relations, e.g. an ordering, are present, we do not consider such built-in relations. The research highlighted the accumulated impact of the relationships between the object and the subject–between the therapist and the patient, the planner and the plan as well as between the individual users and the urban fabric as a whole. In order to increase empathy, as part of balancing the desire to preserve local culture with the proposed development, exposing the entire city to the local culture that has developed over generations at Beit Safafa may be economically, socially, and environmentally beneficial. As a consequence of the present study, various interdisciplinary issues, such as sustainability, require new solutions that combine economics, sociology, and building engineering as a basis.

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Chapter 11
Urban Aesthetics in Jewish Religious Law: Thoughts on the Role of Jewish Law in Urban Planning

Shlomit Flint Ashery and Yossi Katz

Abstract The purpose of this article is to examine the halakhic view of maintaining a physically attractive urban environment, and to explore how the Levitical city beauty ideal has been incorporated into the planning of the modern neighbourhood of Talpiot, Jerusalem. Based on two Geodesign workshops for Talpiot, this paper examines the negotiation process for the future of Talpiot regarding green infrastructure and agriculture. Balancing the various interdependent land uses of the city as reflected in the Levite's utopia, through Kaufman Plan up until the current Jerusalem's planning, have been embedded in the proposed planning scenarios of Talpiot.

Keywords Jewish religious law · Future strategic alternatives · Green infrastructure · Agriculture

11.1 Introduction

Modern scholarship on Jewish law and associated disciplines reveals that many Jewish religious laws deal with physical space and the environment. Much has been written about the possibility of applying these laws in our own day. The establishment of the State of Israel and the potential for incorporating Jewish law in state law expanded the discourse. In the early 1950s, a number of articles appeared in *The Torah and the State* touching on spatial issues from a Jewish perspective.[1] From the 1970s, Nahum Rakover began to research the approach to environmental protection in Jewish religious texts. All these publications, it should be noted, were part

[1] These studies were republished in Shaviv (1991) [Hebrew]. Also see Rabbi B. Yashar, "Urban planning according to Torah law," vol. 3, p. 187 (henceforth: Yashar), originally published in *The Torah and the State* (*Hatorah vehamedina)*, vol. 3, pp. 59–64, 1949 [Hebrew].

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of a broader effort to bring Jewish law into the legal and public eye on the part of Professors Nahum Rakover and Menachem Elon, and Rabbi Ratzon Arusi.[2] In 1980, Zomet Institute launched *Tehumin*, a Hebrew-language journal that features articles on Jewish legal issues, some related to the environment. In 1990, Bar Ilan University's published *Quality of the Environment: Philosophical and Legal Aspects in the Jewish Sources* in the framework of its Responsa Project.[3] Since then, entire bibliographies have been compiled on the subject, among them Esther Dvorzhetski's *Ecology and Values in Jewish sources* (*Ecologia ve'arakim: Eykhut hasviva (ecologia) bemekorot hayahadut* (2001)[4] and *Protection of Nature and the Environment in Jewish Sources* (*Shmirat teva u-svivia bamekorot hayehudi'im*) an annotated bibliography by Yossi Shpanir and Yisrael Rosenson (2005).[5]

Studies on the environment in religious thought published in 2003–2008 included many that discussed how *halakha* can be employed to protect the environment today.[6] Some years ago, Yossi Katz explored the link between Jewish law and urban space in a study of environmental clauses in the charters of Jerusalem's early Jewish neighbourhoods.[7] Thus Jewish law, from the Torah itself to the responsa literature of our day and age, has taken an interest in aesthetics and has made it a duty to care for our urban surroundings. It is a subject that has not gone unnoticed: In 1962, Rabbi Zvi Neria published "Beauty in the city and the needs of the city"[8]; in 1991, Rabbi Yehuda Shaviv published "Beauty and eternity—A chapter in Jewish ecology"[9]; and Rakover included a chapter on aesthetics in his above-mentioned work.[10]

In this article, we examine the halakhic view on maintaining a physically attractive urban environment. It seems that laws connected to the building have always featured prominently in halakha, and as we study the halakhic attitude on the environmental conservation of cities, it becomes impossible to ignore the fundamental role that aesthetics and beauty play in Judaism. Backing up this argument are generations of halakhic literature and rabbinic Torah lore, as well as relevant modern scholarship.[11] We focus on the Levite city beauty ideal and ask how it affected the planning of the modern neighbourhood of Talpiot in Jerusalem.

Starting with a Halachic framework that outlines the importance of beauty in Judaism the next section discusses urban beauty in Jewish law. In the following

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[2] Rakover (1973). See also Rakover (1993) (henceforth: Rakover) [Hebrew].

[3] Zichel (1990) (henceforth: Responsa project).

[4] Haifa University, 2000.

[5] *Mayim medalyo*, Lifshitz College of Education, Jerusalem 2005, pp. 203–219.

[6] *Society in Jewish law and philosophy* (*Hakhevra behalakha u-bemakhshava)*, vol. 1, Jerusalem 2004 [Hebrew]; *Hakhevra behalakha u-bemakhshava*, vol. 2, Jerusalem 2005; *Hakhevra behalakha u-bemakhshava*, vol. 3, Jerusalem 2006; *Hakhevra behalakha u-bemakhshava*, vol. 4, Jerusalem 2008.

[7] *Al Ha'atar*, 8–9, 2001, pp. 37–44 [Hebrew].

[8] *Shvilin*, 1, pp. 57–59.

[9] *Tehumin*, 12, pp. 472–479 (henceforth: Shaviv).

[10] Rakover, pp. 85–93.

[11] Flint Ashery (2015, 2018, 2020, 2022).

section, we discuss how the Levite city's beauty ideal influenced the planning of modern neighbourhood developments in Jerusalem. In the next section, we present Kaufman's plan (1921) for Talpiot and Talpiot's official plans since then. Based on the results of two workshops, the following section examines the negotiation process for the future of Talpiot in regard to green infrastructure and agriculture. Our paper concludes with a discussion of how the capabilities of the past can improve our Geodesigned future.

11.2 The Importance of Beauty in Judaism

That beauty occupies an important place in Judaism is evident from a whole range of quotations and sayings in Jewish sources. First of all, we can cite the Torah, which extols beauty and even associates it with love: "Now Israel loved Joseph best of all his sons… and he had made him an ornamented tunic" (*Genesis* 37: 3).

Secondly, great weight is given to beauty and aesthetics in the construction of the Tabernacle and the Temple: "As for the Tabernacle, make it of ten strips of cloth; make these of fine twisted linen, of blue, purple, and crimson yarns, with a design of cherubim worked into them" (*Exodu*s 26:1); "Make the bowls of acacia wood, and overlay them with gold; by these the table shall be carried…its bowls, ladles, jars, and jugs with which to offer libations; make them of pure gold" (*Exodus* 25:28–29); "and the pails, the scrapers and the sprinkling bowls…were of burnished bronze" (*I Kings* 7:45); "For the cherubim had their wings spread out over the place of the Ark, so that the cherubim shielded the Ark and its poles from above" (*I Kings*, 8:8). In connection with the building of the Tabernacle, *Yalkut Shimoni* (quoted by Rashi) comments that *Exodus* 26:13—"while the extra cubit at either end of each length of the tent cloth shall hang down to the bottom of the two sides of the Tabernacle and cover it"—teaches us to "be cognizant of beauty."[12]

Thirdly, both *Psalms* and *Song of Songs* are laden with the imagery of nature and adornment: "He makes me lie down in green pastures" (*Psalms* 23:2); "Rightly do I love Your commandments more than gold, even fine gold" (*Psalms* 119:127); "How is your beloved better than another, O fairest of women?" (*Song of Songs* 5: 9);"His cheeks are like beds of spices, banks of perfume, His lips are like lilies" (*Song of Songs* 5:13).

The importance of beauty is further illustrated by the way Jews are commanded not only to follow the commandments, but to do so with "*hiddur*," i.e. in a beautiful way. The concept of "*hiddur mitzvah*" derives from a commentary on the verse "This is my God and I will glorify Him" (*Exodus* 15: 2). Examples of *hiddur mitzvah* in the Talmud are "a fine lulav, a beautiful sukkah, handsome tzitzit, and melodious prayers."[13]

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[12] *Yalkut Shimoni* on Parshat Teruma, *Exodus* 26:13, 247–422. Also see Rakover, p. 93, who cites the *Yalkut Shimoni* midrash.

[13] *Tractate Shabbat*, 133b.

The Sages also voiced appreciation for human beauty. Such was the case of Rabban Shimon Gamliel, who upon seeing a beautiful Gentile woman while visiting the Temple Mount, was moved to recite the verse: "How many are the things You have made, O Lord" (*Psalms* 104:24). The Talmud goes on to comment in this regard that upon seeing a beautiful or outstanding creature, one should say: "Blessed be He who has created this in His world."[14] Likewise, the Sages lavishly praised the beauty of places like Jerusalem and Tiberias. Of Jerusalem, for example, they said: "One who did not see Jerusalem in its glory, never saw a beautiful city. One who did not see the Temple in its constructed state, never saw a magnificent structure"[15]; "Ten measures of beauty descended to the world: nine were taken by Jerusalem, while the world received one."[16] On the verse "From Zion perfect in beauty" (*Psalms* 50:2), the Sages said: "The world was created from Zion."[17] The Talmud says of Tiberias: "Why is it called Tiveria, for her sight is goodly" (i.e. a play on the Hebrew word "tov," meaning "good").[18] The Tosefta explains that the city was beautiful to behold because of its gardens and orchards.

Why is beauty so important in Judaism? The answer seems to lie in the way beauty touches the innermost soul and appeals to the human spirit. At its core, Judaism also speaks to the spirit, to the divine spark in man. Beauty (like art in general) allows those who derive pleasure from it to connect to divinity. In this respect, it constitutes a supreme religious value.[19] The Gaon of Vilna taught that the enjoyment of beauty elevates the human spirit. The Talmud says there are three things that bring a person peace of mind: A beautiful home, a beautiful wife, and beautiful vessels.[20] The Maharal held that beauty represented the godliness in human beings and beauty was not a corporeal matter at all.[21] Commenting on a verse from *Genesis*—"And from the ground the Lord God caused to grow every tree that was pleasing to the sight and good for food" (2:9)—Rabbi Samson Raphael Hirsch writes that the Garden of Eden supplied all man's physical needs. However, he notes, the Bible puts "pleasing to the sight" before "good for food." Aesthetics thus comes before taste and satisfying one's appetite. Beauty is thereby justified and sanctified, and the Bible reveals that man is endowed with an extra sense. Beauty comes in many forms in this world, but only man, as far as we know, is capable of enjoying it. The verse also proves the importance of beauty in man's moral mission: Man's ability to take pleasure in the aesthetics of the created world keeps him from sliding into bestiality. Through joy in the beauty of nature and the botanical world we come to embrace moral beauty. In a

[14] *Tractate Avodah Zarah*, 20a.

[15] *Tractate Sukkah*, 51b.

[16] *Tractate Kiddushin*, 49b.

[17] *Tractate Yoma*, 54b.

[18] *Tractate Megilla* 6a.

[19] Also see Recanati (2021) (henceforth: Recanati), p. 175 [Hebrew].

[20] *Tractate Brahot*, 57b. Also see Stauber (2004) (henceforth: Stauber), p. 78.

[21] The Maharal is quoted in Shaviv, p. 479, footnote 22. Shaviv's understanding of the Maharal is that people should act in a manner that befits the place. The holier a place is, and the more it is infused with divinity, the more attention should be paid to enhancing and preserving its beauty.

society that cares nothing for beauty, human beings, too, will grow wild. In Hirsch's view, delight in aesthetic harmony and moral harmony are closely aligned.[22]

In a recent article that explores Rabbi Kook's thoughts on art, the rabbi's words are worthy of being quoted verbatim: "Literature, painting, and sculpting bring out all the spiritual concepts so deeply etched in the human spirit."[23] "They are not a 'lesser evil'… a decorative element or a matter of taste, but a positive and laudable facet of human nature with the power to elevate a person spiritually and give meaning to his life…"[24] "The vast arena of art, ornamentation, and painting is permitted to Jews…"[25] "Even if a single brushstroke remains hidden in the depths of the pondering and sentient spirit, we must bring it out into the world."[26] Elsewhere, Rabbi Kook writes: "God created the human soul upright and honest, exalting in life and at ease with its feelings. As long as people live their lives in harmony with nature, they will find joy and happiness. Amid the turmoil of human society, however, man has moved away from the pure feelings of nature and his thinking has been corrupted. Restoring natural reason will therefore depend on finding a shared sense of pleasure in nature, in God's grace that fills the entire universe: the birds of the sky singing among the foliage; the splendour of the Carmel and the Sharon with their splendid flowers, the scent of roses and all the luscious fruits in God's Garden, the earth He has given to mankind—these will bring his mind back to its natural state, after having been distanced from it by culture and society. Returning to his God-given natural origin will restore to him all the natural delights of the soul, the feelings of awe and spiritual elation towards the God of gods and all the virtues of an upstanding human being who has not ruined his prospects by veering from the straight and trodden path."[27] "To win the battle against corruptive lawlessness, we must raise Torah scholars who are healthy in body and the very depths of their soul. We must teach them good taste and the emotional sensitivity that comes from appreciating the sublime beauty of poetry and fine rhetoric, but also the grandeur of nature and the beauty that radiates from all works of fine art. A beautiful home, a beautiful wife and beautiful utensils broaden a man's spirit."[28] Beauty is the most accurate order of things and best evidence of deliberate intent. The code of beauty is a collection of individual laws consolidated into one organized system. Therefore, observing the work of God begins with the

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[22] Hirsch quoted in Rakover, p. 101 and Stauber, p. 81. Also see Rabbi Kadosh, "Beauty and eternity forever," *Yesha Yamenu*, 36, Nisan 1993 (henceforth: Kadosh), p. 48. Kadosh points out that the Bible highlights the physical attractiveness of the Patriarchs and Matriarchs. Rebecca is described as a very beautiful maiden (*Genesis* 24:16); Joseph is well-built and handsome (*Genesis* 39:6); and David is "ruddy cheeked, bright-eyed and handsome" (I *Samuel* 16:12).

[23] Recanati, p. 167, quoting Rabbi Kook's introduction to the *Song of Songs*, *Siddur olat re'aya*, Jerusalem 1963.

[24] Recanati, p. 167.

[25] Recanati, p. 167, quoted from *Letters of Rabbi Kook* (*Iggrot hare'aya*) no. 158, 1908, p. 206 [Hebrew].

[26] Recanati, p. 167, quoting Rabbi Kook's introduction to the *Song of Songs*, *Siddur olat re'aya*, Jerusalem 1963.

[27] Kook (1990).

[28] Kook (2004) [Hebrew]; ibid., vol. 1, teaching 804, p. 222; ibid., vol. 8, teaching 55, p. 416.

laws of beauty which govern all spiritual and physical reality, our own or that beyond us.[29]

The Malbim writes about the sacred garments that the priests were commanded to wear: "The vestments they were instructed to make seem to apply to outer clothing, and we are told how the craftsmen made them. But in truth the instructions are for inner garments with which God's priests would cloth their souls and minds". Positive thoughts, virtues, and good deeds are the garments of the soul, and they are not the work of craftsmen. God commanded Moses to make these holy garments but it was to teach them to repair their souls and become more virtuous human beings, in this way clothing their inner spirit in splendour. On the meaning of "and you shall make sacral vestments…*for honor*," we have found that wherever the word "kavod" ("honor") appears in the Scriptures, the reference is to the soul: "Make vestments for honor means 'for the soul'…".[30]

11.3 Urban Beauty in Jewish Law

A reference to urban aesthetics already appears in the Torah and the Mishna. The Torah states that 48 cities must set be aside for the benefit of the Tribe of Levi because the Levites, unlike the rest of the tribes of Israel, inherited no land of their own. *Numbers* 35: 1–7 tells us: The Lord spoke to Moses in the steppes of Moab at the Jordan near Jericho, saying: Instruct the Israelite people to assign, out of the holdings apportioned to them, towns for the Levites to dwell in; you shall also assign to the Levites a *migrash* around their towns. The towns shall be theirs to dwell in, and the *migrash* shall be for the cattle they own and all their other beasts. The town *migrash* that you are to assign to the Levites shall extend a thousand cubits outside the town wall all around. You shall measure off two thousand cubits outside the town on the east side, two thousand on the south side, two thousand on the west side, and two thousand on the north side, with the town in the centre. That shall be the pasture for their towns. The towns that you assign to the Levites shall comprise the six cities of refuge which you are to set aside for a manslayer to flee to, to which you shall add forty-town towns. Thus the total of the towns that you assign to the Levites shall be forty-eight towns, with their "*migrashim.*"

While we know what a city is, the term *migrash* (pl. *migrashim*) is not so clear. At the end of *Tractate Arakhin*, Rashi offers a commentary on the Mishna which states that the zoning of the Levite cities, fields and *migrashim* cannot be altered.[31] Rashi (followed by other commentators) explains that two separate strips of vacant

[29] *Ein Ayah*, footnote 26, *Tractate Berakhot*, 43, section…, p. 190, also cited in Kadosh, p. 140.

[30] Commentary of the Malbim on the verse "Make sacral vestments for your brother Aaron…for honor and adornment (*Exodus*, 28:2), cited by Nechama Leibowitz in her book *New Insights on the Book of Exodus* (*Iyunim khadashim besefer shmot)*, Jerusalem, 14th edition, pp. 385–386 [Hebrew]. Also see the Malbim's commentary on *Exodus* 28:3, and the Ramban's commentary on the phrase "for honor and adornment.".

[31] Rashi's commentary on "*sadeh"* and *"migrash*," *Tractate Arakhin*, 33b.

land measuring 1000 cubits each (approximately 500 m) must be left around Levite cities. One strip was an open expanse adjoining the city. This was a *migrash,* on which building and farming were prohibited. Beyond that was a strip of 1000 cubits designated for cultivation. This was a *sadeh.*[32]

Why the prohibition on building or planting on land designated as a *migrash*? Rashi cites a design principle that answers this question: "An open tract free of homes and fields to add beauty to the city."[33] In Tractate Sotah, he defines the term "*migrash*": "a space, clear of planted fields, houses and trees, to beautify the city, to give it air."[34] In other words, the beauty of the city is preserved by leaving an open space at its entrance. This principle appears again in *Tractate Bava Batra*, where the text says: "A tree may not be grown within a distance of twenty-five cubits from the town, or fifty cubits if it is a carob tree or a sycamore tree". Abba Shaul says: "Any tree that bears no fruit may not be grown within a distance of fifty cubits."[35] Rashi explains that the reason for prohibiting the planting of trees near the city entrance is aesthetic, because trees block the view.[36] The distance is doubled for carob and sycamore trees because they have numerous branches,[37] whereas non-fruit bearing trees "detract from the city's beauty" if planted too close by.[38] According to Rashi, the Sages passed a special law to ensure the beauty of cities in Eretz Yisrael.[39] A modern commentator on the Mishna adds the following: "Trees should not be planted close to the city limits because the appearance of the city is marred by having its walls hidden by trees. In the case of carob or sycamore trees which grow thickly, the distance should be doubled—fifty cubits because they obscure the walls even more with their dense growth…" Abba Shaul says all non-fruit bearing trees should be

[32] Ibid. Also see Rabbi Y.H. Amichai, "Planting trees and sowing seeds in Levite *migrashim*," *Planting in the Land of Israel* (*Netiyot ha'aretz)* (ed. Rabbi Y. Zoldan), Torah Ve'haaretz Institute, Kfar Darom, pp. 329–339 [Hebrew]. Other approaches cited here conflict with Rashi's interpretation, among them the contention that a *migrash* is 1000 cubits but a *sadeh* is 2000 cubits. Also see *Al seder hadaf* '*Lo yakhfor,*' *Tractate Bava Batra,* Kollel Avreichim of Bobov, Betar Illit (henceforth: *Otzar hamefarshim*), 2006, pp. 194–196.

[33] See note 30, above; *Yalkut Shimoni* on Parshat Masei, 35:9. Also see note 27, above; and Rabbi Ovadia of Bartenura's commentary on the term "*migrash.*".

[34] *Tractate Sotah*, 27b. The Rambam interprets the term differently in his commentary on *Tractate Arakhin*: "*Migrash*—neighborhoods on the city outskirts…where shepherds and farmers live, and the *sadeh* on the edge of the *migrash.*" Also see *Mishna with the Commentary of Rabbi Moshe ben Maimon* (*Mishna im perush rabeynu moshe ben maimon*) Mosad Harav Kook, Jerusalem 1967, *Seder Kodashim*, *Tractate Arakhin*, Chap. 9, *Mishna* 8 [Hebrew].

[35] *Tractate Bava Batra*, Chap.2, 24b.

[36] Ibid.

[37] Ibid.

[38] Ibid.

[39] Stefansky (1986) (henceforth: Stefansky) [Hebrew]. Also see Stefansky (2008) [Hebrew].

kept fifty cubits away, i.e. it does not befit a city to be surrounded by plain, ordinary-looking trees.[40] The Jerusalem Talmud also attributes the law to the fact that leafy trees will overshadow and obscure the city.[41]

It should be emphasized that the rabbis ruled against the townspeople giving in to a tree owner, i.e. they did not accept the consent of the residents to allow someone to plant a tree in this area. The rabbis held that the laws in question were given by the Torah to protect the beauty of cities and the glory of the Land of Israel, which meant they were relevant to the inhabitants of Eretz Israel as a whole. Therefore, the consent of the townspeople made no difference.[42]

Sefer Hahinukh brings a more philosophical explanation for the laws governing the beauty of Levite cities.

> The Torah commanded that those cities should have a *migrash* of 1000 cubits to serve as an open space for fresh air and beauty, and 2000 cubits set aside for fields and vineyards, that, too to preserve the aesthetics of the city…The root of the mitzvah is as follows: Because the Levite cities were designated for use by all the tribes, the Levites being the tribe chosen to serve the Lord Blessed Be He with a mission focusing wholly on wisdom, in order for them not to be burdened with agricultural labour like the rest of the Tribes, as it is said of them: 'They shall teach Jacob Thine ordinances, and Israel Thy law…' therefore it is fitting that those cities, which are open and accepting of all, should be the epitome of loveliness and beauty, bringing delight to all the people of Israel.[43]

While the commandment to preserve the beauty of cities was in the context of Levite cities, the rabbis ruled that it applied to all cities in the Land of Israel.[44] Likewise, most ruled that the laws on beauty did not apply outside of Israel, even in towns that were mostly Jewish.[45] They were only applicable in the Land of Israel and only under Jewish sovereignty. By ruling that Jews "beautify the cities of Eretz Yisrael but disregard neglected foreign towns, even those inhabited mainly by Jews, they hoped to kindle in us the desire to settle in the Land of Israel, whose cities we were obligated to beautify, for if they were rundown, we might leave and return to the Diaspora, to cities restored by the Gentiles."[46]

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[40] Cohen-Freue (2014) [Hebrew].

[41] Jerusalem Talmud, *Bava Batra*, Chap. 2, *halakha* 7. Also see Rabbi Y. Reischer, *Jacob's Return* (*Shvut ya'akov*) Part I, *siman* 159, Lemberg 1896–1898, 44a [Hebrew].

[42] In the words of the Rashba, "Since the matter at stake is beauty, the townspeople cannot be lenient." See *Rashba's Glosses on Tractate Bava Batra* (*Khidushei harashba al masekhet bava batra)*, 24b [Hebrew]. Also see Shaviv, pp. 475–477.

[43] *Book of Education* (*Sefer Hakhinukh)*, Mosad Harav Kook, Jerusalem, 1956, *Mitzvah* 343, p. 431 [Hebrew].

[44] Rabbi I. Schepansky, "Commentary on the settlement of Eretz Yisrael," *Or Hamizrakh: Quarterly Dedicated to the Torah, the Jewish People and the State of Israel*, vol. 35, 2 (henceforth: Schepansky), pp. 117–118., citing the Rambam's ruling on the laws of *shmitta* and *yovel*, Chap. 13, *halakha* 4–5. Also see Schepansky, pp. 134–136; and Amichai (2000) [Hebrew].

[45] Schepansky, p. 115; Responsa project, p. 93. Also see *The Maggid's Teachings on the Rambam, Laws concerning Neighbors* (*Hamaggid Mishna al harambam, Hilkhot shkhenim*, Chap. 10, halakha 1 [Hebrew]; Herman (1990) *The Problems of Eretz Yisrael as Illuminated by Our Sages* (*Eretz yisrael uba'ayoteha be'oram shel khakhameynu z"l)* Bnei Brak, pp. 242–24 [Hebrew].

[46] Responsa project, p. 93; Schepansky, p. 116. Also see Amichai, p. 245. In *Tractate Bava Batra*, the Ramban writes: It is clear to me that there is no such regulation except in the Land of Israel,

Promoting the attractiveness of cities in the Land of Israel while overlooking the decline of foreign locales was designed to achieve more than beautifying Eretz Yisrael. Behind it lay the lofty goal of settlement in the Holy Land.

Halakhic scholars in recent generations have been divided over the relevance for our day of keeping the entrance to cities free of trees. Some ruled that if there was no longer any aesthetic significance to leaving an open area, doing so was not mandatory. On the contrary, it was better to plant trees or greenery, in keeping with the current custom. Others ruled that even today, although the definition of urban beauty may have changed, an expanse of land without trees or plants should be left around the city. This was so because it was a Torah-given commandment and no modification should be made in the distances cited, either with respect to the 25 cubits for trees or the 1000 cubits of open land at the approach to cities in Eretz Yisrael.[47]

11.4 Methodology

The case study of the Talpiot neighbourhood was chosen to answer the question of the role played by the beauty ideal of the Levite city in planning modern neighbourhood developments in Jerusalem. This selected neighbourhood is representative of a mixed-population central urban neighbourhood. The unique circumstances of its establishment as an independent and planned garden city and its annexation to Jerusalem as a central urban neighbourhood make it an interesting test case and an appropriate choice for this research question.

The methodology proposed in this study is based on Steinitz's Geodesign method, which he introduced in his many papers and his book "A Framing for Geodesign: Changing geography by design" published in 2012. Steinitz's method lays the groundwork for planning based on a specific geographic location and allows a large number of participants to take part in the process.[48] A digital version of this methodology was developed by Dr Hrishi Ballal into Geodesignhub.

Geodesignhub provides a practical framework for a collaborative design using an open digital workflow.[49] With the software, the preparation of plans and planning procedures can be actively supported between professional disciplines and with the public. Geodesignhub enables the advancement of complex and controversial planning procedures through negotiation. The Geodesignhub is typically used for public

whereas outside of the Land of Israel, there is no obligation to repair anything. If only it would fall apart under its inhabitants." Cited by Shviv, pp. 476–477. Also see *Anthology of Commentators* (*Otzar hamefarshim)*, 194 [Hebrew]. According to the Rama and the Tur, the law is also valid outside the Land of Israel. On this matter, see Rabbi Y.G. Edelshtin, *Mimeged geresh yerakhim*, study pamphlet on *Tractate Bava Batra*, pp. 401–402.

[47] Yashar, pp. 187–190; Amichai, pp. 245–251.

[48] Flint Ashery and Steinitz (2022).

[49] Geertman and Stillwell (2020).

policy and urban planning purposes, including infrastructure investment, environmental management, and climate change adaptation.[50] A software programme is used to mediate and negotiate socio-political issues that arise about issues of the location while offering planning that promotes a sustainable community.[51] Through a Geodesign workshops examination, we can examine how environmental values influenced the choices made by Jerusalem planners today.

To examine the characteristics of scenic nature and open spaces in the future planning of this neighbourhood and under conditions of increasing land-use pressures, we will analyse the products of the Geodesign workshops held during February 2021 in collaboration with community administration, residents, and planning professionals. Four interest groups were involved: authorities, community, environmental, and entrepreneurship, with the participation of representatives of these groups. It is the purpose of the workshops to allow representatives of interest groups to collaborate in real-time to develop future alternatives and assess their chances of implementation, including evaluating the implementation of the neighbourhood master plan.

According to their initial reference group, participants in the workshops suggested planning alternatives to Talpiot. By assigning people to different interest groups, they can express their views individually and prepare a design suited to their interests, which helps them focus on the solution. Following the process of presenting potential partners and selecting them, both groups came together and negotiated a solution. The final process involved combining all source groups into one large group, which together created the agreed-upon final design alternative. In the process of comparing quantitatively and qualitatively the alternative planning options, it is possible to understand the process the participants went through and draw conclusions about the likelihood of the proposed plan being implemented. Plan alternatives, prepared by different groups, consist of diagrams that can be revised, edited, deleted, and recreated, providing a variety of choices before making a final decision, and reaching a single planning goal within a clear planning system provides the objective standard.

11.5 How Has the Levite City Beauty Ideal Affected the Planning of Modern Neighbourhoods in Jerusalem?

11.5.1 Urban Beauty: The Case Study of Talpiot

In 1912, Anglo Palestine Co. director Dr Levontin asked the director of the Jerusalem branch to "search the area of Jerusalem and see if any beautiful land could be purchased nearby for the construction of houses for the bank's officials."[52] A suitable

[50] Goodchild (2010).

[51] Nyerges et al. (2016).

[52] C.R. Ashbee, Jerusalem 1920–1922, London 1922, p. 151.

spot was found on the way to Bethlehem. The area was larger than needed, but the landowners did not want to sell anything but everything. Israeli Land Development Company hired German-Jewish architect Richard Kaufman to design the settlement (Fig. 11.1). Talpiot was the first settlement Kaufman designed in Israel.

Talpiot's master plan was completed in March 1921 on an area of about 800,000 m^2, of which Jews only own about 540,000 m^2. The settlement was designed as a modern independent city outside the municipal area of Jerusalem for about 800 families, and many public buildings were erected there. In the early planning stages of the neighbourhood and even before the official approval and signature of the High Commissioner, the Israeli Land Development Company made announcements to the public inviting the public to buy land for the construction of houses in accordance with the neighbourhood's master plan. While the Israeli Land Development Company was responsible for the purchase of the land and the planning of the neighbourhood, the actual construction of the neighbourhood was to be done by the settlers, after they purchased land for private property. In order to establish a neighbourhood and maintain a uniform character, the buyers established a cooperative association that will concentrate its affairs within the neighbourhood committee.

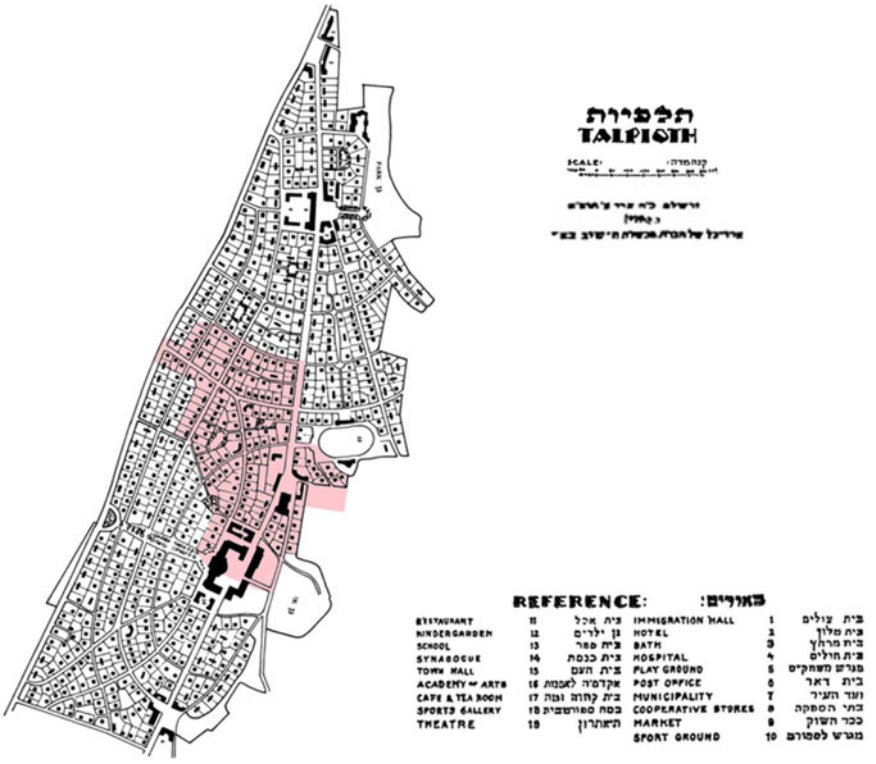

Fig. 11.1 Plan for Talpiot by Kaufman, 1921. The marked area is the area actually built. Wikipedia Feb. 2023

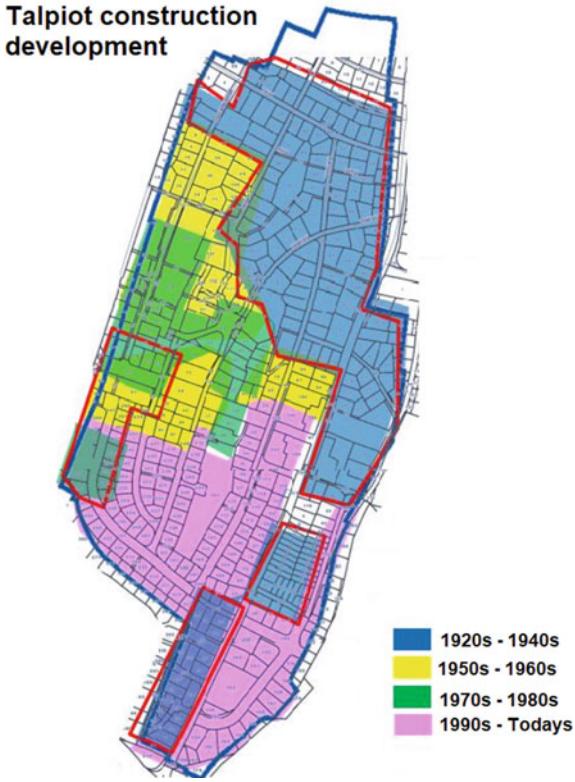

Fig. 11.2 Talpiot construction development. Talpiot-Arnona-Plan, Architect Nili Renana Harag, Arctic Architects, Jerusalem

In July 1924, two years after construction began, only 40 houses stood in the neighbourhood and four were under construction. Within five years, only about 7% of the planned area of 800 homes was built.[53] Along with the high construction costs, the lack of security uncertainty contributed to population difficulties, which resulted in a big gap between the completion of planning and implementation. Talpiot served as a checkpoint against Talbiyeh, Katamon, Abu-Tor, Baka, and the Allenby camp, which was under the control of the British government. As a result of this security situation, plots were sold that were not in accordance with the original parcel and damage was done to the original plan for the neighbourhood as a garden city.[54] Figure 11.2 indicates Talpiot construction development.

During the 1936 Arab revolt in Palestine, the neighbourhood was abandoned by most of its residents, who gave their property over to the administration on orders. The construction and settlement movements in Talpiot indicate modest construction movements up until 1947, despite the neighbourhood's prominent advantages, such as proximity to the main traffic axis and to Arab elite neighbourhoods. In 1947, some

[53] Daily mail 15.7.1924.

[54] Accounting of the Annual General Meeting.

of these advantages disappeared, and new disadvantages were added, such as proximity to the border and neighbourhoods of evacuated and immigrant neighbourhoods, which led to a freeze on construction in the area. In the period 1948–1956, there has been a settlement movement caused by the construction of an intensive neighbourhood, and there was a relative stagnation in the construction movement between 1956 and 1967. Up until 1947, Talpiot was considered an upper-class neighbourhood: the housing unit is higher than the urban average, the family is relatively small, and the housing density is low. The 1967 war resulted in a rise in land values, which in turn increased the density and heterogeneity of the population.

11.5.2 Talpiot's Official Planning

Talpiot's first outline plan is "City Planning Plan No. 1721, Change No. 64 to Jerusalem Outline Plan No. 62" from 1955. Flexibility in the plan led to an increase in land values and many requests for changes in use. In recent years, it has become apparent that Plan 1721 does not meet development needs, and spot development plans have negatively affected the character of the neighbourhood. The enactment of Plan 1721A in January 1986 sought to regulate these uses and close loopholes but faced opposition from developers who wanted to delay implementation of the plan to create facts on the ground.

Talpiot's population has changed significantly between 1968 and 2021. Changes in housing density, heterogeneity in population composition, and significant rejuvenation are the main trends. Due to these trends, the high level of construction in the neighbourhood, the unlicensed construction and its retroactive approval, as well as the lack of adequate enforcement, significant gaps exist between master plans and reality. The willingness of decision-makers to surf institutionalized from the neighbourhood's boundaries and its transformation into a "great Talpiot"[55] coupled with the increase in land values in the neighbourhood resulted in a dissolution concerning building additions. According to officials in Jerusalem's municipality, the previous plan did not address the needs of the area, and market forces have had filling this void. The situation, in which market laws drive reality, encourages illegal building additions that are expected to be approved retroactively in the formal plan for this area. In this case, plans on a path of deviation confirm anomalies according to which future urban and detailed plans will be created.

An outline plan intended to address these issues in advance of the approval of the Jerusalem master plan was recently introduced and approved for the specific area of Talpiot.[56] An immediate response to existing construction anomalies combined with an effective enforcement mechanism to prevent recurrence proposed in the recent outline plan will allow for controlled densification of the neighbourhood, taking into account conservation, landscape, and environmental issues that may be

[55] https://www.jerusalem.muni.il/media/19583/2-statori.pdf.

[56] https://www.jerusalem.muni.il/media/19584/3-suggested-situation.pdf.

avoided in uncontrolled actions. This development process, which is not part of a comprehensive vision plan, calls for neighbourhood-specific regulations. In order to balance the interests of conservation versus development, as well as to meet changing needs, a feedback procedure is required that ensures the adjustment of results to be in compliance with regulations.

11.6 What Role Does the Urban Beauty Ideal of Levite Cities Play in the Planning of Talpiot?

We turned to a digital planning process, in which the values and preferences of those involved in the process are revealed, in order to examine whether the Levite city beauty ideal is reflected in the planning of the Talpiot neighbourhood. In this section, we examine which elements of Levite's utopia have been adopted without knowledge and embedded during the workshops, as values embedded in the local planning heritage, in order to propose an alternative future to the neighbourhood.

The workshops preparations began in January 2020. The Geodesign workshops' management team handled the database construction. The digital information about the neighbourhood of Talpiot is collected from the OpenStreetMap website and from the spatial knowledge database of the Jerusalem municipality, derived from a GIS map with all layers of urban planning (buildings, roads, land designations, etc.). Planning data collected from the Jerusalem Municipality's Planning Division: approved master plans and master plans in preparation; policy documents; City Vision Document and Strategic Plan, etc. In conjunction with social data obtained from the Centre for Socio-Economic Research of the City, such as census data and socio-economic ranking data, conclusions could be drawn in collaboration between the workshops' management team regarding local values used when creating assessment maps of the evaluation model. Using the information from the research centre, population targets were also set for 2035 and 2050.

As a result of an initial analysis of the study area, ten spatial planning systems were selected, each with an innovative issue suitable for promotion at the micro-level according to the Sustainable Development Goals, the SDGs. A carefully selected set of spatial planning systems and innovative issues was chosen by the workshops' team so as to fit the Israeli planning system, the vision document, and the strategic plan for Talpiot, as well as the unique urban situation of the area. A dedicated workspace for Talpiot was prepared using the ten selected systems based on the colours of the IGC method (Fig. 11.3). Following the knowledge acquisition, analysis, and illustration phases, the PSS can create a real-time impact and simulation to assist in formulating an effective management strategy and making smart decisions.

During February 2021, two Geodesign workshops addressed the future planning of the Talpiot neighbourhood.

A total of 24 guests attended both workshops, including city officials and members of the public. Planning and strategic planning personnel, environmental

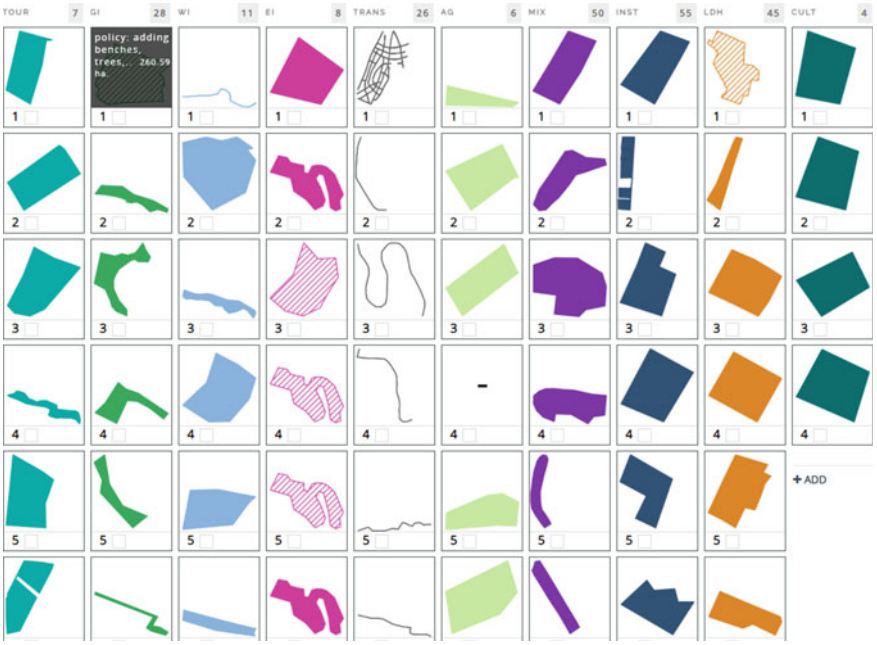

Fig. 11.3 According to the IGC method, local plans and policies are represented by polygons with colours that correspond to the ten systems

planning and sustainability representatives, community manager representatives and neighbourhood committee representatives, surveyors, geographic information, and computing personnel were among those represented. The workshops' participants were familiar with the Talpiot neighbourhood and their backgrounds included urban planning, architecture, computerized geographic systems, science and technology, and a combination of skills appropriate for the Geodesign workshop.

The emphasis was on realistic and highly programmable planning for implementation as a tool for planning and decision-making for the complex area that is currently being planned according to this list of selected planning systems and updated innovation issues:

1. Tourism (TOUR);
2. Green Infrastructure (GI); green walls and green roofs; integrated vegetation into building design, biodiversity, and conservation;
3. Water Infrastructure (WI); runoff management and retention, supply, storage, and recycling;
4. Energy Infrastructure (EI), local production of energy through renewable sources, energy efficiency in buildings, green construction;
5. Transport Infrastructure (TRANS), combining transportation infrastructure and renewable energy infrastructure, promoting cycling and walking, public transportation;

6. Agriculture (AG), Urban agriculture, incl. green roofs and vertical fields;
7. Mixed use of residential and commercial uses, up to 7 storey buildings (MIX), development of innovative mixed-use models;
8. Institutions and Public Buildings (INST); development of education systems, civic, smart facilities;
9. Residential (LDH), low density housing;
10. Cultural Heritage (CULT), protection of buildings and sites of cultural significance;

Ten evaluation maps generated by the system depicted the current situation in the neighbourhood, with the purpose of assessing and simulating the potential future impacts of various planning alternatives. The traffic light method of the assessment maps (red: existing-working infrastructure; yellow: areas not suitable for a particular infrastructure, it is possible to determine whether or not a change is required; green: new infrastructure can be developed), helped to understand the different situations and develop solutions tailored to each location. Using a defined and uniform graphic language to describe the future development of space contributed to facilitating the understanding and communication between participants and assisted in making science-based decisions.

The Planning Support System (PSS) provided participants with the flexibility to choose goals and advance in the planning process using Change Models. By using the Change Models, a framework for creating and developing design scenarios is provided that is based on scientific and value information, which is then presented in Representation Models, evaluated and compared with the same information in Impact Models. The diagrams were organized in a matrix and made available to all participants regardless of their groups. According to the priorities they set, each group created different planning alternatives by combining project and policy diagrams differently. After the first round of planning, each group's alternative 1 was presented to the other participants and workshops' management team, and evaluated on the basis of the effects of the alternative on the design space and compliance with pre-set objectives for each of the design systems.

The Geodesignhub interface also provides a unique interactive interface that is able to analyse and compare the effects of alternative solutions so that the solutions proposed by different groups can be compared. An analysis of design alternatives using negotiation and performance comparison tools enabled group members to synthesize a self-assessment matrix of the alternative, compare the decision model, and create a sociogram. As a result of the analysis based on the similarity between alternatives or the integration potential, and on the preferences of the groups filled in the sociogram, the desired consensus was formed, and from four groups to two large groups chose to work together. In each unified group, priorities were redefined, and planning alternatives were created. Geodesignhub's simple and fluent graphics as well as converting every schema into a number facilitate a compromise and waiver towards the formulation of a common alternative.

Geodesignhub's digital evaluation models helped groups develop a coordinated and agreed-upon alternative during a continuous planning process that included

several planning cycles. Through these models, groups were able to analyse the effects of different policies and projects incorporated into the scenarios examined. Both groups could see the other's solutions side by side and choose whether to accept or reject them. The interface allows the presentation of the two design alternatives on top of each other while allowing to isolate the agreements as a basis for the initial alternative only. In this case, the disagreements need to be discussed while switching between the comparison grid and negotiation alternative. As a result of several planning-feedback-planning cycles, each unified group presented its final planning alternative. Finally, all the groups were merged into one to create the final and agreed-upon planning alternative for the neighbourhood. Figure 11.4a, b represent the final future alternatives relating to green infrastructure and agriculture presented by the planning teams at the two workshops.

The first prohibition refers to the land uses of the Levite cities, and in particular to "turn the city field into a plot and vice versa, and also not to turn part of the city itself into a city plot, and vice versa". Because the first construction in the area was according to the Kaufman plan, we will compare Kaufman's land uses to the existing situation and to the proposed scenarios regarding the workshops. Talpiot used to be designated as a residential neighbourhood, but its designations have been altered slightly since the Kaufman plan. In Kaufman's plan, the public uses include: (1) Immigration hall; (2) Hotel; (3) Bath; (4) Hospital; (5) Playground; (6) Post office; (7) Municipality; (8) Cooperative store; (9) Market; (10) Sport ground; (11)

Fig. 11.4 **a**, **b** Scenario A and B as proposed at the end of Workshop 1 (respectively)

Restaurant; (12) Kindergarten; (13) School; (14) Synagogue; (15) Townhall; (16) Academy art; (17) Café and tea room; (18) Sport gallery; and (20) Theatre. The neighbourhood was annexed to the city and no longer required autonomous public services. In addition, transportation improvements have made these services more accessible. Comparing the land uses at Kaufman to the existing situation shows that the areas defined as built or open public remained so in the developed area as described below.

The joint planning policy of the two workshops creates a green connection between the neighbourhoods, as well as their surrounding area, while taking topography into consideration. The neighbourhood will be adorned with benches, trees, and shade arrays as part of this renovation. Figure 11.4b shows the joint environmental development projects for the two workshops, link Talpiot Arnona to Talpiot East. The project includes creating a connection between the mound of rocks (the Mechvar) and Talpiot Arnona. The proposals support the Kaufman Plan, which defined these areas as open spaces, and even today, these areas remain undeveloped.

Ein Tzurim Street, for example, is a pedestrian path that stretches over the topography of the neighbourhood and separates two areas with different density characteristics. In Kaufman's plan it appears to be a monumental main green axis that connects the main north–south transportation route to the main public area of the neighbourhood, where among other public services, the synagogue is planned. In the two scenarios that were presented in the workshops, which included strengthening the Ein Tzurim promenade that connects Ein Tzurim to the Talpiot industrial area to the west, as well as connecting the rocky mound (the Mechvar) to Talpiot East and Mordot Arnona.

In relation to the green infrastructure, the difference between the two workshops is shown in Fig. 11.4a, where the cultivation and enlargement of the existing garden project ("Gan Hachursha") is proposed, in addition to the proposals shown in Fig. 11.4b. Additionally, the proposed projects include a pocket garden (located near Dostrovsky Street and west of Shalom Yehuda Street), a linkage between the north and south promenades, and an open space along the aqueduct in Mordot Arnona. Gan Hachursha appears in the Kaufman Plan, and the proposed green infrastructure corresponds with the street parcellation.

A change in street parcelling led to a change in land use in areas not developed under the Kaufman Plan. As an example, the northern part of the Kaufman Plan (north of Yanovski Street), which appears in white as an under construction for residential construction in the vicinity of the U.S. Embassy complex and significant brown areas for public use. Additionally, a difference in construction and street layout between the Kaufman Plan and the current situation in the southern part of the plan led to the proposal that the aqueduct will be developed on areas defined in the Kaufman Plan as residential. In terms of agriculture, both workshops offered a community agricultural garden near Israel Eldad Street and an existing open space.

In conclusion, the Torah lays out the structure of the city in relative detail. The Levite cities are each surrounded by four winds, which are known as Migrash—a plot of land. Despite the disputes about the Migrash's width, its function is described as "לִבְהֶמְתָּם וְלִרְכֻשָׁם וּלְכֹל חַיָּתָם." Sages interpret that "חייתם" is for the service needs

of life, and in the planning language, public spaces and everything that adjacent the residential areas. Open spaces around dense urban neighbourhoods are seen as a benefit to the city that results from the open spaces surrounding them, in a way that complements them. Mixed uses combine different rationales, such as accessibility to leisure activities in open space, ecological, and environmental rationales since open space facilitates air circulation and aesthetic rationales that promote growth (נוי והרחבת הדעת - מפרשי המשנה בבא בתרא ב, ז, והגמרא כד ע"ב). Balancing the various interdependent land uses of the city as reflected in the Levite's utopia, through Kaufman Plan up until the current Jerusalem's planning, have been embedded in the proposed planning scenarios of Talpiot. Even as the neighbourhood's population has grown considerably, Talpiot has managed to maintain its local planning heritage.

11.7 Concluding Discussion

The future management of our investments in our cities and regions, infrastructure, and the citizens will have a digital component to it. To enable this digital transition, we need to understand the trade-offs and organizational implications systematically, and in relation to the heritage of the place and its planners. Although geography and design have accompanied our being since human permanent settlement, it has only in the past decade taken on its present character and form. Steinitz[57] lays out the framework which is based on tight integration of iterative design—getting it right by trial and error—with stakeholder priorities, insights, and intuitions. This is the core of any modern design process and his model is state of the art with respect to informing decision processes involved in the physical location of various land uses, activities, facilities, and related objects and peoples within the urban and regional vernacular landscape culture.

Since Geodesign is a process, it does not fit neatly into a box, and there is no two Geodesign projects are similar. The context for Geodesign is dependent upon the place and participants. As different places will have different Geodesign needs, and the people within these locations will express their preferences differently, we focus here on two workshops for Talpiot. The objective of the workshops was to think through strategic alternatives for a set of interdependent policies and projects within a heritage-embedded inner-city neighbourhood for 2035. This paper examines the way in which the Levite city beauty ideal is reflected in the proposed planning values and preferences. We examined how GIS technology and its informational and analytical capacity can be used to inform and enhance green infrastructure and agriculture.

The purpose of the Talpiot workshops was to think through strategic alternatives in a future-oriented spatial–temporal manner and to do this with considerable openness, flexibility, and efficiency. This activity considers the contents of methods within the contexts of the Jewish religious law, which has included guidelines for planning residential environments over the generations. One was intended to preserve the

[57] Steinitz (2012).

aesthetic beauty of cities for the future generations. It was a guideline that evolved as a result of the importance attributed to beauty in the Jewish sources. In the opinion of most Jewish legalists, it was not relevant to the reality of Jewish life in the Diaspora. Nor was it binding as long the Land of Israel was under foreign dominion. Hence some Jewish scholars deemed the commandment to protect the beauty of cities in the Land of Israel a "halakha dimeshikha," a halakha for the Messianic era. This is one of the explanations for the fact that Rabbi Yosef Caro did not include it in the Jewish code of law, the Shulkhan Arukh.

However, in our day, when the Jewish people are living in their own land and in a sovereign state, there is no dispute that the law governing urban beauty is binding. It also serves the glory of the Land of Israel, with a purpose that goes beyond beauty itself. There may be different opinions on the practical aspects of observing the law in modern times.[58] Some may argue that it is precisely the planting of trees at the city entrance that lends an aura of beauty, whereas others will say that the law must be kept to the letter and the frontage should be left open. However, it seems everyone will agree that a "halakhic city" must abide by the spirit of the halakha, which requires the city patrons to enhance the beauty of their city and put a stop to anything that could deface it. Perhaps this is an opportunity to tell those who work for the municipal authorities in Israel that in the same way they are performing a mitzvah in observing the laws of shmitta in public parks, they are also performing the mitzvah of beautifying Israel's cities.

Understanding how planning is negotiated and the opportunities for introducing technological methods to negotiation processes becomes central to the activity of planning and at the core of planners' skills. Also, there is a need to develop an understanding of the background and the organizational implications of these policies. The risk is that without systematic analysis that takes into account the values of multiple stakeholders, including the citizens, the conflicts in our environment would get worse. Geodesign is a bridge-builder between old and new, between theory and practice. In urban planning theory, it is very important to consider the role of heritage, culture, and beliefs in the context of digital planning methods. With the increasing number of Geodesign case studies and implications, there is a good likelihood that the next generation of city planners and designers will be able to construct strategies for creating sustainable urban futures that take into account their past. We must now allow for a critical reflection that can lead to a critically and inclusively formulated planning policy.

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[58] Flint-Ashery and Stadler (2021).

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