THE ROLE OF URBAN DESIGN IN TOKYO’S SHRINKING PERIPHERAL AREAS: THE CASE OF TAMA NEW TOWN

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Abstract

The aging of Japanese society will inevitably restructure Tokyo’s spatial organization in the coming decades. Population loss will manifest itself unevenly, being most dramatic in peripheral areas—where ca. 87% of Greater Tokyo Area’s population lives—triggering a gradual spatial restructuring. Several scholars have tackled this issue from a geographical and planning perspective. From an architect’s viewpoint, such researches build a theoretical foundation upon which a more concrete investigation should be done, since the question of how liveability at the architectural and urban design scale could be tackled remains an open one. This paper focuses on one representative case study: Tama New Town, some 30km west of Tokyo Station. The emphasis is on four liveability factors relating to urban morphology, embedded in a wider socio-economic context: density/compactness, diversity of uses, walkability and green/water space. The significance of the research is threefold. On a theoretical level, we have assessed how urban design physical factors impact liveability in Tokyo’s peripheral areas. On a methodological level, we have tested workable methods that can be used by architects and urban designers to analyze neighborhood liveability in both quantitative and qualitative terms. On a practical level, we have provided new data and information about Tama New Town for the use of local municipalities and groups, suggesting strategies to address existing problems and highlighting potentials to be exploited.

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INTRODUCTION

The aging of Japanese society will inevitably restructure Tokyo's spatial organization in the coming decades. A low fertility-rate (1.45), high life-expectancy (ca. 83 years) and a modest presence of immigrants (1.9% of the total population) (Ministry of Internal Affairs and Communication, Statistical Bureau, 2017) are causing the rapid aging of Japanese society. As a consequence, population shrinkage started around 2005. Population loss will manifest itself unevenly, and, in the case of Tokyo, be most dramatic in peripheral areas, where ca. 87% of Greater Tokyo Area's population lives (Ohno, 2005), triggering a gradual spatial restructuring. In fact, population shrinkage is often followed by urban shrinkage (Oswalt, 2006). This is not to say, though, that population loss is the only cause of urban shrinkage (Salone & Besana, 2014:104). As an example, in Europe (e.g. the Ruhrgebiet in Germany) and in the US (e.g. Detroit, MI) urban shrinkage was mainly triggered by severe deindustrialization, or by internal migration following political and administrative disruptions (e.g. cities in the former German Democratic Republic in the 1990s). In the case of Tokyo, however, urban shrinkage will mainly be caused by population loss due to aging society and low fertility rates.

Several scholars have tackled this issue from a geographical (e.g. Yui & Kubo, 2013) and planning perspective (e.g. 村上, 2016; Sorensen & Okata, 2010). The former aimed at exposing the cause-effect relationship of population decline and built space, focusing on the risks of peripheral areas to become severely depopulated and dysfunctional. The latter called for the need of preserving socially mixed and lively neighborhoods, by means of urban policy and management. From an architect's viewpoint such researches build a theoretical foundation upon which a more concrete investigation should be done, since the question of how liveability at the architectural and urban design scale could be tackled remains an open one (Capitanio, 2018).

Evolution and future shrinkage of Tokyo's peripheral areas

The suburbanization of Tokyo has had its specific driving forces and should not be compared to its American counterpart, since it unfolded on the premises of different socio-economic characteristics. This process did not start, as some literature claims, in the 1960s, but was already on its way before WWII, with the foundation of new towns like Kunitachi (Capitanio, 2016) or Den-en Chofu (lit. “garden suburb”). The 1960s witnessed, nonetheless, the extensive spread of suburban living. Due to increasing land-prices, housing shortage and environmental degradation, the generation born in the 1930s, coming to Tokyo to study and work, predominantly settled in areas situated between 10 and 20km from the center (assumed to be around Tokyo Station).

The following generation, born in the 1950s and 1960s and getting married in the 1980s, aspiring to a detached house with garden, came to populate areas located between 30 and 50km from the center, along main train lines (Oe, 2005:12). In a suburban family of the period, the father would usually be a salary-man, spending long hours commuting to and from his workplace, while his wife would either be a housewife or would work (part-time) close to their house. Such a family-life pattern would often cause the weakening of relationships with neighbors and among family members (Okamoto, 1997:88-89). The suburbanization of Tokyo was dictated by the impossibility of finding affordable housing close to the city center, and not by unattractiveness or decay of central locations, even though the 1960s environmental crisis was of great concern. Nonetheless, the appeal of suburban living has deep roots within the Japanese people, which seems due to the fact that a detached...
house surrounded by a garden would mimic samurai residences in verdant yamanote, the high city (Sorensen, 2004:38-39).

The generation born in the 1980s, because of the decreased land prices following the burst of the property bubble in the early 1990s, and because of the perceived burden and stress linked to commuting, seems to prefer living in central wards, exacerbating the current depopulation trend of peripheral areas. In fact, as investigated by many scholars (Fujii, 2008; Oe, 2005), due to the general population decline in Japan, even Tokyo is starting to face population loss in its peripheral areas. It has to be noted, though, that suburbs are not to be seen as a homogeneous body showing univocal trends (Fujii, 2008:20). Their conditions are rather diverse, depending on their location, the train lines that serve them, etc. Nonetheless they will, with varying degree of intensity, experience the downsides of shrinkage, and will have to cope with diminishing tax revenues and increasing cost of public services and transportation. This could lead to the progressive degradation of peripheral areas, to their abandonment or to the ghettoization of the elderly living there. Some scholars argue, therefore, that a growth-oriented model should be turned into a “decline paradigm” (Müller & Siedentop, 2004) and that an era of “deurbanization” (Onishi, 2011:27) is about to start. Moreover, even though Tokyo and its catchment area are continuing to attract residents, its growth is expected to halt and reverse after 2025 (河合, 2017:75-9).

Due to the massive inflow of the generation born in the 1930s and 1940s, the city’s aging will be dramatic (Oe, 2005:10; Masuda, 2015). This prospect has already prompted various proposals. On the one hand, from a policy-making perspective, the Japan Policy Council suggested to gradually favor the relocation of the elderly from Tokyo toward a number of areas in other prefectures, to balance the offer and demand of nursing-care facilities and housing (The Japan Times Online, 2015). Even though such a move might seem reasonable from a statistical and demographic point of view, it remains to be seen how the plan could be actually implemented and how many elderly, under which conditions, would be willing to leave their social connections and families behind. On the other hand, urban design proposals such as Fiber City / Tokyo 2050 (Ohno, 2006) tackled depopulation from a spatial, design-oriented perspective. A de-urbanization strategy should convert less accessible, depopulated residential areas into green “fibers”, to act as natural amenities and disaster-prevention measures. Complex policies and financial mechanisms would be needed, though, to make this proposal work. Meanwhile, the number of vacant houses is worryingly increasing, so that new legal instruments will be needed to cope with this issue (see Nozawa, 2016; HOME’S 総研所長, 2015:229).

AIM AND METHODS

This paper focuses on Tokyo’s peripheral areas, aiming to assess urban design issues affecting liveability at the neighborhood scale, based on the analysis of one representative case study. The emphasis is on four factors—relating to urban morphology—deemed to be fundamental in understanding the spatial characteristics of a neighborhood (see Dovey, 2016): density/compactness, diversity of uses, walkability and green/water space. The significance and assessment of these factors will be explained in the “results” section of this paper. The research is limited to the Greater Tokyo Area because it represents an exceptional case within Japanese urban development, as it has been following a unique trajectory, different from that of other urban centers in the country. Moreover, shrinkage of remote towns and villages has specific drivers—such as poor accessibility, lack of jobs, deindustrialization—which make them incomparable with Tokyo. The term "peripheral areas" refers here to neighborhoods situated between 30 and 60km from central Tokyo (Nakazawa,
2011), so that both central wards and farther cities were excluded from the study. As this research investigates an intermediate scale—the "missing link" (Calthorpe, quoted in Ellin, 2006:140)—between planning and architecture, national urban policy and building design go beyond its scope, which is to evaluate how urban design physical factors influence liveability in peripheral neighborhoods threatened by the downsides of shrinkage. Data for this investigation were collected as follows: first, from literature reviews in English and Japanese; second, from fieldwork during the course of several non-consecutive days in 2017; third, from publicly accessible geodata and aerial photographs.

**TAMA NEW TOWN**

Tama New Town (多摩ニュータウン) is an area spread over four municipalities (Tama City, Hachioji City, Machida City, Inagi City), some 30km (45 minutes by train) west of Tokyo Station, with a population of ca. 224,500. It was founded by a public joint venture in the late 1960’s, for a planned population of 340,000, representing the largest new town in Japan. Once inhabited by young cohorts—mainly couples with children—the town has now to cope with depopulation and a high proportion of elderly, endangering its liveability on multiple fronts, as we will see in the following section. We chose to investigate Tama New Town as it is representative of a number of post-WWII suburban developments not only in Tokyo, but throughout Japan as a whole. From this point of view, ‘serious issues afflicting Japanese society, such as how to deal with a declining birthrate and an aging population, or how to shift to a recycling society, appear now in Tama New Town in a condensed form.’ (財団法人多摩市文化振興財団, 1998:12; author’s translation). More specifically, we selected two districts within Tama New Town, where to carry out our analysis: Toyogaoka and Ochiai, respectively developments of the mid and late building phase.

**Historical background and current issues**

The area where Tama New Town is located was, before its development, hilly forested land, dotted with villages mainly devoted to agricultural production. Parts of the so-called "Tama hills" had been developed before WWII for leisure purposes, resulting in uncoordinated land use. Despite being spatially close to the city center, because of the difficult topography and lack of accessibility, the site had remained undeveloped until the mid-XX century.

Severe housing shortage and the need for a better land use to preserve green areas in Tokyo, sustained by ideological references to European and American green belts (Amati, 2008:9), pushed for the creation of modernist new towns in leafy environments, often to serve as bed-towns for salarymen commuting to the center. The proximity of large swatches of land to central Tokyo was, in fact, a crucial reason for choosing the location of numerous Japanese new towns in the 1960s and 1970s.

The Tokyo Metropolitan Government had been planning a 1600ha housing development for 150,000 people in the Minami Tama area in 1960-62. This was the "prototype" of Tama New Town. In 1963, though, a New Urban Development Law was enforced, which changed the scope and extent of the project. Beside the Tokyo Metropolitan Government, the Japan Housing Corporation and the Tokyo Metropolitan Housing Supply Corporation came to be involved in the planning of the new town. A 3000ha area, spanning over four municipalities was decided upon in 1964, to be reached by two railway lines and served with water from the Tama River. After the plan was finalized in 1965 by the Ministry of Construction, the public developers began to undertake full-scale land acquisition negotiations, according to two
types of area foreseen in the masterplan: "new urban residential development projects" on the hills, and "land readjustment projects" in the valleys, where villages were present.

The whole masterplan spans 14km east-west, and 3km north-south (Fig. 1). Construction started in 1967, beginning with waterworks and the major roads, followed by residential *danchi* (Japanese public housing, often in the form of 5-story linear apartment blocks) in the Suwa and Nagayama districts. Development proceeded over a timespan of 30 years, divided into phases, so that groups of districts were built at one time. Districts toward the east of the area were built first, and the development gradually proceeded westwards.

Figure 1: Aerial map of Tama New Town. Railway lines are indicated in yellow (Source: Author).

Tama New Town is composed of 21 residential districts, each centered around one junior high school. According to the masterplan, each district (*chiku*) has an area of ca. 100ha, originally planned for 3-5000 dwellings or 12-20,000 people. Two elementary schools, a neighborhood center with post office and police box, stores and other facilities complete a district as a discrete neighborhood unit (Fig. 2). Each district-unit, thus, is supposed to host various functions necessary for everyday life, such as housing, commercial, medical, and public facilities, beside the above-mentioned schools (Ueno & Matsumoto, 2012:10-13). This concept echoed C. Perry’s 1920s theory of the neighborhood unit, with some relevant differences. Districts in Tama New Town are almost double the size of Perry’s neighborhood units, both in terms of area and of population. Perry assumed a 400m radius as an ideal maximum walking distance of a square-ish neighborhood. In Tama New Town, however, due to the elongated shape of the whole masterplan area and to the topography with valleys running north-south, districts are rather some 2km north-south and some 0.5km east-west. In terms of circulation, while Perry had proposed to lay major streets along the borders of the unit, to limit traffic in its center, districts in Tama New Town feature a complete separation of pedestrian from vehicular traffic, according to classic principles of modernist planning. Moreover, while in Perry’s idealized neighborhood topographical levels were not taken into account, the terrain of the Tama hills, despite extensive bulldozing and flattening, called for numerous stairs, ramps, flyovers and bridges, a great burden for the elderly and the physically impaired (Fig. 3).
In 1971 the Suwa and Nagayama districts were occupied first. At the beginning, all apartments were for rent, but later more and more apartments for sale were built. During this period, the main dwelling units supplied were 2DK (the number stands for the amount of rooms, while D and K stand for “dining” and “kitchen” respectively) or 3DK units, and the floor area was usually around 50m². 5-story, freestanding blocks with no elevator, often arranged in south-facing rows, were the standard residential type of the first development phase. Even though, at the beginning, such housing schemes embodied an idea of modernity for the common people, residents soon realized the many downsides of such small, jerry-built apartments. During the mid-development phase, in districts such as Toyogaoka, the size of dwelling units was increased.

The vast majority of new tenants were young couples with children. Since district residents would move-in all at one time, Tama New Town came to host a much higher-than-average ratio of children, a demographic imbalance that would cause serious issues in the future (HOME’S総研所長, 2015:125). An immediate result was the lack of schools and educational personnel, requiring great efforts by developers and local administrators, which only partially met residents’ demands. Traffic was another concern of residents, who had to spend commuting time in traffic jams to and from train stations. As a public transportation network had not been efficiently implemented, in fact, reliance on cars was high. To relieve this problem, Tama Center Station opened in 1974, connecting to Shinjuku Station.

In the 1980s, further west, the development of Ochiai and Tsurumaki districts showed a more diverse mix of housing types (e.g. apartment buildings 5- to 11-story high, townhouses, row houses, detached houses), in a move from quantity to quality. In 1985 the new town hit a population of 100,000, and, during this decade, four universities, various firms and facilities moved there, especially around Tama Center Station. A monorail started operating in 2000, roughly corresponding to the official completion, in 2006, of the Tama New Town project. The area has thus shifted from a construction phase to a stock management phase, reaching a maturity stage, with the gradual easing of the developer’s burdens.

By this point, the first districts to be developed, Suwa and Nagayama, were already facing population decline, as their housing, unsuitable for contemporary living standards, could not attract newcomers. Once bustling with children, these areas saw a rapid demographic U-turn: when children became adults, they often opted to move to more central locations, thus leaving soon-to-become elderly behind. The spatial consequences of this were the merging or closing of various schools, now lying abandoned.
Building stock in Tama New Town now faces serious challenges. After some pilot projects, older *danchi* apartments have been proven difficult and expensive for barrier-free renovation due to their construction and layout. Demolition and rebuilding has had some degree of success, while public buildings, besides producing financial losses year-by-year (Brasor & Tsubuku, 2016), are in need of extensive renovation, which, due to the lack of funds by local governments, keeps being postponed. In sum, Tama New Town faces a number of challenges which are spatial manifestations of demographic trends, being accelerated by questionable urban design.

**Case study area**

The case study area comprises two districts located in Tama City: Ochiai to the west (hosting Tama Center) and Toyogaoka to the east (Fig. 4). The former has (as of 2015) ca. 13,000 residents, the latter 11,000, for a total of 24,000 inhabitants, about 1/10 of the whole Tama New Town. Toyogaoka and eastern Ochiai were built from 1976 onwards, the former by the Japan Housing Corporation, the latter by the Tokyo Metropolitan Housing Supply Corporation. Western Ochiai and Tama Center were instead built from 1980 onwards (Ueno & Matsumoto, 2012:9).

Since the mid-2010s, the population of Tama City (mainly constituted by residents of Tama New Town) has begun to slowly decline: the projected shrinkage in 2040 is -14.3%, compared to 2015 (国立社会保障・人口問題研究所, 2013). This is much higher than that of nearby towns. Let us consider, for instance, Kunitachi, a garden city of sorts founded in the 1920s. Despite sharing similar accessibility and location in regard to the center of Tokyo, Kunitachi is predicted to lose 2.8% of its population by 2040 (国立社会保障・人口問題研究所, 2013). Moreover, land prices in the case study area are assessed at ca. 410,000 yen/m² for commercial areas around Tama Center, and between 175-220,000 yen/m² for residential areas (木浦税務不動産, 2017), around half the land prices found in Kunitachi. In order to highlight causality relations between shrinkage and morphological characteristics, let us now examine the following four factors: density/compactness, diversity of uses, walkability and green/water space.
Figure 4: Aerial map of the case study area. At the bottom-left corner, the area in 1975, after extensive earthwork (Source: Author).
RESULTS

Density/compactness

All relevant metrics are graphically summarized in Fig. 5. The Spacematrix diagram—developed by Berghauser Pont and Haupt (2010) at TU Delft—integrates four variables in one chart: the FSI (Floor Space Index, the density or intensity of a settlement); the GSI (Ground Space Index, the compactness of a settlement); L (Layers, the average number of floors); and the OSR (Open Space Ratio, the openness and pressure on non-built land). It indicates a total GSI of 0.16—i.e. 16% of the case study area is occupied by buildings—a FSI of 0.84, an OSR of 1.00, with an average number of floors of 5.2. These show that Tama New Town is a mid-rise development with abundant open space between buildings, presenting a suburban character. Nevertheless, there are great differences within the case study area. While residential blocks show degrees of density and compactness slightly lower than those of the total area, having an almost rural character, blocks around Tama Center Station present values typical of highly-urban areas, such as those of inner city, mixed-use blocks. These discrepancies are due to the increased height and plot coverage of mixed-use and commercial typologies close to the transportation hub.

Three types of urban fabric can be clearly identified from the figure-ground map: compact areas with low-rise detached- or row-houses (mainly in western Ochiai); spacious mid- to high-rise danchi or towers (mainly in eastern Ochiai and Toyogaoka); and compact, mid- to high-rise blocks of large-footprint buildings around the station (in western Ochiai). Buildings in compact areas align themselves along streets, while danchi and towers are south-oriented irrespective of the given street network. The whole urban fabric does not present outstanding voids, so that we cannot tell where a public park or large water space might be located. The population density is 42.0 people per hectare, 2/3 of that of the whole Tokyo Prefecture.

Diversity of uses

All relevant metrics are graphically summarized in Fig. 6. First, we have quantified diversity of uses both at ground floor (MXI GSI)—where most of pedestrian activities take place—and with regard to the total floor space (MXI FSI). The Mixed Use Index, or MXI, was conceived by van den Hoek (2008; 2009). It is a tripartite system calculating the amount of floor-space devoted to housing, working (e.g. offices and factories) and amenities (e.g. commercial activities and public functions). We will follow Dovey’s suggestion (2016:27) to replace the term "amenities" with "visiting", as the three categories clearly show the purpose of one’s stay, namely living or working in a place, or visiting it. These functions are represented in a chart by a percentage over the total floor space of the area, thus indicating the degree of mix. It has to be noted that, even though we are analyzing the diversity of uses, we take here into consideration just built space. Greenery and water space will be tackled in a separate factor.

At ground level, 58.7% of built space is devoted to housing. Visiting functions occupy 39.5% of the total ground floor space, while working functions constitute a mere 0.7%. Figures regarding the diversity of uses over the total floor space present similar proportions. By these figures we understand that the case study is a mixed-use area, with a substantial amount of non-residential functions, but with a minimal presence of productive activities. As it can be inferred from the difference in working functions between the MXI GSI and the MXI FSI, a small amount of offices can be found above ground floors.
Figure 5: Figure-ground map showing building footprint and height; Spacematrix diagram; photographs from top to bottom: representative low-rise type; representative high-rise type; representative mid-rise type; elevated pedestrian deck close to Tama Center (Source: Author).
Figure 6: Figure-ground map showing the distribution and diversity of uses; MXI diagram; photographs from top to bottom: mobile vendor inside *danchi*; pedestrian deck close to Tama Center; neighborhood shops; covered pedestrian alley (Source: Author).
Second, we have mapped the spatial distribution of uses. This shows that the distribution of functions within the area is extremely unbalanced, as there is great concentration of commercial activities around the station, housed in large structures. Tama Center is, in fact, a regional shopping and entertaining hub, catering patrons from the whole Tama Area, so that we can say it belongs to the supra-neighborhood level. Despite the high quantitative presence of visiting functions according to the MXI, once we disregard Tama Center, neighborhood shopping facilities are scarce. Danchi and some of the compact residential areas are monofunctional—only interspersed with educational facilities (some of them already closed)—following the principle of one junior-high and two elementary schools per district. Areas along the border between western and eastern Ochiai, and between western Ochiai and Toyogaoka—"land readjustment areas" where settlements were formerly present—are to be understood as shopping streets, even though they do not form a continuous commercial street front.

In qualitative terms, we have observed (in summer 2017) that neighborhood shops, originally planned at the ground floor of some danchi—forming a pedestrian-only shopping street—are generally in a declining state. Their structures are often in need of renovation and many shopfronts are shut down or vacant. A surprising finding, encountered within the premises of a danchi, was the presence of a mobile vendor coming to sell fresh goods and groceries by truck. Parked on a small paved open space close to the danchi management office, this vendor placed his products in front of the opened-truck, providing carts and baskets for his customers. Elderly formed the largest pool of patrons, and this service seemed to be most welcome, being an opportunity for social contact too.

Walkability

All relevant metrics are graphically summarized in Fig. 7. The pedestrian environment was first analyzed with quantitative models and simulations referring to space syntax, a spatial and analytical theory developed by Hillier and Hanson (1984) at Bartlett University, London. Space syntax is mainly used to assess the (intel)legibility of street networks and the accessibility of points (e.g. representing buildings) along given routes. With two betweenness simulations we aimed at predicting pedestrian flows in the case study area, according to shortest paths. For this research, we have used the plug-in software “Rhino UNA toolbox” developed by City Form Lab (Sevtsuk, 2016) at MIT. This software was specifically programmed to be used by architects and planners, as it enables a seamless workflow between design, analysis and simulation of spatial configurations. Among the many types of space syntax analysis, we have focused on betweenness, to simulate pedestrian flows, and gravity, to assess shopping accessibility.

**Betweenness**

Betweenness ‘approximates by-passing traffic or footfall at particular locations in a spatial network. The Betweenness of a building is defined as the fraction of shortest paths between pairs of other origins and destinations in the network that pass by a particular location’ (City Form Lab, 2015:23). Tama New Town is, due to its topography and circulation concept, a particularly challenging location to analyze. First, the software we used could not take into account topographical variations, so that a flat and a steep path are treated equally. This can greatly distort results. To mitigate the consequences of this issue we have drawn steep paths artificially longer than in reality, so that they appear as more unfavorable to the simulating...
Figure 7: Gravity analysis; betweenness analysis; photographs from top to bottom: exemplary stairs connecting plateaus to low-lying streets; mobility issues for the elderly; neighborhood park; view from Parthenon Tama toward Tama Center station (Source: Author).
software. Second, as we have previously seen, Tama New Town's masterplan completely segregates vehicular from pedestrian traffic. This means that, by design, vehicular roads tend to appear uninviting and uninteresting to pedestrians, and might be discarded even though they might be the shortest possible route.

In the first simulation (a), all residential and office buildings represented origins, weighted according to the number of floors, while two stations (Tama Center and Tama Center Monorail) represented destinations. Routes were calculated according to shortest paths, resulting in a maximum value of 6654 routes and a minimum of 1. As expected, pedestrian flow was predicted to be at its highest around the destinations, even though the most trafficked segment was in the vicinity, and not attached to the stations. What is questionable in this simulation is the high pedestrian flow through Parthenon Tama coming from Tama Central Park. There are, in fact, long and steep stairs coming down from the park, through Parthenon Tama and to the stations. It appears that flow at this location has been overestimated.

In the second simulation (b), shops represented origins, weighted according to the number of floors, while two stations represented destinations. Routes were calculated according to shortest paths, resulting in a maximum value of 485 routes and a minimum of 1. As the majority of commercial activities are located around Tama Center, the predicted pedestrian flow mostly happened there, with only a handful of routes reaching farther locations.

On qualitative terms, we have observed on site how difficult it is for elderly people to move around Tama New Town, due to stairs and ramps, making manifest the problematic characteristics of such a pedestrian environment. Connecting all malls around Tama Center is a pedestrian deck at first-floor level, a reminder of the modernist planning ideas underpinning the town's masterplan. The deck appears in some tracts over-scaled and monumental (forming a 40m-wide visual axis between Tama Center Station and Parthenon Tama) and, due to its sheer width, tends to seem empty. Nevertheless, more proportioned segments can be appreciated as a safe environment for pedestrians, especially mothers with children, as motorized traffic happens at ground level. Landscape features, though, such as trees or seats, appear to have been designed more with an aesthetic, rather than functional intent. “Informal” uses on the pedestrian deck only appear during special events, such as seasonal festivals. Let us now examine the accessibility of shops.

Gravity

Gravity, beside 'the number of destinations around each Origin within a given Search Radius [...] measure[s] additionally factors in the travel cost required to arrive at each of the destinations.’ (see City Form Lab 2015:16-17 for a detailed description of the gravity analysis) This analysis aims at indicating how many shops can be reached by each residential building within a 500m walking distance, along a given street network. Since topography greatly affects pedestrian behavior—hilly neighborhoods are harder to walk through—the gravity index can express aversion to walking by the exponent $\beta$, adjusted according to the topographical characteristics of a specific location. Gravity, as well as betweenness, was “weighted”, i.e. the buildings' number of floors influenced outcomes, generating a proportional number of simulated pedestrian routes.

A gravity analysis was run with a 500m radius and a $\beta$ value of 0.005. It indicated a maximum number of reachable shops of 116 and a minimum of 0. The results are strongly polarized, and only 3 to 5 buildings—new manshon in the vicinity of Tama Center—enjoy a convenient shopping environment within walking distance. The two shopping streets along
the district borders seem to marginally influence their surroundings. This is due to the fact that they are greatly outnumbered by commercial activities housed in the multistory malls around the station. Meanwhile, the rest of the residential area faces serious issues in shopping accessibility, explaining the presence of vendors on truck stopping within *danchi* premises.

**Green/water space**

All relevant metrics are graphically summarized in Fig. 8. Tama New Town is ca. 100m above sea level, with a maximum variation in altitude of 40m. It presents a hilly topography with valleys running north to south, creating narrow and long plateaus. The planners laid, in principle, vehicular roads in the valleys and often defined each plateau as a neighborhood unit, i.e. a district. From this point of view, an understanding of the topography of the area is crucial to grasp planners’ intentions and current mobility issues. Green and water space in the case study area amounts to 51.9%, explaining the suburban character highlighted in the density/compactness subsection. Qualitatively, it can be categorized as follows: private green or non-paved areas (20.5%); shared green (16.3); public green, i.e. parks (14.3%); water (0.7%); and a negligible presence of agriculture.

Since *danchi* and apartment towers are the main residential typology, shared or communal green space constitutes a considerable share of the overall natural environment. This is a fundamental qualitative trait, as the management of such spaces relies on residents’ fees or volunteering activities. During our fieldwork we have encountered numerous elderly people taking care of these green spaces, which appeared as great burdens for an aging and shrinking pool of residents. Beside smaller neighborhood parks and playgrounds, where we seldom encountered children or anyone at all, there are two district parks: Tama Central Park and Toyogaoka Park. The former is a pleasantly landscaped park, featuring a large pond, lawns where to lie and rest, and abundant trees providing shade. It also hosts a reconstructed farmhouse with free entrance and a greenhouse where flowers are grown and displayed. According to our fieldwork, the park is used and appropriated by local inhabitants, given also its proximity to Parthenon Tama and Tama Center. Toyogaoka Park, on the other hand, is abandoned. It has poor accessibility and its only outstanding feature, a hilly topography, only serves to make it unattractive to elderly residents. During our fieldwork we encountered no single person walking the park, which was in a state of disrepair. Agriculture, once abundant in the area, has virtually disappeared. *Danchi* residents, in fact, do not have the opportunity to have an orchard close to their apartments, and the only agricultural patches we found were small private allotments adjacent to detached houses.

**Bottom-up resident activities**

Bottom-up activities by local residents, aiming at the improvement of liveability at the neighborhood scale, have been having limited success. As the case study area can be considered, in part, a bed town where people (especially men) commute from, civic engagement is relatively low (財団法人多摩市文化振興財団, 1998:10). Not spending enough time socializing with neighbors and being involved in local activities and events, is a major reason for the lack of strong social cohesion. This problem is common to other bed towns
Figure 8: Mapping of green and water spaces with topography; amount of open space by category; photographs from top left to bottom: abandoned Toyogaoka Park; communal green space by *danchi*; playground; green house; Central Park by Parthenon Tama (Source: Author).
across the country. As the population ages and retires, however, it would be possible to
spend more free time in cooperative activities, or simply to socialize more.

In 2004 the Tama New Town Machizukuri Specialists' Committee was established (秋元, 2005). According to its statement of intents, given the retreat of the semi-public developer
UR Agency from management duties, residents will have to organize themselves, cooperate
and mobilize local resources, especially in view of an aging and declining population. The
main focus of activity thus concerns liveability for the elderly and the improvement of
childcare services. This committee can be seen as a board of well-educated residents,
fostering the inception of bottom-up participatory activities and facilitating their development.

With the construction of large shopping malls around Tama Center in the 1980s and ‘90s,
neighborhood shops have received a major blow, suffering a loss of patrons. As a result,
many local businesses were forced to close, especially to the detriment of the elderly and of
people without cars. Reacting to this situation, various revitalization initiatives have been
launched, yielding mixed results (財団法人多摩市文化振興財団, 1998:43).

DISCUSSION

The four factors we have examined have clarified the role that morphological features play in
regard to Tama New Town's liveability. Our analysis has shown that the area has a
patchwork-like structure, and is very diverse in terms of building height and footprint size. Its
commercial core around Tama Center Station—with its highly-urban character—is in stark
contrast with residential areas. The area around Tama Center station, for instance, is a
regional commercial and entertainment hub, presenting highly-urban density and
compactness. Large-footprint malls are connected at first-floor level with a pedestrian deck, a
reminder of modernist planning ideas. Services catering patrons from the whole Tama area,
such as a cultural complex, a theme park and corporate headquarters, are present.

Despite a suburban character with 1970s, 5-story danchi as the most present housing option,
the case study area features later developments with mid-rise types and detached houses.
Depending on the housing type—the less appealing the higher its age—and location,
neighborhood character and liveability greatly change. As time has revealed, danchi and
high-rise residential towers interspersed with green have proven to be unpopular types, both
in architectural and urban design terms. Rather that attempting to renovate such aging
housing stock—which would mitigate architectural flaws, but not urban design ones—it
seems more reasonable to demolish the oldest and less accessible structures and gradually
compact neighborhoods closer to transportation hubs by way of infill or retrofitting. This
would be a long-term change that need to be supported by adequate local urban policies and
financial mechanisms.

We argue that such policies should replace quantitative goals of density with qualitative ones
of compactness, in order to achieve vibrant, convenient and liveable neighborhoods in
peripheral areas. As Berghauser Pont and Haupt (2010) have pointed out, in fact, a mere
quantitative measure of density is an unreliable data to express the character of a settlement.
This is particularly relevant as cities and their administrations around the world are often
pushing for densification in an attempt to achieve sustainability goals, reduce the cost of
infrastructure and increase the efficiency of services.

The Strategy for the Establishment of Intensive Urban Structures launched by the Abe
Cabinet in 2014 aims at promoting 'intensive urban structures to ensure the steady provision
of public services, such as medicine, welfare and shopping, by maintaining a certain population density’ (Tsuij, 2015). A quantitative attempt at densification, though, without qualitative and typological considerations, may even produce negative effects, especially when achieved through high-rise buildings. While densification itself may well be an appropriate goal in broad terms, the real question is how it is achieved and in which building types it materializes. We argue therefore that “compactization” (Wada & Ohno, 2011) is a more fitting word than “densification” in the context of urban regulation and policy-making. From this point of view, betweenness and gravity analyses can assist local municipalities in identifying areas and corridors, within their boundaries, that are crucial for pedestrian accessibility and thus the vitality of the urban environment. Policy measures, such as economic incentives or disincentives, should aim at placing businesses and housing in such locations, making use of the Japanese planning framework separating "Urbanization Promotion Areas" from "Urbanization Control Areas". Moreover, transfer of development rights (TDR) should be explored as a financial mechanism to empower prescriptive urban rules, when public and private spending is limited.

At the district level, uses are rather mixed and seem to suggest a vibrant case study area. Nonetheless, their spatial distribution is highly unbalanced, as non-residential functions, mainly businesses and shops, are concentrated around Tama Center, while the rest of the area suffers from poor access to shopping within walking distance, as demonstrated by our gravity analysis. Obviously, topography crucially influences accessibility: the valleys and plateaus of Tama hills called for stairs, ramps and flyovers to connect different neighborhoods in Tama New Town. As a result, elderly and impaired people are particularly disadvantaged in their daily errands. A minibus system may be introduced and services by mobile vendors may be boosted and complemented with other offers—e.g. healthcare—to increase their attractiveness and efficiency. Some vacant schools and other abandoned public buildings may be reused for a number of purposes, including elderly care. More ambitious strategies may envision the reuse of vacant buildings as startup hubs, fab labs and the like, offering low-cost spaces to innovative businesses. This would bring much-needed young professionals to the area, activating various microeconomic mechanisms. Moreover, since Tama New Town benefits from excellent infrastructure and spatial proximity to Tokyo, it should exploit this asset and initiate low-cost renovation to turn unattractive housing into (shared) weekend houses, where urbanites can engage in outdoor activities such as gardening.

Given the increasing number of vacant properties, only the ones with good accessibility should be considered for reuse. Municipalities should estimate refurbishment and renovation costs to distinguish between buildings which may be reused and buildings to be demolished. We argue that, besides reserving some structures as emergency shelters and facilities in the case of natural disasters, as weekend houses or inexpensive co-working or production space, municipalities should realize that the majority of their vacant properties will not be reused, and that an early demolition prevents growing negative externalities to unfold in the future.

In regard to open space, Tama New Town has a high presence of green, in stark contrast to Tokyo's central wards (Almazán et al., 2012). Particularly abundant are shared or communal green areas belonging to danchi or high-rise residential complexes. Their management being shared too, they are increasingly difficult to maintain. Given the considerable presence of natural areas, sometimes parks become redundant, as in the case of the abandoned Toyogaoka Park. From this point of view, a subdivision of shared green spaces into allotments or private gardens may ease the communal burden of their maintenance, and
sustain the offer of weekend houses. Moreover, reconverting some of the abandoned green spaces into productive uses, once present in the area before its development, could provide new vitality and economic stimulus to Tama New Town, exploiting a dormant asset at disposal. This would be an easy move from the point of view of planning regulations, as the Japanese planning system already allows for agricultural uses inside so-called Urbanization Promotion Areas.

In regard to suburban areas, Müller & Siedentop (2004) ask whether demographic shrinkage will diminish suburbanization, as more and more young people want to move closer to the city center, leaving the elderly behind. Many peripheral municipalities, in fact, are already facing the problem of fewer revenues, causing worries about the economic sustainability of public facilities, services and transportation, ultimately calling for a restructuring of the built environment. While the thinning-out of suburban population seems to be a matter of time, the ways in which this could unfold are multifarious, and the strategies to cope with a diminished population are still to be properly debated. Moreover, new technologies, e.g. robotics for elderly-care, driverless cars etc., will likely disrupt our approach to aging and peripheral living, and their impacts will have to be taken into account.

From a socio-cultural point of view, Tama New Town needs to retain and attract non-elderly residents—especially families—to maintain a certain degree of liveability. In synergy with previously suggested strategies, the municipality should exploit its characteristics by boosting child-rearing facilities and make use of the abundance of open space and buildings at disposal, since these come at a premium in central wards. Larger apartments and outdoor green space at lower prices than in the city center would represent an attractive incentive for families with children to stay in or move to Tama New Town.

Since ‘there is no universal approach to land use planning for depopulating and aging society’ (Maruyama, 2016:79), what will happen to peripheral areas will depend on national policy-making on the one hand, and on their own ingenuity, the capabilities of local municipalities and the natural, social and cultural assets at their disposal on the other. In this respect, the problematic status quo of Tama New Town is partially determined by urban design faults, causing imbalances in the distribution of services and difficult pedestrian accessibility. These issues can only be seen with a fine-grained analysis at the neighborhood level, involving both quantitative and qualitative spatial assessments (Talen, 2010). As an example, on pure quantitative terms, the case study area as a whole appears varied and sufficiently served. Nevertheless, our spatial analysis revealed poor accessibility and lack of services within walking distance. From this point of view, it becomes crucial to devise urban design and urban management strategies to adapt outdoor (public, shared and private) space to the needs of an increasingly elderly population (Sassi & Molteni, 2010). Such strategies should be project-oriented and tackle specific issues at the neighborhood scale in a cooperative and bottom-up manner, framed by an analytical assessment considering the needs of local inhabitants.

CONCLUSIONS

The significance of the research is threefold: theoretical, methodological and practical. On a theoretical level, we have assessed how urban design physical factors impact liveability in Tokyo’s peripheral areas, exemplified by the case study of Tama New Town. As numerous municipalities in Japan and East Asia will be confronted, in the near future, with the phenomenon of shrinkage (e.g. Kotkin, 2016:123-24; Nakazawa, 2011), the case study analysis examined in this research constitutes a reference to look at. On a methodological level, we have tested workable methods, that can be used by architects and urban
designers, to analyze neighborhood liveability in quantitative and qualitative terms. Such methods are flexible enough to be adapted to a variety of contexts with different socio-economic characteristics, instead of being rigidly fixed a priori. On a practical level, we have provided new data and information about Tama New Town for the use of local municipalities and groups, suggesting strategies to tackle existing problems and highlighting potentials to be exploited.

As a solution for the challenges ahead, Doteuchi (2003:9) suggests that 'suburban areas will have to differentiate themselves through unique local characteristics. [...] What the ultra-aging society represents is an era of living the slow life in such unique communities.' These suburbs could become a decaying symbol of past prosperous times, or they could find a renewed importance in view of the "slow life", in contrast to the bustling city center. The suburban communities that will stand the test of time will be the ones with the abilities and assets to do so.

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