The Concept of "Smart Density Planning" Principles for Livable and Sustainable Urban Transformation

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Abstract

The aim of this study is to contribute to sustainable and livable environments with the approach of "smart density planning", which ensures a smart and planned growth with an acceptable density taking into consideration the efficient distribution of public spaces and services in urban regeneration areas in Turkey. There is a rapid urban transformation especially after the 2000s in Turkey in order to redevelop squatter settlements that have been built in order to respond to housing needs in rapid urbanization in cities unofficially and building areas that require improvement for structural resilience. However, there are significant problems confronting the process of regeneration. Squatter settlements have been demolished in order to create modern urban areas with better "physical conditions". Multi-story housing blocks are the dominant shape of a new style of housing. Their scale and high number of flats provide shelter for more people on limited land and cause a high-pressure density which ignores the livability and socio-spatial needs of the inhabitants. Since housing is a condition more than a shelter, creating livable residential areas is a crucial issue. The paper first discusses the meaning, context, relation and importance of these terms in order. Moreover, a critical review of the "smart city" has been conducted in relation to the presented "smart density planning" concept in order to rethink urban transformations in terms of socio-spatial quality of inhabitants. The authors introduce this concept of "smart density planning", which refers to the logical distribution of facilities and public spaces for overall inhabitants in efficient planning. Moreover, the proposed concept defines a morphology that takes into account the human scale and optimization of activity patterns in terms of smart planning, rather than a well-known definition of "smart cities" that is minimized to technological developments. Consequently, a framework has been composed to define the principles/indicators of "smart density planning" to ensure sustainable and livable urban transformation implementations in Turkey. These indicators assay how smart planning can be achieved in terms of density-based planning. This analytical framework also acts as a guideline to lead future neighborhood designs in Turkey.

Keywords

Urban Regeneration • Density • Smart Planning • Livability • Housing Quality

1 Introduction

Cities are densely populated areas by many people from different social and cultural backgrounds. This high density has complex spatial relationships supported by the opportunities provided by high technology. Urban spaces where residential, commercial, industrial and green areas are intertwined face some physical and social problems as a result of the high density of the cities. In order to respond to the need for accommodation in the urbanization process, unofficial squatter areas emerged in many cities of Turkey. Since the 2000s these squatter areas and several old districts have been transformed into high-rise/density concrete apartment blocks with the aim of providing better physical conditions. However, there are significant problems that cities are confronting in the process of regeneration such as disregarding socio-spatial quality, well-being of the people, logical distribution and ratio of facilities and public spaces. The design of these areas determines the livability and

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sustainability of our environments. The multi-story housing blocks provide shelter for the people ignoring the reality that housing is more than a simple condition of physical protection. Housing is a spatial environment that has cultural, economic, psychological and social dimensions (Payne, 1977). Home is anchored with its special environment and humans interact with this environment (Angerbauer, 2001). Urban design is the art of shaping the interaction between people and places, environment and urban form, nature and built fabric, and has a great effect on the development of successful and livable cities (Campbell & Cowan, 1999).

These urban transformations in the form of mass housing have satisfied the quantity of housing but created many problems with regard to having serious quality insufficiencies and a great impact on urban patterns (Tekeli, 2010; Şenyel, 2006). Consequently, the solutions brought with these transformations to eliminate the housing problems could not demonstrate real success in terms of ensuring sustainable and livable environments due to the ignoring socio-spatial dimensions of the urban environment (Sezer, 2009).

Moreover, the dominant morphology in these high-dense areas is the high-rise due to the high amount of land value and the unearned income. Since there are a lot of disadvantages of high-rise buildings that have negative influences on livability and sustainability, it is crucial that these people have enough public spaces such as facilities, greenery, playgrounds, schools etc. and a well-designed infrastructure such as roads, parking places and technical equipment. Most of the urban transformations, which have been realized in squatter areas, have residences with low or middle income due to their previous reputation. There is a general tendency for high-rise building development in newly built residential areas independent of the income of the inhabitants. Generally, the differences between different income residents are not obvious in morphology but their services such as guidance, security and some facilities in the gated borders. Although there are guidelines and more facilities behind borders in high-income residential areas, the building morphology and distribution of facilities do not support people in their activity patterns for a livable and sustainable neighborhood in terms of social and ecological aspects. Due to the gaps in planning in terms of livability, this housing tendency requires a paradigm change. Accordingly, this can be provided by the logical distribution of facilities and public spaces. In this sense, it is very important to provide a sense of place and safe spaces in these environments following the concept of "smart density planning", which takes into account the acceptable density level and density distribution of the area (Gideon, 1967; Scarr, 1973).

Smart density planning can be a reflection of "smart city" approach to planning that is minimized to technological developments. While smart city is a broad concept and does not propose a specific morphology, "smart density planning" differs from smart city/planning with the definition of morphology based on smart and efficient density planning in terms of population and facilities/services. The proposed concept defines a morphology that takes into account the human scale and optimization of activity patterns in terms of smart planning giving priority to ecological and social sustainability, rather than the well-known definition of "smart cities". This morphology can be achieved with a low rise and high density, including well-interrelated micro-scaled spatial arrangements which support efficient activity patterns of neighborhoods opposite to the current tendencies of building developers in Turkey. This provides integration of spaces in order to connect them in a good meronymy, commercial viability, sustainable movement system, efficient and adequate green spaces, functional efficiency and flexibility which provide the ease of use and appropriate human scale.

The purpose of the study is to demonstrate the importance of "smart density planning" which follows the arguments of "smart planning" focusing on density distribution. A qualitative approach has been used in order to understand the dynamics specific to the space. It has been defined principles of qualified/sustainable and livable urban environments in the urban transformation areas focusing on an efficient morphology supporting activity patterns with socio-spatial quality. Since the principles have been discussed in the case of urban transformation areas in Turkey, there are also general housing development problems in the form of mass production, and these principles can lead the future housing development as a guideline. Moreover, the study also creates awareness by transferring "smart city" concepts under the shadow of technology to the urban design/planning with the priority of ecological and social sustainability of neighborhoods.

2 Conceptual Framework

2.1 Problems of Urban Transformations in Turkey

Since the pre-industrial agricultural cities turned into modern industrial cities, there has been a transformation with the increasing population and changing dynamics in lifestyles. In Turkey, the urban population increased up to 80% relative to the total population of the country between the years 1950 and 1960, and this increase reached its highest level between 1965 and 1970 (Osmay, 1998). As a result of this situation, the need for housing has increased incredibly and the response to this requirement has been a challenge, especially for big cities. The number of existing legal housing could not cover the demand in Turkey. Some people find their own self-organized solution as illegal squatter areas. In the 1980–2000s, mass housing construction was started by

cooperatives and initiatives of the government, parallel to mass housing construction and the number of illegal buildings increased during this period. The urban transformation has been legalized with laws after the 2000s and housing supply was higher than housing demand during this period. However, new neighborhoods had not met the need for efficient accessibility of the services. After the 2000s, several actors have the right to the implementation of projects in parcels, and comprehensive/qualified planning and design has not been a real concern in urban transformation implementations (Koca, 2012).

For example in Ankara, after being the capital city of Turkey in 1923, there was a migration process from rural areas to the city; however, huge numbers of people could not afford to settle in close distance from their working areas such as factories. Then, they started to create their own houses on weakly controlled urban land, mostly near the decentralized factories (Uzun, 2005). From the 1960s the housing policy of Turkey developed in a way designed to build a high number of housing units with minimal investment (Tekeli, 2012). Reconstruction operations between 1955 and 1970 began to change the face of cities, especially in Istanbul. In the 1980s, with the awareness of the redeveloped squatter lands, authorities developed a model which is called "Urban Transformation Projects" in order to transform illegal houses into regular/legal houses. Even the aim is to provide settlements for the low-income group which was living in squatter settlements before the transformation. Within this time the target group has turned into middle-high income groups and this situation causes a debate in Turkey (Ozdemirli, 2014). These projects mostly have been conducted by demolishing the existing settlement and rebuilding a new standardized model without a distinct character which also demolishes collective memory, social structure, cultural values, daily life routines of dwellers, neighborhood relations, existing urban tissue and patterns (Şenyel, 2006; Tekeli, 2010; Alkışer & Yürekli, 2011).

The general morphology of these areas is high-rise apartment buildings on a mass scale which also has expanded to the periphery in the form of satellite cities. The sprawl in Turkey with its high-density and high-rise expansion to the city edges differs in this sense from the sprawl in America and Europe. In metropolitan cities of Turkey, there are illegal houses at the periphery, however, with the urban transformation projects on the land, squatter settlements have been demolished and new high-rise mass housing residential areas have occurred. These newly built transformed areas caused a housing problem with regard to social and spatial qualities as a result of the focus on the satisfaction of quantity (Ataöv & Osmay, 2007; Tekeli, 2010; Türkün & Kurtuluş, 2005). The unconsidered distribution of density of these urban transformations, which were expected to respond to the problems of modern cities, went beyond their purpose of existence and resulted in a lack of livability with inefficient infrastructure, services, greenery and social inadequateness (Figs. 1, 2, 3, 4). The transformations in the form of high-rise buildings have turned into an arbitrary tendency, exceeding the necessities in terms of housing demand. After the 2000s, housing has

Fig. 1 Siluets from the Sentepe, Ankara, Turkey (from authors' archive)

Fig. 2 Apartment blocks in Sentepe, Ankara, Turkey (from authors' archive)

Fig. 3 A top view from urban transformation project in Mühye, Ankara (Ankara Büyükşehir Belediyesi, 2014)

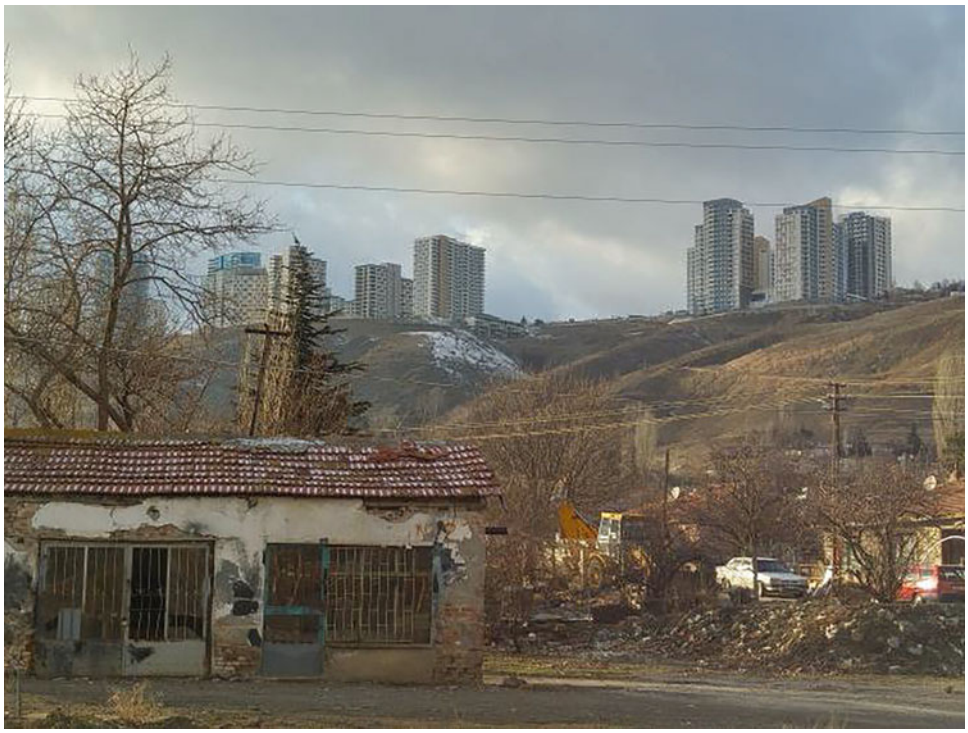

Fig. 4 Around transformation project in Mühye, Ankara (from authors' archive)

become a way of investment for some and a statute determiner for some others, instead of being only an accommodation possibility for people which gives people the opportunity to make a profit (Koca, 2012). The socio-spatial needs around the housing and the neighborhood structure in terms of livability and sustainability left their significance to land use compulsions and unearned income. Considering the problems of high-rise/density settlements from different perspectives, this tendency requires a shift that can lead to better implementations with strategies providing smart distribution of the functions in an adequate morphology and relationship which responds to socio-spatial requirements efficiently. This shift can ensure the sustainability and livability of these neighborhoods.

2.2 Sustainable and Livable Neighborhoods

The usual definition of sustainability means not to leave future generations a much worse environment than the present (Chapman & Gant, 2007). The meaning of the word sustainability is "to hold up" or "to support from below". Although the concept of sustainability was first mentioned for the first time in the Brundtland Report named "Our Common Future", its history is as old as human life. In the Brundtland Report it has been described as: "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987, p. 51). The term emerged after the oil crisis in the 1970s in order to consider the balance between humanity and nature and reduce the consumption of natural resources. Although it began with economical motivation, the ecological and social aspects have integrated into the concept after a while and sustainability has been a fluid concept with broad definitions including social and spatial qualities. Cooper (1997) indicates four main principles of sustainability as "futurity, environment, equity, and participation".

Sustainability has been put forward recently as a special phenomenon, and the terms such as "energy efficiency" and "ecology" have been assumed as a distinct movement in the discipline of architecture and planning. Actually, sustainability should not be understood as a style but as an ideology that every architect/planner should take into consideration in the design process (Gyson, 2012). All people and all disciplines are responsible to protect nature and provide the balance between technology, nature and human. Koolhaas and Whiting (1999) indicates that architecture is the task to create a plausible relationship between the formal and the social. However, the concerns and urban/building design implementations today are away from the direction of providing healthy environments that increase life quality by decreasing the negative effects of construction and technology. Although architecture and urban design have been both crucial and central to social life, their importance has declined in recent years as a result of economic growth and progress in technology. The new chaos of city life converted people from being "part of the environment" to being

"separate from the environment". This makes our living environments economically, ecologically and socially deprived of adequate qualities. The ideology and principles of sustainability have come into life as an opportunity for successful living environments which connect people and their needs, as well as humans and nature. The main idea of sustainability is to consider humans and nature in the center to minimize the undesirable aspects of the constructions and enhance the life of quality. According to Guy & Farmer (2000), there are six competing qualities of sustainability; ecological, smart, aesthetic, symbolic, comfort and community. Gyson (2012) summarizes the concept of sustainability in the field of architecture and urban planning as having special design qualities, being contemporarily technical and socially compatible. It is also crucial to sustain provided quality in the future.

Consequently, people are motivated to live today and in the future in sustainable environments because these places respond to various requirements of the residents of today and the future with their safe, inclusive, well-planned characteristics and contribute to the quality of life with its equal opportunities and good services (Odpm, 2003). Key principles of ensuring sustainable communities are promoting accessibility, walking, cycling, public transport, decreasing the need to travel with mixed-use development and promoting efficient land use by providing quality of life in safety and convenience, ensuring an attractive, well-maintained appearance with a distinct sense of place by promoting social integration, enhancing green infrastructure and playgrounds.

In the field of urbanism, some urban theories have discussed the livability and sustainability of neighborhoods without mentioning the term "sustainability". Some of these are the "Neighbourhood Unit" theory of Perry, New Urbanism, Smart Growth, "Garden City" concept of Howard. According to Perry, the social integration between the people is the distinction between good and bad working neighborhoods. Thus, the socio-spatial quality of the design is an important aspect that also has an influence on the life cycle of a neighborhood in the context of sustainability. With the growing population filling the gaps between villages and the city, Perry interpreted this expansion as a growing attenuation of community characteristics and in some emerging regions residents continued to relate to their neighbors, while in many of these areas of expansion the relationships cannot be sustained. There are different spatial needs required for different social groups who live in the same neighborhood. In this regard, Perry indicates that the different needs of different social groups have an important influence on neighborhood design (Perry, 1929). Perry's proposal is the idea of a self-sufficient neighborhood unit. There are specific architectural design requirements for the unit design that define a local community, have a sense of belonging to the environment, have a sense of safety and trust-based relationships, have an environmentally sensitive land use, reduce urban car use and travel with its walkability. Moreover, these units create safe spaces for pedestrians and children. Perry has titled these requirements under the name of the neighborhood-unit principles and his proposal is the idea of a self-sufficient neighborhood unit in a holistic approach (Perry, 1929).

New Urbanism is also an urban design movement that encourages walking habits in residential environments and environmentally friendly habits which are crucial for creating neighborhood relationships and a sense of belonging. This has a huge effect on many aspects of subsequent urban design and land use strategies. Creating a sense of community and ecological practices are the main concepts of this movement (Katz et al., 1994). Architectural design perspective according to the context, the provision of social infrastructures such as sports facilities, libraries and community centers in the right distribution and density balanced with workplaces and residences are prominent considerations of New Urbanism.

Another approach for a livable and sustainable neighborhood is smart growth which aims to manage the sprawl (Song, 2005). The mixed land use, a compact building design, a strong sense of place, consideration of the need of society, improved transportation, cost-effective measures in development etc. are the main considerations of smart growth in order to provide an economic, environmental and social development (Susanti et al., 2016).

"Garden City" is the concept derived by Ebenezer Howard with the aim of intersecting the positive matters of urban and rural life. The main purpose of the approach is to prevent dense, unhealthy and limited-access neighborhoods. It expresses the composition of the settlements, recreative spaces, commerce and socio-cultural facilities in a low-density neighborhood. Green/rural areas around the neighborhood and face-to-face relations between inhabitants has prioritized with an approach that supports the recovery of urban living conditions with social purposes as the most important issue of planning (Ersoy, 2016).

All these concepts demonstrated various principles and considerations which show parallelism in substance in order to provide qualified and livable urban environments. Although human-centered approaches should be the main concern for architects and planners, neighborhoods have been transformed without consideration of the efficient distribution of services, activity areas, green spaces etc. because of the focus on unearned income and land use compulsions. The livable neighborhoods which also respond to the ontologic requirements of the people with low-rise and acceptable density have been transformed into high-rise settlements with the urban transformation projects in order to provide more houses and to gain an income through this type of project.

The situation today in the urban transformation of Turkey's neighborhoods is not compatible with the idea of sustainability in terms of social and ecological aspects and livability. This has been the motivation for the development of "smart density planning" as a concept for the urban regeneration areas in Turkey. The authors propose that the contribution to livable and sustainable neighborhoods can be provided with this concept, which follows demonstrated principles in the context of the smart distribution of population and services in an efficient and interrelated morphology.

3 Materials and Methods

The method of the article is to elaborate a theoretical framework for smart density planning by reviewing literature and studies focusing on density, livability and sustainability. As the main manner, deriving guidelines from the previous movements/concepts and studies about planning in terms of livability and sustainability and how to reconsider/reflect them for a positive response to the urban transformation challenges in Turkey has been considered.

The paper first discusses the meaning, context, relation and importance of the terms. Moreover, a critical review of the smart city concept has been conducted in relation to the presented "smart density planning" in order to rethink urban transformations. Then the study composes a framework to evaluate and enhance the urban transformation implementations in Turkey in general and link desired guidelines to sustainable/smart planning. The indicators to assay how smart density planning can be achieved have been defined in order to present an analytical framework for the future evaluation of neighborhoods.

4 Smart Density Planning

The right way of controlling density is the fundamental approach to sustainable development. A concept of "smart density planning" has been introduced by the authors in order to ensure human-centered, livable and sustainable living environments. The emerging point of the concept has been based on a "smart city" vision from the perspective of urban planning/design on the scale of neighborhoods. The proposed "smart density planning" concept supports that the daily activity patterns in neighborhoods can be achieved with low-rise and high-density approaches and micro-scaled public spaces integrated with housing environments efficiently. The "density" has been emphasized in "smart density planning" which focuses on the logical distribution of facilities/services according to the density and in an efficient morphology that provides ease of use. Smart density planning can be a subset of "smart city" approach in terms of planning, which is a more broad concept and does not propose a specific morphology. In addition to the smart city approach, "smart density planning" proposes a morphology based on smart and efficient density planning in terms of population and facilities/services. The study criticizes "smart city" based on technology and ignores smart planning approaches. For this reason it is crucial to comprehend and discuss the "smart city" concept in order to understand the gaps.

A smart city was first linked to technological developments depending mainly on economic perspective (Gibson et al., 1992). Similar to the destiny of the term "sustainability", the integration of social dimensions has become a crucial issue since the value of the livability of place and quality of life has been a discussion. Giffinger et al. (2007) emphasize that although the term is not used in a holistic way, it presents several aspects from IT solutions to the smartness of the inhabitants of the city. Even though there are a lot of definitions of smart cities related to technology, there are several studies that relate "smart city" with planning patterns in recent years (Caragliu et al. 2011; Berry & Glaeser, 2005; Ateş & Önder, 2019). A smart city can be classified according to its approach in three categories (Greco & Cresta, 2015):

- Defining a smart city as a technologically advanced city, highlighting the "hardware" approach (Cairney & Speaks, 2000; Washburn & Sindhu, 2010)
- Defining as a city that has the ability to manage the resources intelligently in order to contribute to the quality of life in a human-centered approach (Partridge, 2004; Berry & Glaeser, 2005)
- Defining a smart city as a holistic approach for the integration of technology and human and social capital (Kanter & Litow, 2009; Campbell, 2012).

Hollands (2008) points out the lack of studies which correlate smart city implementations with the most crucial characteristics of the city and its transformations. This causes a smart city based on a high-tech motivated entrepreneurial city. On the other hand, Cohen (2012) indicates the vision of a smart city, including several dimensions such as "Smart cities use ICT to become more intelligent and efficient in the use of available resources, with the effect of reducing costs and energy consumption and at the same time, improve the delivery of services and quality of life citizens, reducing the ecological footprint and developing innovative and sustainable economy".

Despite broad definitions of smart cities, it can be concluded that a smart city is a city that is sustainable, competitive and self-sufficient. This means efficient and adequate

solutions as a response to the challenges of the modern cities in urban transformation should be improved in order to achieve real smartness from the perspective of urban planning regarding the smart city. This is possible with the design of a successful urban environment. It is a very crucial aspect of how planners can contribute to making these cities smarter in the context of livability and sustainability in complex and chaotic cities. One of the most important elements of creating a livable and perceived urban environment for smartness is the density distribution of spaces. Density is not mentioned here just as the population/number of people but as a logical distribution of social and public activities to the number of people. The social, cultural and economic identity of the residents of the neighborhood has a relation to the morphology in which the distribution of this density has been designed (Susanti et al., 2016). This morphology defines the activity patterns of the residents. For livable neighborhoods, it is important to reach services efficiently and to create communication with other people and facilities. For this reason, building compact and walkable cities that allow smaller-scale movement both saves time and avoids investment and operational expenses. To achieve this goal, a morphology with compact and micro-scaled arrangements of the density allowing pedestrian movement is of particular importance. Smart density planning, with the design of special places where children can play as a part of urban life, establishes residential units with adequate and efficient public spaces, roads that can also be easily used by disadvantaged social groups such as the elderly, disabled and pregnant, and enables all segments of the society to improve the sense of belonging, integration and adaptation to the city. The indicators of smart density planning have been determined by rethinking discussions and principles in terms of livable and sustainable neighborhoods in light of the specific problems of urban transformations in Turkey. These problems have been reconsidered with the focus of an approach based on the smart distribution of density which can be achieved with a proper morphology supporting social relations between people in themselves and with their physical environment. These indicators have been described as follows.

4.1 Density and Proportion of Buildings

Density is a term that clarifies the number of people on the land vis-à-vis its size (Cambridge, 2020). The density of buildings and street accessibility are essential factors of the city which has a dense concentration of people (Jacobs, 1961; Ye et al., 2018). Perception of density can change at different places because of separate spatial features of lands. Bonnes et al. (1991) have mentioned that the relation between vacant lands and built areas, the width of streets, size and the height of buildings has an impact on the perception of density. The relationship that people establish with the neighborhood spaces is affected by the density of the neighborhood in terms of population, structuring and activity patterns. Planning the density level and density distribution of the area to form is very crucial for livable and sustainable neighborhoods (Gideon, 1967; Boggs, 1965; Scarr, 1973).

In high-density residential areas, problems arise in sharing urban areas and ensuring neighborhood privacy. Usually, public spaces and building entrances are shared by many people in these places. The fact that the neighborhood does not have sufficient/adequate green areas, parks, children's playgrounds, educational areas or their use is not planned according to their capacity weakens the social relationship that the neighborhood residents establish with that place. As the number of people using these spaces increases, the relation and unity of families with their ground decreases. In addition, it has been revealed in the studies that the feeling of belonging and adopting the common areas decreases when the number of people living in dense settlements increases (Gehl, 2011).

The morphology/proportion of the building blocks is also an important indicator that influences smart distribution of density for the livability and quality of life in the neighborhoods. According to Al-Kodmany (2011), like spacing, alignment and coherence, the height of the building affects the sense of place in a human-scale environment. Creating zones of influence is also determined by the morphology of the building blocks in the same density. Assigning some definitive areas for small groups of people is preferred to undefined empty flying spaces around tall buildings in order to create these zones (Newman, 1996). The advantage of having more spaces on the ground turns into a disadvantage due to the lack of sense of belonging which was observed in Pruitt-Igoe (Newman, 1996).

"Tall building" has signified density of people per base-land because of its various floor/story. According to Al Kodmany (2011), "tall building" is a relative term because of the characteristic of the city; for instance, a 20-story building can be named "tall" if it is located in Damascus, but it is not a "tall" building for Chicago. Similar to the definition of "tall", its outcomes—deficits, benefits—are controversial. Although tall buildings have been accepted as an efficient way of land use and it has been promoted by Mayors in many countries (Buchanan, 2008), it causes chaos and becomes a trigger to stress and it gives a feeling of workaholic/placeless people with many other accompanying disadvantages (Brown et al., 2009; Jacobs, 1961; Gehl, 2011). The people except on the first few floors of the building cannot get meaningful contact with the ground level in multi-story buildings (Gehl, 2011). Moreover, there are also some negative effects on the physical and psychological health of children (Alexander, 1977; Van Vliet, 1983). It is

necessary to build "short blocks" which provides permeable and perceivable urban landscape on a human scale in order to ensure livable neighborhood and sustainable urban facilities (Jacobs, 1961). As mentioned in the "Introduction" and "2.1", urban transformations in Turkey have been implemented in a high-rise morphology in order to get unearned income from land use. The discussion about building proportions reveals the importance of a paradigm shift toward a better distribution of the density with low rise and high density for livable neighborhoods in Turkey.

4.2 Accessibility and Street Network

Accessibility can be described as the extinction of the difficulty in reaching the destination of the users and visitors, the ease of the use in their anticipated activities and facilities for their required purposes (Voordt & Wegen, 2005). Even in the sixteenth century, to provide accessibility by arranging a street network in order to form connections between the landmarks was the main objective while establishing a new city (Madanipour, 2007).

In smart density planning, accessibility of planned spaces is necessary in order to sustain a livable environment and successful development. Lynch (1981, cited in Carmona et al., 2010) has mentioned the term "access" as the reachability of one to services, places, resources, activities and other persons. Visual and physical accessibility is needed to become integrated with its surroundings (English Partnership, 2000). In addition to physical and visual accessibility, symbolic accessibility which means reachability of each group of people without discrimination should be considered (Carmona et al., 2010).

Streets—*as a site of interaction* (Vidler, 2002)—provide the access that the neighborhood unit uses in relation to the inside and outside of the neighborhood by creating a network system according to their size and capacity. Additionally, the design of streets creates a morphology passing through the periphery or the center of the neighborhood.

According to Ersoy (2015), how the roads should be planned in hierarchical order is decided by considering what purpose they will be used for. For instance, although a high level of the road should be planned in order to provide continuous and fast-moving car traffic, a low level of the road should be planned with the aim of ensuring accessibility between houses and social facilities.

The most efficient solution for an adequate traffic pattern is to promote public transportation and discourage car usage by improving public transport (Gehl, 2011, Jacobs, 1961). Bus stops should be designed by arranging roads with considering the safety of cars/vehicles and pedestrians. The location of stops should be planned in a position where all inhabitants of the neighborhood can reach easily.

Besides the car-oriented roads/streets and efficient public transportation, the provision of a good, safe and sufficient vehicular-pedestrian concept is a crucial indicator of the quality and adequateness of the circulation. The needs of pedestrians, cyclists, especially children and older people, or people with impaired mobility should be responded to by considering the measures efficiently. The network of pedestrians and vehicles must ensure convenience, safety and security for all intended users. Moreover, the hierarchy and division of these routes must be clear and adequate. A priority should be assigned to the pedestrians and the car-parking zones and similar services should be designed conveniently in the neighborhoods.

Farr (2008) indicates that the public places created with urban uses should be accessible to everyone living in the neighborhood. Therefore the walkability of mixed uses such as shopping opportunities and working areas from the housing environments has become very crucial (Gehl, 2011). Moreover, the interconnected and walkable street pattern is an important planning principle in urban transformation areas. In this pattern, it is emphasized that the side length of a building block should not exceed 180 m (Farr, 2008). Thus, the presence of small building blocks and frequently located intersections are important indicators to increase accessibility. Since most of the high-rise areas have a crowded population, they create a traffic load that influences walkability and transport in a negative way. In these areas there is a need for an improvement of an adequate network system which also requires an improvement in terms of walkability, street hierarchy and public transport. In the case that the traffic system has been improved in an infrastructure that can solve the problems, this development is in contradiction with ecological sustainability and dynamics of neighborhood ideas in Turkey.

4.3 Green Spaces and Ecological Considerations

Green areas are spaces that contribute to a better life in the neighborhood such as open spaces, gardens, squares and parks/playgrounds. They provide the intersection of nature and cities. Apart from its aesthetic aspects, green spaces have benefits for comfort, health and physiologic well-being of people by preserving pollution and absorbing the noise of the others in an urban land (Shaftoe, 2008; Ersoy, 2015). Additionally, green spaces encourage walkable areas for inhabitants and provide safe areas for pedestrians by separating pedestrians and vehicles in settlement areas.

The size of green spaces in a neighborhood should be determined in compliance with population, characteristics of settlement, topography, ecologic system and climate (Ersoy, 2015). Overall, the green system should be continuous, and in this way there will be a corridor that helps airflow.

In Turkey, there is a lack of consideration in the transformation areas as well as other new residential areas. In mass housing tendency, there are big building blocks surrounded by undefined areas. Even if there are defined green spaces, these are macro-scaled in just one place which does not allow a well integration for all of the building blocks. Smart density planning suggests that these areas should be micro-scaled and well integrated with ease of reachability with close contact to the houses.

As a result, smart density planning offers an efficient distribution of green spaces for inhabitants of a neighborhood in order to increase the ecological aspects of the neighborhood. Moreover, these micro-scaled spaces will be assigned to the houses adequately and increase the sense of belonging opposite to the floating high-rise building blocks. The design of the green areas with the low-rise morphological characteristics ensures interrelation with the housing and other services in accordance with the population, and neighborhoods can provide more livable and sustainable areas.

4.4 Services

Neighborhoods are like real organisms which people meet their daily needs. These service areas which also act as public places are busy and important areas that create a lot of circulation in the neighborhoods. The nature and position of these mixed-use environments are important to establish a safe territory which also has a positive effect on encouraging walkability and a sense of belonging in the neighborhoods (Jacobs, 1961; Gehl, 2011). Moreover, public space improvement and mixed-use development decrease social segregation and encourage social cohesion in the neighborhoods (Madanipour, 2007). Thus the coexistence of residential areas in the form of mixed-uses with shopping and commerce and workplace etc. will ensure people save time and energy as it allows them to meet their needs at a close distance.

The nature and position of mixed uses which establish a territory have been positively associated with security in many studies due to the fact that businesses create diversity by merging with residential areas and especially because of its feature of increasing the eyes on the street by encouraging the use of this diversity by pedestrians. Safety is one of the most important indicators in the urban transformation areas in the cities. In order to ensure safety in living environments, a new urban pattern has been created in the form of gated communities with security guidance, and the pattern of neighborhoods in Turkey has been sacrificed for this reason.

For an efficient neighborhood design, it is beneficial to allocate suitable residential areas with public spaces, education, health and shopping facilities to the places which are convenient to neighborhood centers in a location that can provide ease of transport within a reasonable walking distance in case of emergency. Moreover, the capacities of these areas should be considered in accordance with the density of the people living in the area for smart density planning.

Although most of the new urban transformation projects in Turkey includes commercial, recreational and sport facilities inside, these meet the needs of only their residents in the form of gated communities. This situation should be handled by considering all neighborhoods instead of focusing on a few blocks.

4.5 Flexibility

Inhabitants' needs can change over time because of the social, demographic and economic changes in their life and usable spaces become essential. The capability of buildings to change in physical structure and adaptation to spaces is expressed with the term flexibility. According to Schineder and Tilll (2005) flexibility is to give chance to inhabitants in accordance with their desires and decisions about the future usage of space. Buildings and surrounding urban spaces can gain flexibility at the design stage. This ensures a better performance of spatial organizations during different periods which is a very crucial condition for the provision of sustainable design.

Due to the changes in lifestyles, spatial conditions such as sizes and types require implications in terms of adaptation over time. It is observed that people prefer to adapt to their environment instead of changing their living environments because of the fluctuations in social and demographic circumstances (Hasgül & Özsoy, 2016; Schneider & Till, 2005; Habraken, 2019). For example, the situation of the need for additional spaces in the buildings results in the preference for detached houses, sometimes with the addition of a new floor to the top floor of apartments. The standardized and fixed housing sites built today in Turkey do not allow possible interventions needed within the time and this brings along the forced adaptation of the user to the environment instead of the preferred opposite version. As a result, this perspective ignores the adaptation to the needs and patterns of the inhabitants.

The ability of living environments to adapt to the time is a logical solution for different reasons to current problems of modern cities. The efficient use of space considering adaptations decreases space consumption, carbon footprint and damage to the environment. Moreover, there are a lot of economic benefits because as a result of the considerations of flexibility these living environments will sustain longer with accompanying cost savings (Cellucci & Di Sivo, 2015, Zairul & Geraedts, 2015; Schneider & Till, 2005). This

contributes to the sustainability of the neighborhoods. Consequently, flexibility becomes one of the main elements that should not be underestimated in smart density planning. Rather than finding a solution to housing needs by building high dense and tall buildings, it will be a more sustainable method in the long term to build the houses flexibly and to offer solutions in this direction. This can be achieved with a shift from the strict classification of rational functionalism of modernism to a flexible and adaptable urban environment considering the social dynamics of everyday life. Instead of standardized approaches in housing and urban design, some decisions should be left to user preferences. Some architectural values such as types, patterns, themes and systems should be followed but the dominant approaches such as coding and assigning just playground equipment for children should be replaced with flexible solutions (Habraken, 2017; Alexander, 1977). This also allows adaptation and contributes to the architectural quality and identity of spaces.

Most of the urban transformation in Turkey has been focusing on designing houses for inhabitants who live under bad conditions in the neighborhood. Architects/institutions, which have responsibilities for planning, implement standardized designs in order to find quick solutions for the inhabitants' needs. However, in practice, these solutions do not meet future requirements. The characteristics, design and materials of buildings and their environments do not meet the future requirements and cannot provide sustainable solutions because of a lack of consideration in terms of flexibility. Flexibility ensures the adaptability of the spaces according to the changing requirements of the users that support sustainability ideas. The planning of the neighborhoods should foresee future adaptations. In this way, even if the users of units change, there is no need to demolish all of the areas for new users' needs. The adaptation can be managed with small interventions. The flexibility can be possible with detailed considerations in the planning phase taking into account possible additions and extractions in the long term.

4.6 Playgrounds

Clarence Perry has taken playgrounds and small parks as the elements of each neighborhood unit (Carmona et al., 2010). Playspaces are very crucial for mental freedom, which provides the deviation from the rules and for the development of intelligence (Lefaivre, 2007; Groos, 1973). Children's playgrounds also contribute to the liveliness of the environments and reinvention/communication of the children as well as their parents (Kalfaoglu Hatipoglu, 2016).

In Turkey, transformed/regenerated urban settlements contain playgrounds that enable children to spend their time; however, the planning of playgrounds has not responded according to the density of settlements or housing units and their quality is underestimated. Moreover, the design of these playgrounds should be considered adequately and should not be assumed just as standard plastic play equipment. All the public areas should provide the possibility for children to spend their time in a flexible and creative manner and these areas should be sufficient both qualitatively and quantitatively for the inhabitants to provide smart density planning. All the public areas should provide the possibility for children to spend their time in a flexible and creative manner and these areas should be sufficient both qualitatively and quantitatively for the inhabitants to provide smart density planning. Accordingly, these playgrounds should be designed in accordance with the density of settlements or housing units. Moreover, the design of these playgrounds should be considered adequately and should not be assumed just as standard plastic play equipment. Instead of putting standardized play equipment, some creative solutions specific to the neighborhood should be designed as several public spaces in the neighborhood. Sandpits and some graded topographies are some suggestions in order to create playgrounds without equipment. Moreover, micro-scaled public spaces integrated with housing environments efficiently provide visibility and easy access from houses instead of disconnected macro-scaled playgrounds.

4.7 Hierarchy/Transition of Public/Private Zones

Designing a hierarchy of private, semi-public or public space is crucial in order to create defined areas at the entrance of residential units (Newman, 1996). This is provided by real or symbolic barriers. These areas, which are defined as the hierarchy of transition zones, are necessary to create boundaries that define this hierarchy in the transition from public streets to private units—buildings, flats—to define these areas. These spaces, which are defined as private, semi-private, semi-public and public spaces, create perceptible transition zones for use, belonging and neighborly relations. Therefore, it is important to ensure a sense of belonging and safe spaces which are the main indicators for the sustainability and livability of a neighborhood (Lawson, 2010; Altman, 1975; Hall, 1966; Watson, 1970; Newman, 1996). Building types and heights are directly related to the formation of this hierarchy because these different types define the grading of these zones (Heng & Malone-Lee, 2009). The solution of a campus of the same density with different types affects the relationship of the residence with the street and the situation of creating a sense of belonging, privacy, and social relationship with different transitional zone occurrences. In high-rise buildings, the perception of private areas such as indoor shared spaces as public areas and the lack of transitional zones such as semi-public and

semi-private areas have a negative influence on accustomed neighborhood patterns. Consequently, the consideration of adequate planning of these zones influences smart density planning.

In urban transformation projects in Turkey, it is observed that there is not an efficient transition zone due to the high-rise buildings and walled island residential areas with security measures. There are some differences in the space hierarchy. For example; some urban transformation projects which are transformed from squatter settlements, do not have semi-public/semi-private spaces anymore. In Fig. 5, it can be perceived that the circulation route of one building represents a street in terms of its inhabitants and the hierarchy of transition zone has been lost in these floating buildings.

The motivation for the concepts is the lack of social and ecological aspects which have an influence on livability in these projects regardless of the income levels of the inhabitants. Figure 5 presents the housing tendency which is also a characteristic of urban transformation areas. These high-rise mass housing blocks cause damage to the socio-spatial structure of the neighborhood which has been discussed in several parts of the study. The criteria for introducing "smart density planning" are the guidelines that have great importance when designing new neighborhoods by urban transformation projects. The discussed indicators lead to how to provide a balanced distribution of services and public spaces which ensure sustainable and livable environments. Additionally, these indicators are the guidelines for arranging physical environments in an ecological way and establishing adequate neighborhood relations. With interrelated morphology and smart distribution of population and services of low-rise, high-density housing, "smart density planning" has the potential to provide livable sustainable neighborhoods.

5 Conclusion

Following the modernization processes, urbanization and then urban transformation processes have affected cities in a negative way in terms of sustainability and way of living in such concretized urban contexts. In order to minimize these negative effects, we need a rethinking of regeneration processes which may lead to an alternative future path for urban transformations in terms of urban practices, approaches and implementations. To achieve this goal, smart density planning has been introduced as a solution to the challenge of coincidental planning which ignores the smart distribution and socio-spatial quality of the living spaces.

The discussion of several concepts and movements in order to set up a framework of indicators for smart density planning revealed how important it is for livable urban transformation areas. Moreover, the "smart city" is discussed critically and reconsidered in terms of planning and sustainable neighborhoods. The definition of the indicators of smart density planning, which also act as a guideline, shows that density is not just correlated with population but other qualitative and quantitative parameters, such as logical distribution of functions, adequate vertical and horizontal morphology design, sensitive circulation concept etc.

In addition, the indicators present problems of high-rise buildings for neighborhood patterns and social relations and

Fig. 5 Mass housing project from Bursa (Alagöz, 2011)

promote more human-oriented and human-scaled living environments. As a result of the new morphology with high-rise development in these transformation areas in Turkey, the previous morphology has been changed dramatically. Moreover, the accustomed neighborhood structure, previous activity patterns, the communication of the inhabitants themselves and their interaction with the ground, and the safety of these spaces have been demolished. Thus the lack of consideration for smart density planning in these urban transformation areas has an influence on the socio-spatial structure, cultural values, and daily life routines of dwellers, neighborhood relations, urban tissue and existing green patterns. The discussions and evidences in the indicators reveal the gaps in considerations of these implementations. It is highlighted that most urban problems can be minimized by following the content of the indicators of the suggested concept which promotes solutions with directions. Moreover, the study evokes an awareness of the possibility and necessity for a shift toward planning that considers smart density planning for a human-centered livable environment. This is very important for the socio-spatial quality and sustainability of neighborhood structure in Turkey, which responds to the ontological needs of the inhabitants beyond physical requirements.

The authors' intention for their future studies is to implement the analytical framework on an urban transformation case in Turkey in order to highlight the problems and development potentials concretely.

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