

# Theoretical Approaches in the Context of Spatial Planning Decisions and the Relation with Urban Sustainability

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**Abstract.** The sustainability agenda has maintained its importance since the days, when the production system took its capitalist form, as well as the population in the urban areas started to rise. Increasing number of both goods and the people have caused the degradation of the certain systems, which generate the urban areas. These systems could mainly be classified as social, environmental, physical and economical systems. Today, urban areas still have difficulty to protect those systems, due to the significant demand of the population. Therefore, studies related with the sustainable issues are significant in the sense of continuity of the urban systems. Therefore, in this paper, those studies in the context of the effects of physical decisions taken in the spatial planning process on urban sustainability, will be examined. The components of the physical decisions are limited to land use, density and design. Land use decisions will be examined in the context of mixed land use. On the other hand, decisions related with density will be analyzed in the sense of population density and floor area ratio (FAR). Besides, design decisions will be examined, by linking them with neighborhood design criteria. Additionally, the term of urban sustainability will only be limited to its social and environmental contexts in this study. Briefly stated, studies in the sustainable literature concerned with the effects of land use, density and design decisions taken in the spatial planning process on the social and environmental sustainability will be examined in this paper. After the compilation and the analyze of those studies, a theoretical approach will be proposed to determine social and environmental sustainability in the context of land use, density and design decisions, taken in the spatial planning process.

## 1. Introduction

Beginning from the 18<sup>th</sup> century, when industrial revolution was initialized, and especially after from the World War II to present, economic activities have been continuing to increase. Countries, which completed their recovery times after WW-II, have made progress in economic development and increased their production capacities [1]. Under those circumstances, some doubts have arisen, related with social and environmental concerns. In this sense, social concerns have been generally linked with some social problems risen due to unfair distribution of income, in consequence of increased economic activities. On the other hand, environmental concerns are generally associated with the exploitation of the natural resources to increase production. Accordingly, United Nations World Commission on Environment and Development defined the term of “sustainable development” in the Brundtland Report, written in 1987 as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” [2].



This definition emphasizes the fact that business-as-usual activities are not working and will not work anymore. A new paradigm for urban areas, linking global debates with the local practices and not lodged solely in the current production-oriented growth based economy is required [3]. It is significant to develop a new paradigm, which emphasizes on the balance among the growth-based economy both with the scarce natural resources and allocation of resources, as output of production, among people. Developing such a paradigm could enable holistic management of the relation among production with natural and human resources.

The discipline of “urban planning” is significant in the sense of composing a holistic approach in the context of a new urban development paradigm. In other words, urban planning is one of the important disciplines, which deals with the adverse effects of production systems on the segments, which constitute the urban environment. Those segments which constitute the urban environment could be classified under the four main circumstances as; natural environment, physical environment, economy and the people. Planning enables those segments of the urban areas to reach specific goals in the following years. Those goals might be consisted of providing the maintenance of the social, environmental and economic sustainability, protecting environmental and historical values, ensuring new investments and the other related desired improvements in the urban areas and the urban planning mostly manages the land development in the sense of reaching those goals [4]. In other words, the main occupation field of the urban planning is related to “*space*”.

Within this scope, the effects of the decisions related with the physical space in the urban plans, namely spatial planning decisions, which shape the built environment on social and environmental sustainability will be examined. In this context, spatial planning decisions are collected under three criteria as land use, density and neighbourhood unit design. Those three criteria, which are frequently discussed in the urban sustainability literature, are shaped by the spatial planning decisions. As one of the spatial planning decisions; land use decisions are associated with the diversity of the land use pattern (namely, mixed-land use), density decisions are associated with the building (floor area ratio-FAR) and population density pattern and lastly decisions linked with the neighbourhood unit design are associated with the neighbourhood design criteria, which shape the silhouette of the built environment.

Studies related with the relation between spatial planning decisions and urban sustainability discloses the issue that sustainability is ensured by mixed-land use, compactness and the proper implementation of the neighbourhood unit design criteria. Land use measurement techniques are important in the sense of determining mixed-land use. On the other hand, density measurement techniques are significant in the sense of determining compactness within the context of population and residential density. Besides, neighbourhood unit design criteria are crucial in the sense that certain design principles have to be provided in the neighbourhoods.

In this context, the relation between sustainability and land use, sustainability and density, as well as sustainability and neighbourhood unit design criteria will be examined separately, by referring the related literature, described by various researchers. In other words, effects of the decisions shaping the built environment on urban sustainability will be discussed. Then, what might be the best practice, which maintains the sustainability, in the context of land use, density and neighbourhood unit design will be discussed, by suggesting some proposals. Therefore, that newly proposed practices could be used by researchers and the other related professionals for providing continuance of the sustainability.

## **2. Relation between sustainability and spatial planning decisions**

Relation between the term “*sustainability*” and spatial planning decisions, in the sense of land use, density and neighbourhood unit design will be examined. First, the relation between sustainability and land use will be discussed.

### *2.1. Relation between sustainability and land use*

Land use, here, is examined in the sense of mixed land use and its effects on the urban sustainability. Land use is the main component of the urban plans, which shape the built environment, where we are living in. Some of the major land use types could be stated as residential, commercial, industrial etc. types of land uses. Each component in the city has at least one land use type and some usages as skyscraper units might include more than one land use, including both residential and commercial usages etc. This is because mixed use constituting in the four settings, as within districts and neighbourhood, within the street and the other public spaces, within building or street blocks or within individual buildings [5]. In the urban sustainability literature, it is widely stated as there is a direct relation between mixed land uses and urban sustainability. So, first of all, the definition of mixed land use should be clarified.

Mixed land use includes various urban usages, located on the close-ranges. For instance, in an area, where residential usages accompanying with the commercial usages could be described as mixed land uses. Besides, areas, including commercial and industrial usages together also could be described as mixed land uses. In addition to these, a residential building, including a commercial usage on its base floor could be also defined as a mixed use structure.

Many researchers state that there is a direct relation between mixed land use and urban sustainability, both in the environmentally and socially sense. In other words, it is stated that the increase in the diversity of the land uses promotes the urban sustainability, both in the environmental and social contexts. Beginning with the relation between mixed land use and environmental sustainability, many researchers link those two issues in the context of green-sustainable transportation, which aims to reduce greenhouse gas emissions, by discouraging the automobile usages and encouraging the public transport, cycling and walking. This circumstance is stated in the literature as [6]:

“The concept is simple enough: while a large, single-use residential area will often require residents to use motorized transportation to reach employment, commercial, or leisure destinations, a fine-grained mixing of residential, commercial, and recreational land uses might allow local residents to walk or bike to desired destinations.”

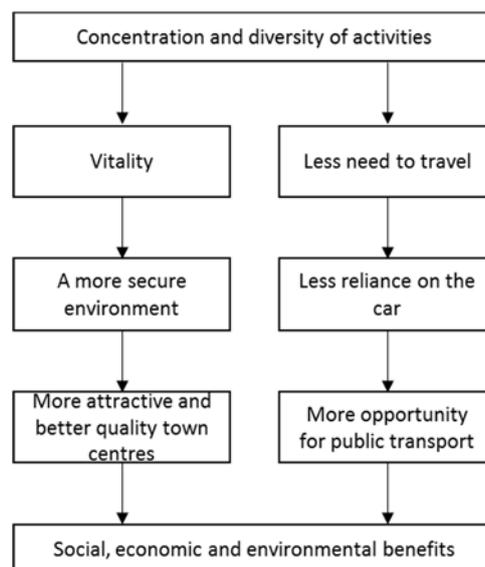
In addition to these, it is claimed that since different usages, as offices, shops, restaurants, cafes, residents and the other urban usages as leisure usages (theatres, cinemas etc.), as well as open-green spaces etc. are located close to another, then people are encouraged to walk, bike or use public transport, instead of using their own automobiles [7] and this might contribute to the reduction of greenhouse gas emissions. Similarly, it is argued that people, who are living nearby the places, where they could shop, work, study or relax etc. are encouraged to use public transport, walk or bike. It enables them not use their automobiles and this decreases vehicle trips [8]. Therefore, a shift towards from the motorized-travel mode to non-motorized travel mode is observed and this circumstance leads the decrease of greenhouse gas emissions. Besides, the New Urbanism movement also supports mixed land use both in the sense of environmental and social contexts. In this sense, it is argued that the main idea of New Urbanism supports the encouragement of public transit, walking and cycling (namely, green transport modes) to decrease automobile usage and dependency [9].

So far, the relation between the mixed land use and environmental sustainability is examined. Now, the relation between the mixed land use and social sustainability will be examined. As is in the environmental context, it is argued that there is a direct relation between the mixed land use patterns with social sustainability. In other words, the higher diversity among the land uses, the higher will be the social sustainability rates. In this perspective, it is stated that [10]:

“... diversity attracts human capital, encourages innovation, and ensures fairness and equal access to a variety of groups. Indeed, by this logic, the competitive advantage of cities, and thus the most promising approach to attaining economic success, lies in enhancing diversity within the society, economic base, and built environment.”

As in the citation stated above, the components of the social sustainability is promoted through the diversity within the society, economic base, and the most significant for this study is within the sense of built environment. Within this framework, land use decisions are classified as one of the most important factors, which shape the built environment and mixed land use is considered as one of the significant tools, which enable the built environment more diverse. Enabling built environment diverse, namely, mixed-used, promotes social entity of the society. For instance, close different urban usages, promoted by mixed land use, encourages vital economic relation among people, due to the fact that closer usages allow people to work, shop etc. in the close locations and this situation increases the social relations among people, giving rise also to the economic relations. Additionally, close coexist of different usages in an area enables these area to be used by people in the different periods of time in the daytime and this circumstance increases the safety of these place. However, people living in the area might be disturbed by the crowded [*op. cit.* 8].

In the view of such information, desired effects of mixed land use on environmental and social sustainability could be illustrated in Figure 1 [Coupland, 1997, cited in 11]:



**Figure 1.** Desired effects of mixed land use on environmental and social sustainability [Coupland, 1997, cited in 11]

In the following section, the relation between density and urban sustainability, in the context of environmental and social sustainability, will be discussed.

## 2.2. Relation between sustainability and density

There are still some doubts about the ideal level of density, as well as strategies in order to reach that density level. Besides, there are still some concerns about the probable undesired effects of the high density, as pollution, crowded etc. Despite those circumstances, there is a general tendency to state relation between the sustainability and density is directly proportional in logic. In other words, there is a common agreement about the fact that high density (compactness) promotes environmental and social sustainability [12].

One of the issues in this sense that it is claimed that high density promotes environmental sustainability. Fundamentally, since higher densities are linked with the term “compactness”, in this study, the relation between the density and urban sustainability is examined in the perspective of compactness. Accordingly, it would be better to start with the definition of compactness.

Urban compactness is generally known as, “intensification”, “consolidation” or “densification”, both in the senses of population density, as well as residential density, which is measured in terms of *floor area ratio, FAR*<sup>1</sup>. Besides, it encourages the usage of brownfield land, as well as it includes more intensive usage of the buildings. Moreover, it encourages the usage of existing development by means of conversions and its main objective is to increase the population density in the certain urban areas [13]. In other words, urban compactness is directly related with the density, related to both population and residential densities, because a dense urban area is built both in the sense of dense population and buildings, especially used for residential purposes.

Beginning with its effects on environmental sustainability, it is argued that there is a correlation between travel variables and urban density. In this sense, gasoline usage, automobile ownership, automobile usage, number of people using public transport when going to work, public transport usages per person and percentage of total passenger kilometer by public transport are found to be in a relation with urban density and it is crucial to state this fact that more of those variables are found to be negatively correlated with urban density (except the last two) [14]. Another study related with the relation between compactness and environmental sustainability in the sense of household consumption shows that in the dense areas, residents tend to use less energy than the residents living in the areas, having lower-density housing [15]. In addition to these, some current approaches as the smart growth, new urbanist and traditional transit oriented development are suggested as reactions to sprawl, which advocates the lower-densities [16]. For instance, in the Charter of The New Urbanism [17], it is stated that:

“Appropriate building densities and land uses should be within walking distance of transit stops, permitting public transit to become a viable alternative to the automobile.”

Locating closer of the buildings is significant in the sense that especially the higher residential densities mean the higher population densities. It contributes the effective public transportation systems. In this sense, the question of how this is possible could be answered with the fact that certain degree of population density is required in order to increase the number of people, who use the public transportation. Similarly, it is stated that in the densely populated area, the public transport usage tends to increase, comparing with the lower density areas [18]. Similarly, Barrett [19] lists some advantages of density in the sense of reducing greenhouse gas emissions as stated below:

- Certain degree of density increases the chance of different sorts of travel options, generally within the walking distance
- It is possible to reach various usages in a certain locality, since higher densities enable different usages and services to converge. It promotes the usage of public transport, cycling or walking by decreasing the usage of automobiles
- Coexistence of different usages provides densities of trip ends and this circumstance promotes the usage of public transport

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<sup>1</sup> Floor area ratio (FAR): the ratio of the total floor area of the building to the size of the land which that building is located on

- It highly discourages people to have private vehicles

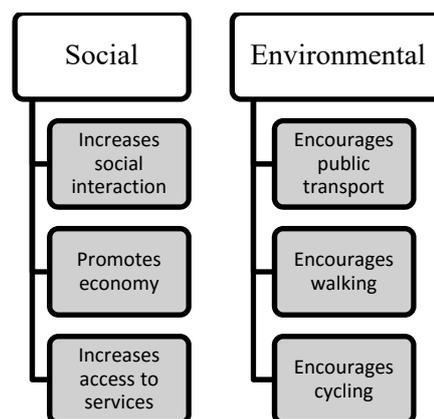
Besides its environmental benefits, it is mostly stated that higher densities promote the continuance of social sustainability, although some argue that there might be drawbacks of higher densities against social sustainability. For instance, it is argued that compact urban forms, having higher densities, might increase problems associated with neighbourhoods and dissatisfaction; on the other hand, it might increase access to some services [20]. It is significant for disadvantaged groups in the population (old people, children, people with disabilities etc.) to sustain social equity. Similar to this, Bramley et. al. states that neighbourhood pride and attachment, stability and safety are found to negative relationship with density. On the other hand, they state that social interaction and group participation increases with density up to a certain level (medium levels) and decreases approaching to higher density levels and they also state that access to local services are tend to increase with higher densities [21].

Additionally, in the foreword of 11<sup>th</sup> chapter of her book “The Death and Life of Great American Cities”, Jane Jacobs states that [22]:

“The district must have a sufficiently dense concentration of people, for whatever purpose they may be there. This includes people there because of residence.”

Jane Jacob’s quotation is significant in the sense that in order to provide the maintenance of social, as well as economic relations among the society requires the existence of people. Dense concentration of people bring about dense concentration of various urban usages as well. This might contribute interaction among the people, economical relations and access to services, since the concentration of people also requires the advanced and diversified transportation modes, including the options related with green transport modes.

In the view of such information, it could be asserted that high density mostly has positive effects on environmental sustainability; on the other hand, it has a few positive effects on social sustainability, illustrated in Figure 2:



**Figure 2.** Desired effects of high density (*compactness*) on social and environmental sustainability

Besides the effects of mixed land use and high density (*compactness*) on environmental and social density, in the following section, the effects of neighborhood unit design on urban sustainability in the environmental and social contexts will be discussed.

### 2.3. Relation between sustainability and neighbourhood unit design

As well as the mixed land use and high density (*compactness*), neighbourhood unit design has vital role in shaping the built environment and affects the continuity of environmental and social sustainability. The design of neighbourhood unit should depend on some certain criteria, which have been agreed upon many researchers, having similar characteristics. In this sense, it would be sufficient to mention about the neighbourhood unit design criteria, which were developed by Perry. Yet, first, the question that what is a neighbourhood unit should be answered.

The boundaries of a neighbourhood unit could be defined as the area, where its central point shows central characteristics (in terms of retail and public usages, including convenience stores to primary schools). In other words, a neighbourhood is where its inhabitants could easily meet their daily needs within the range of close proximity of their homes. In a similar way, Mumford [23] states that the roots of the development of neighbourhood concept depend on two fundamental origins, as social impoverishment and social integration. Therefore, it could be argued that a neighbourhood unit is a close proximity, where people, generally, can shop, study and have social relations.

In this context, neighbourhood unit design criteria, defined by Perry in 1929 [cited in 24] is listed below:

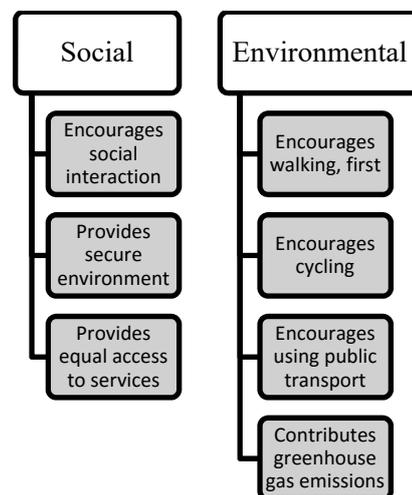
- *Site*: A residential area should be designed so that an elementary school is required for that residential population.
- *Boundaries*: Proposed neighbourhood unit should be surrounded by arterial streets, which are adequately wide to enable traffic pass through.
- *Open space*: A system, comprised of parks and the other related recreational spaces, should be provided for inhabitants of the neighbourhood unit.
- *Institution sites*: Required schools and the other institutions should be located on the central point of the neighbourhood, so that they can serve the inhabitants in an equal way, by providing equal access to those usages.
- *Local shops*: Shopping areas should be located nearby the boundaries of the neighbourhood, preferably adjacent to traffic junctions and the other neighbourhoods' boundaries.
- *Internal street system*: An internal street system should be designed in the neighbourhood, by considering the road hierarchy and the traffic loads. That system should be designed in a way that it should discourage the usage of private vehicles and promote walking within the neighbourhood.

In this context, proper implementation of the neighbourhood unit design is significant in the sense of sustaining the continuity of environmental and social sustainability. Neighbourhood design is especially important for environmental sustainability in the sense that ideal design encourages people for walking, cycling or using public transport, rather than using private vehicles. Accordingly, greenhouse gas emissions are reduced. In a similar understanding, professionals call neighbourhoods as pedestrian oriented in the case that neighbourhood has higher densities, mixed land use, connected street network and aesthetic design characteristics [25]. All of these features of built environment, which are related to the neighbourhood unit design criteria, defined by Perry above, are significant due to the fact that those features encourage people to walk, cycle or use public transport. In a neighbourhood, where has a pleasant aesthetic value with its greenery and leisure spaces, make feel its inhabitants great while they are walking. In addition to these, since the appropriate neighbourhood unit design requires the well-practiced distribution of resources, namely equal access to the services; the public transport stops are distributed fairly in the boundaries of the ideal neighbourhood. Therefore, people are encouraged to use

public transport modes. All of those promote the decrease of greenhouse gas emissions, which is required for the maintenance of environmental sustainability.

In addition to those benefits, proper neighbourhood unit design contributes to the maintenance of social sustainability, as well. According to American Planning Association (APA), three of the characteristics a great neighbourhood should have is that it should encourage contacts among people and social interaction, as well as it should promote social involvement within the context of a secure environment. Besides, it should have a memorable character [26]. Those are only possible, by providing adequate neighbourhood unit design. For instance, contacts, as well as social interaction among the inhabitants of a neighbourhood is possible, by sustaining a mixed land use layout with connected streets and safe pedestrian route having a certain density to create sufficient concentration of people, who begin interaction in the sense of both socially and economically. Besides, the provision of necessary public institutions, as elementary schools, are significant to provide services to people in an equal way.

Depending on the information stated above, the desired effects of the proper implementation of neighbourhood unit design criteria could be illustrated in Figure 3:



**Figure 3.** Desired effects of proper implementation of neighbourhood unit design criteria on social and environmental sustainability (illustrated by the authors).

### 3. Discussion:

Thus far, the advantages of mixed land use, higher density and proper neighbourhood unit design have been criticized. It is argued that mixed land use, having various types of usages, as residential, commercial, institutional etc. is advantageous in the sense that it contributes the concentration of people and enable them to develop social interactions and economical relationships. Also, coexistence of different usages enable various public transport modes and walking more efficient.

In a similar way, higher densities are desirable in some extent. In other words, generally, higher densities up to some point is considered as desirable. This is because the fact that very high density is regarded as undesirable in the sense it might create too crowded and closed built environment, which could suffer people who are living in those areas, causing the formation of a non-human scale built environment. Otherwise, higher density at some point enables certain concentration of people, as is in the case of mixed land use, and this promotes interaction and the other related relations among the people, both in social and economical contexts. In an environmental point of view, higher densities are advantageous in the sense that compact settlements are not located on or nearby the vulnerable natural resources, as well since higher density requires certain population concentration, the usage of public

transport would be much efficient. Proper neighbourhood unit design, on the other hand, is another essential built environment feature, which is required for the continuance of both social and environmental sustainability. A sustainable neighbourhood should have defined boundaries with its various usages located on its central point, having equal access to its inhabitants. Additionally, the silhouette of the built environment should meet the requirements of both dense and human scale appearance. Besides, a sustainable neighbourhood also should include mixed land use.

So, what is the ideal built environment form, which could be stated as the most sustainable? The answer of this question has more than one answer, which could change depending on the local characteristics of the neighbourhood and its inhabitants living in that neighbourhood. No matter what are the answers, the significant key point in here could be described as the locality due to the fact that different societies in the World have different life-styles. The way people live shapes the built environment where they are living in. Accordingly, the characteristics of the mixed land use, compactness and neighbourhood unit design criteria might change from society to society. For instance, a relatively high residential density is considered as more sustainable urban form in the literature; however, some societies demand lower densities, shaped by single-detached dwellings. It is, obviously, a non-sustainable urban form in the environmental context. However, those societies are associated the areas covered by single-detached dwellings with pleasant and safe environments. Therefore, that kind of built environment is considered by those societies as socially sustainable (although the others might not think that way). In a similar extent, some people may not desire to live in an area, where different usages other than the residential ones are combined together, because those people believe that different usages make that area crowded and this circumstance might cause the rise of various doubts about privacy and safety. These two distinct examples are obvious in the sense of American and European cities. In American cities, single land use linked with suburban areas, covered by single-detached dwellings are popular. On the other hand, European cities, where the traditional urban planning approach is appropriated, relatively dense areas with mixed land uses are in the case. In the context of those two types of settlement layout, both of them have some advantages and disadvantages both in the sense of social and economic sustainability. Therefore, it is not possible to state that there is a single most sustainable built environment layout, since the perception of the concept of *sustainability* differs from society to society. To develop the most sustainable built form, required analyses should be carried out in the local scale.

#### 4. Conclusion

In this paper, the fact that there is no single sustainable built form exists is pointed out, by referring mostly to the advantages and too few disadvantages of the mixed land use, high density and proper neighbourhood unit design in the contexts of social and environmental sustainability. In the beginning of the paper, it is stated that a theoretical approach to determine social and environmental sustainability in the sense of land use, density and design decisions, taken in the spatial planning process will be developed. After the compilation of various viewpoints of the different researchers, it is argued that mixed land use, higher density and proper neighbourhood unit design is favoured by most of them. Yet, in practice, this is not always the case. At this point, in the discussion section, the question of “*what is the ideal built environment form, which could be stated as the most sustainable?*” is constituted to show that there is no single answer and the reason for this circumstance is concluded as the fact of: *locality*.

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