ADOPTING SUSTAINABILITY ASSESSMENT CRITERIA TO GUIDE URBAN REGENERATON PROJECTS: TWO CASE STUDIES IN ANKARA

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ABSTRACT

ADOPTING SUSTAINABILITY ASSESSMENT CRITERIA TO GUIDE URBAN REGENERATON PROJECTS: TWO CASE STUDIES IN ANKARA

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Increasing awareness of climate change, loss of biodiversity and increase in environmental pollution due to the current trends of consumption in the urban areas have brought about a myriad of schemas to guide environmentally friendly urban developments. These schemes or Neighborhood Sustainability Assessment Tools (NSA Tools) provide a convenient way to establish healthier and sustainable cities. Meanwhile, Turkey is going through a rapid urban transformation process that is being questioned with respect to the urban quality they create. To this end, NSA tools can also be used as a guide for the transformation of urban environments in order to create sustainable cities.

The aim of this research is to investigate the capabilities of the NSA Tools to guide the transformation of sustainable built environments in the urban regeneration projects, at the neighborhood scale, in Turkey. Three assessment tools have been chosen to investigate their capability; namely, LEED ND, BREEAM COMM and CASBEE UD. The problems and deficiencies of newly regenerated built environments were determined through case studies and the literature review. The performances of selected NSA tools has been evaluated by comparing their level of responsiveness to the determined problems. Thereafter, the usability and appropriateness of the NSA tools to answer urban transformation issues in Turkey

were investigated and possible solutions derived from the criteria of the rating tools as well published sources were gathered. Lastly, these solutions were summarized under thirteen categories to produce a final framework, in the form of a problem-solution chart, to be used as a guide for future urban regeneration projects.

Keywords: Neighborhood Sustainability, Assessment Tools, Sustainable Urban Development, Urban Transformation, Urban Regeneration

ÖZ

SÜRDÜRÜLEBİLİRLİK DEĞERLENDİRME KRİTERLERİNİN KENTSEL DÖNÜŞÜM PROJELERİ İÇİN YÖNLENDİRİCİ MODEL OLARAK ADAPTE EDİLMESİ: ANKARA'DA İKİ VAKA ÇALIŞMASI

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İklim değişikliği, çevre kirliliği ve biyolojik çeşitliliğin azalması üzerine oluşan farkındalık ve çözüm arayışları, kentlerin sürdürülebilir kalkınma hedeflerini gerçekleştirebilmek için anahtar role sahip olduğunu gündeme getirdi. Bu sürece rehber olabilecek Sürdürülebilir Mahalle Sertifika Sistemleri ekolojik, ekonomik ve sosyal sürdürülebilirliğin yaygınlaşabilmesi için kentlerdeki yapılı çevreyi uygun hale getirecek içeriklere sahip sistemlerdir. Bir diğer taraftan Türkiye'deki birçok şehir bugün ürettiği yapı kalitesinin ve kentsel değerlerin sorgulandığı hızlı kentleşme sürecinden geçmektedir. Bu noktada mahalle sertifika sistemleri hızla değişen kentlere sürdürülebilir dönüşüm için rehber olabilecek içeriklere de sahiptir.

Bu çalışmanın amacı, Türkiye'deki kentsel dönüşüm projelerinde, yapılı çevrenin sürdürülebilirlik ilkeleri çerçevesinde yeniden üretilebilmesi için Sürdürülebilir Mahalle Sertifika Sistemlerinin kapsamının ve etkinliğinin incelenmesidir. Araştırma için dünyada yaygın olarak kullanılan üç değerlendirme sistemi belirlenmiştir, LEED ND, BREEAM COMM ve CASBEE UD. Türkiye'de mevcut olan kentsel dönüşüm projelerinde ortaya çıkan problemler örnek projeler üzerinden literatür taraması ve saha çalışması yapılarak belirlenmiştir. Sonrasında bu sistemlerin kentsel dönüşüm projelerinin sorunlarına karşı kullanışlılığı ve uygunluğu incelenmiş, literatür

kaynaklarından ve değerlendirme sistemlerinden çözümler önerilmiştir. Son olarak, önerilen çözümler on üç kategori altında problem-çözüm tablosu olarak kentsel dönüşüm projeleri için bir rehber haline getirilmiştir. Sürdürülebilir Mahalle, Değerlendirme Sistemleri, Sertifika Sistemleri, Sürdürülebilir Kentsel Kalkınma, Kentsel Dönüşüm

Anahtar Kelimeler: Sürdürülebilir Mahalle, Değerlendirme Sistemleri, Sertifika Sistemleri, Sürdürülebilir Kentsel Kalkınma, Kentsel Dönüşüm

Dedicated to my family and my partner Fuat Salman

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This thesis is dedicated to the people living in Ankara who lived the cheering moments in this city once and who feel suffocated from the current situation, hoping for a bright future for the city.

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LIST OF ABBREVIATIONS

ABBREVIATIONS

BREEAM: Building Research Establishment Environmental Assessment Method

BREEAM COMM: BREEAM Communities

CASBEE: Comprehensive Assessment System for Built Environment Efficiency

CASBEE UD: CASBEE Urban Design

ÇEDBİK: Çevre Dostu Yeşil Binalar Derneği

LEED: Leadership in Energy and Environmental Design

LEED ND: LEED Neighborhood Design

LID: Low Impact Development

LCA: Life Cycle Assessment

NSA: Neighborhood Sustainability Assessment

OECD: Organization for Economic Cooperation and Development

The NEARP: The North Entrance of Ankara Urban Regeneration Project

CHAPTER 1

INTRODUCTION

1.1. Argument

Loss of biodiversity, increased environmental pollution, resource scarcities, and climate change: these are the main issues that are still raising the question "How it is possible to ensure our needs without compromising future generations." In 1983, Brundtland expressed his concerns over the accelerating deterioration of the planet, which is currently the only known planet where humans can survive (Drexhage & Murphy, 2010). Since then many conferences have been held to discuss the sustainability issues, such as Habitat III, where it was declared that "the battle for a more sustainable future will be won or lost in cities" (Habitat III, 2016)

Cities are the main hubs where unsustainable consumption habits occur. Ensuring sustainability for future generation is implicit in our abilities to understand cities, the way it shapes society and its capabilities to reduce ecological footprint. For this reason, sustainable urban development is a visionary paradigm that many authorities are making efforts to adapt as a principle. An urgent need has emerged to set up rules and guidelines to support sustainable urban developments. Some sustainability assessment systems are dedicated to evaluate sustainable approaches for urban developments. These so called Neighborhood Sustainability Assessment (NSA) tools can be recognized as "the latest generation of impact assessment tools" (Sharifi & Murayama, 2012) pursuing sustainability at the local level.

Meanwhile, Turkey is undergoing a process where large scale reconstruction projects are put into practice under the guise of "Urban Regeneration". There is no doubt that the urban population is increasing dramatically while housing stock is going out of date. According to the report "Real Estate Sector in the Vision for 2023" prepared by

GYODER (Gayrimenkul ve Gayrimenkul Yatırım Orteklığı Derneği) the total housing demand is going to be 7.56 million units between 2011-2023. 64% (4.84 million) of the units will be needed due to increase in urban population and decrease in household size while 28% (2.12 million) will be needed to meet the deficiency caused by demolition of unlicensed residential stock or the housing that is exposed to earthquake risks. Besides 600 thousand housing units that are older than 50 years of age will be reconstructed. (Gürlesel, 2012) In this respect, Turkey should use this opportunity to construct better quality urban environments that can ensure sustainability. This aim also creates the need to reinterpret current sustainability guidelines to overcome the poor quality in urban environments, mostly generated via urban regeneration.

The aim of this study is to investigate potentials of NSA tools in order to guide Sustainable Urban Regeneration Developments by studying the sustainability assessment criteria and their responsiveness to solving the current issues of urban regeneration projects. Consequently, a list of such criteria were determined from an in-depth study of three rating tools, namely BREEAM-COMM, CASBEE-UD, LEED-ND; these criteria were then re-arranged under revised categories for formulating the guideline as an assessment matrix. This matrix is presented in the thesis as the final outcome of this research.

There are considerable number of comparative studies conducted on various rating tools. The Ministry of Environments and Urban Planning has made regulations for sustainable building and sustainable neighborhoods certification systems together with ÇEDBİK (Çevre Dostu Yeşil Binalar Derneği). (ResmîGazete, 2017) However, what makes this study distinct is that its intention is to look for the criteria in the three widely used international assessment tools that can respond to the problems encountered in the regenerated built environments in Ankara. The criteria will be a guide for better quality and sustainable urban regeneration projects.

The concept itself requires comprehensive research on sustainable urban development to be able to judge the criteria in the assessment tools. For this reason, one of the interests of the research is to answer the question: "What are the problems encountered in urban regeneration projects in Ankara?" and "What are the basic principles of sustainable urban developments?" Furthermore, the main focus of the study is the assessment tools. Hence the study continues by conducting a comparative analysis to answer the question "What are the differences between the NSA tools in terms of their approach responding to the previously determined problems?" and "How effective are the selected assessment tools to respond to urban regeneration issues in Ankara?" Initially, the various rating tools were investigated and three popular ones were selected. The difficulty of such an analysis is that a multitude of diverse criteria that measure social, environmental and economic sustainability, that are all in different hierarchical order for each tool, needed to be studied. In order to cope with this problem, the criteria are aligned under a new framework to be able to select the most applicable ones. At the same time, the problems in urban regeneration projects were determined through the selected case studies in Ankara and a literature review. Finally, the rating tools were examined under the framework to evaluate their capabilities of responding the determined problems in the urban regeneration projects in Ankara. As a conclusion the criteria that are able to respond to these problems are summarized and presented as a useful guide for urban transformation projects.

1.2. Objectives

The main aim of this study is to evaluate NSA tools in order to derive the criteria that are able to respond to the current urban regeneration problems in Ankara, and to prepare a guide based on these applicable criteria. Below are the primary objectives that compose the motivation of this study;

. To understand the basic principles of sustainable urban development.

. To understand the deficits of urban regeneration in Turkey in terms of sustainability.

. To investigate the responsiveness levels of selected assessment tools to the issues of urban regeneration in Ankara.

. To derive a list of criteria from the NSA Tools that may be a guide for the current urban problems.

. To increase the awareness that current trends of urban regeneration in Turkey can be turned into an advantage to achieve sustainability goals while improving social and economic wellbeing.

1.3. Procedure

The research started with literature review on basic principles of sustainable urban development to be able to have the necessary background information to evaluate the assessment tools. Also, information obtained on sustainable urban development is supported by literature review on urban regeneration in Turkey.

Following this, the information related to the case studies that are selected from Ankara, The North Entrance of Ankara Urban Regeneration Project and Çukurambar-Kızılırmak Neighborhood, are gathered from various resources and the problems determined in the literature review is summarized. Some of the data that are not available in the literature is further investigated under results and discussions.

Hereafter, to be able to evaluate the assessment tools, the categories of the tools are analyzed and a new framework is composed to re-align the criteria from different tools in one table. As a result the weights of the categories are obtained for each rating tool. The results indicates the importance levels of the categories for each rating tool.

Later, the complementary data related to the case studies is gathered through onsite observation, map analysis and interviews with Ankara Municipality. The problems obtained through investigations are summarized to be used for the comparative analysis.

Finally, the problems and the criteria that are able to respond to the problems are gathered in a table for each category in the framework and a comparative analysis is conducted to understand the responsiveness levels of the NSA tools to the problems determined through case studies.

In conclusion, the criteria that are able to respond to the problems are summarized and their importance levels are indicated as compulsory, optional and recommended.

1.4. Disposition

Chapter 1 introduces the study via its argument and objectives; together with brief procedure of the study and the disposition.

Chapter 2 presents review of literature, conducted on basic principles of sustainability, principles of sustainable urban development, sustainable neighborhood and assessment tools. Literature review on case studies and urban regeneration is conducted under this section also.

Chapter 3 clarifies the materials and methods used in the research.

Chapter 4 presents the results and discussions. The structures of the NSA Tools are evaluated to compose new framework and the criteria of the NSA Tools are reordered to be able to compare. Further research is conducted on case studies and the problems derived through the interviews, site survey and analysis are presented. The results of the qualitative and quantitative analysis are used to compare the responsibility levels of the NSA Tools.

Chapter 5, the conclusion derived from this study is presented and recommendations have been made for further research.

CHAPTER 2

LITERATURE REVIEW

This chapter on a review of relevant literature covers the necessary background information on sustainability, sustainable urban development and sustainable neighborhoods. Herein, pertinent information on urban regeneration and the three selected assessment tools are provided. The information from literature review on case studies were gathered under this chapter also.

2.1. Origins of Sustainable Development

Between 1972 and 1992 a series of international conferences have been held to discuss sustainability on a global scale. (Drexhage & Murphy, 2010)The first one was held in Stockholm in 1972. A series of recommendations from the conference led to the establishment of the UN Environment Program (UNEP) and many other environmental organizations. It was followed by the 1980 World Conservation Strategy that identified priority conservation issues and critical policies to promote sustainable development. (Drexhage & Murphy, 2010).

In 1983, a commission had been established and chaired by Norwegian Prime Minister Harlem Brundtland to address growing concerns over "accelerating deterioration of the human environment and natural resources and the consequences of that deterioration for economic and social development". Four years later, the group produced the landmark publication Our Common Future. (Drexhage & Murphy, 2010) The report is a very comprehensive one dwelling on all global issues related to sustainability. Six challenges have been defined in this comprehensive report (Drexhage & Murphy, 2010) which are as follows:

1. Population and Human Resources
2. Food Security: Sustaining the Potential
3. Species and Ecosystems: Resources for Development
4. Energy: Choices for Environment and Development

5. Industry: Producing More With Less
6. The Urban Challenge (Drexhage & Murphy, 2010)

The United Nations General Assembly accepted the report that was followed by a political reaction which resulted in the United Nations Conference on Environment and Development in Rio de Janeiro, Brazil in 1992. (Drexhage & Murphy, 2010)The Summit was a chance to bring forces together to call for action for rethinking the economic development to halt the destruction of irreplaceable natural resources and pollution of the planet. The message has resulted in nations agreeing on Climate Change Convention -which in the future led to the Kyoto Protocol and Paris Agreement- and some guiding principles for the governments and businesses to follow have been announced as listed below: (the Earth Summit, 1992)

- Patterns of production that releases toxic components should be systematically displaced with sustainable production methods.
- Alternative energy sources should replace fossil fuels that are linked to global warming.
- Air pollution, congestion and health problems caused by private vehicle use in the cities should be eliminated by means of public transportation.
- Growing scarcity of water and the catastrophes it may cause should be recognized.

2.2. Definition of Sustainability and Sustainable Development

There are different approaches to what sustainability is and how it can be achieved. The most widely accepted definition of sustainable development is mentioned for the first time in the Brundtland Report, Our Common Future. According to this report, "Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (Brundtland, 1987)In more general terms sustainability aims to endure systems and processes for long terms and avoid them to be depleted through overconsumption.

Manzini (1997) defines sustainability as "a form of organization of human activities whereby, on a planetary and on a regional level, the ecosystem need not be disturbed

beyond the threshold of its resilience." (Manzini, 1997) Human comfort should not exceed the threshold levels for the recovery of nature.

Flint (2013) conceives sustainability as a word which represents a goal. He defines it as "the capacity for continuance into the long-term future". On the other hand, the process moving through this ideal state is defined as sustainable development. Whether the aim of sustainability is achieved or not, the principles applied in the process have a value to achieve the sustainability goal.

2.3. Principles of Sustainable Development

Sustainability is about ensuring a better quality of life for everyone while seeking for nature. We simply cannot achieve it following the model of the past where economic activity causes more pollution and wasteful use of resources. (Flint R. , 2013)

> "Sustainability is a concept that describes a healthy, dynamic condition of the Earth's biosphere and its various systems, the productive balance of which exists in harmony with human social and economic systems that interact without prejudice to the nonhuman elements of the biosphere, the environment." (Heintz, 2004)

Integrated approach model for sustainably is represented with a conceptual diagram shown with three overlapping circles as a Venn diagram. (Flint R. , 2013)The three-overlapping circle principle represents that each decision given for one approach made will also have an impact on the other two. The three elements represent: (Flint R. , 2013)

- **Economic Security**: development that protects and/or enhances natural resource quantities through improvements in management practices and policies, technology, efficiency, and changes in lifestyle.
- **Social Equity** (Balancing the Playing Field)—guaranteeing equal access to jobs, education, natural resources, and services for all people; total societal welfare; access to fair conflict resolution.
- **Ecologic Integrity** (Ecosystem Capacity)—understanding natural system processes of landscapes, watersheds, and seas to guide the design of sound economic development strategies that preserve these natural systems.

It is mentioned in the Brundtland Report that people will only be concerned about environmental problems only when their basic needs are met. That is why equity and wellbeing should be worked on together for sustainable developments. Burningham and Thrush (2003) indicate that it is not possible to focus on planet-saving solutions such as purchasing an energy efficient home while being unable to purchase necessary medication, food, and heating.

2.4. Definition of Neighborhood

The effects of the social and physical environment of neighborhood is a significant focus for researches and policy makers in recent years. One problem about the study of neighborhood that has been long recognized by social ecologists and geographers is that neighborhood is a genuinely amorphous concept. (Sastry, Pebley, & Zonta, 2002) There is no specific population size or a universal civic function defined for neighborhood but it is for sure a merely subdivision of the urban area. (Choguill, 2008)

> "Neighborhood" is probably best described as a relatively close area with fuzzy boundaries that may expand or shrink depending on context and personal experience. (Sastry, Pebley, & Zonta, 2002)

An individual's perception of neighborhood will vary from how he interacts with its surrounding. Whether he only live there to accommodate himself or he interacts with the surrounding community in public places such as parks, community centers, shops, cafes or public schools and even jobs. Cities usually have accurate definitions on where neighborhood begins and end such as the Lower East Side in Manhattan or Hyde Park in Chicago. However, the individual residents' definition of the neighborhood has quite different borders than that and these areas and often smaller. (Sastry, Pebley, & Zonta, 2002)

2.5. Sustainable Development Principles

Kural (2009) refers to Frey's definition of sustainable city from a socio-economic perspective, which is based on the following four points, as follows:

1. The individual elements in a city network such as neighborhood or villages should be semi-autonomous places preserving their individual characteristics in the net to provide a sense of place.
2. Different housing types and different uses provide a base for different social interactions.
3. Open country concept integrated into the city-net enhances entrepreneurial activities for city farms, forests, food production, recreation, and sports, building up of a symbiotic relation between the two.
4. The flexibility of the space should be provided by a hierarchical network structure that allows for small and large conglomerations of rural and urban character.

Basic principles of sustainable neighborhood according to Lock(2000) are;

- compact living
- mixed land uses
- public transport-oriented designs
- pedestrian-friendly streets
- well-defined public spaces
- integration of nature in developments
- developments based on walking and cycling distances. (Lock 2000)

Habitat III was the United Nations Conference on Housing and Sustainable Urban Development. It took place in Quito, Ecuador, from 17th to the 20th of October 2016. (Habitat III) It builds on the agenda of Habitat 2 which took place in İstanbul in 1996. The City We Need is a document prepared to contribute to Habitat III. In this document, the principles for the new urban paradigm have been described. (The City We Need, 2013) According to this document the following nine requirements should be met in a city:

1. **"The city we need is socially inclusive.** It provides spaces for all segments and age groups of the population to partake in social and cultural expressions. It eliminates all physical and spatial forms of segregation and exclusion."

2. **"The city we need is well planned, walkable, and transit-friendly.** Schools are within walking or biking distance from homes. Offices are located no farther than a few transit stops away from homes. Shopping for daily necessities is within walking distance of residential buildings and located near transits stops. Open space for recreation is near schools, work, and home."
3. **"The city we need is a regenerative city.** It is designed to be resilient by being energy efficient, low-carbon, and increasingly reliant on renewable energy sources. It replenishes the resources it consumes and recycles and reuses waste. It uses water, land, and energy in a coordinated manner and in harmony with its surrounding hinterland in support of urban and peri-urban agriculture."
4. **"The city we need is economically vibrant and inclusive.** It encourages and fosters local economic development from the smallest entrepreneur to the largest corporations. It provides a one-stop shop for streamlined licensing and other administrative services. It recognizes and protects the specific needs of the informal sector of the economy in its economic development policies and strategies."
5. **"The city we need has a singular identity and sense of place.** It recognizes culture as key to human dignity and sustainability. It involves cultural actors to unlock the creative potential of all citizens. It strengthens the bonds between the city and its surrounding hinterland."
6. **"The city we need is a safe city.** The city is welcoming night and day, inviting all people to use the streets, parks, and transit without fear. Public officials - the police, the fire department, and health, welfare, transit, and environmental services - and neighborhood residents and community groups communicate frequently and speak with one voice."
7. **"The city we need is a healthy city.** The city's parks and gardens are havens of peace and tranquility and harbor local flora and fauna and biodiversity. All public and private entities providing public services (water, waste, energy, transport) work together with the city's residents and have public and environmental health as a common performance indicator.**"**

8. **"The city we need is affordable and equitable.** Land, infrastructure, housing, and basic services are planned with low-income groups in mind. Public services are planned together with the communities they serve and consciously include the needs of women, youth, and vulnerable populations."
9. **"The city we need is managed at the metropolitan level.** It coordinates sectorial policies and actions (economy, mobility, biodiversity, energy, water, and waste) within a comprehensive and coherent local framework. Communities and neighborhoods are active participants in metropolitan decision making."

2.6. Key Sustainable Development Issues

Sustainable Urban Development can only be achieved through a harmonious integration of different issues on sustainability, a well-organized implementation of sustainable practices and a well-designed urban environment as a base for these practices to be flourished. Sustainable Neighborhood Assessment Systems have been generated through experts who have blended their knowledge on urban design, sustainable development, and architecture. Sassi (2006), Flint (2013) and Weeler and Beatley (2014) who devoted their work on Sustainable Urban Development and Architecture have compiled their concerns considering the issues described in the following sections.

2.6.1. Site and Land Use

Land-use is a general term for the human's modification for Earth's terrestrial surface. (Flint R. , 2013) Negative consequences of land use are soil degradation, loss of biodiversity, release of CO_2 by the disturbance of terrestrial soil and vegetation. Vegetation removal leaves soil vulnerable to soil erosion by wind and water especial on steep terrain.

Urban Sprawl is defined as an urban development lacking mix of land uses, good street connectivity, and reliable public transportation. (Wheeler & Beatley, 2014) According to Gordon and Richardson Urban Sprawl is a reflection of market forces.

Consumers and businesses prefer outlying locations where land is cheaper and houses are spacious. (Gordon & Richardson, 1997)

Compactness of the settlement is crucial to avoid formless, spreading, inefficient consumption of land caused by urban sprawl. Sprawl model also negatively effects locally owned stores as zoning laws allow large megastores. Urban sprawl reduces the interaction between the members of the society hence increase the separation between ethnic groups and sense of community weakens. (Flint R. , 2013)It also affects public health and increases obesity and cardiovascular diseases. (Ewing, Barthholomew, & Nelson, 2011) OECD recommends principles for compact developments; (OECD, 2012)

- Compact cities have dense and proximate development patterns, are linked by public transport systems, and maintain accessibility to local services and jobs. As such, they play a significant role in responding to the needs of urban areas.
- Compact cities lessen the impact on the environment, with shorter intra-urban distances and less automobile dependency. They play a part in the economy by increasing the efficiency of infrastructure investment and by giving residents easier access to services, jobs, and social networking.
- Two types of indicators are used to measure compact city policy outcomes: those that represent "compactness" (density, proximity, public transport systems and accessibility to local services and jobs), and those that measure a compact city's performance in relation to other cities.
- This report examines differences in policy practice in five case study areas, and underscores the need for tailoring policies to specific needs. For example, fast-growing regions where there is pressure for development, regulatory tools are essential to prevent uncontrolled urban expansion.
- Recommendations for compact city policy strategies: set explicit compact city goals; encourage dense and contiguous development at

urban fringes; retrofit existing built-up areas; enhance diversity and quality of life in urban centers; minimize adverse effects.

Intersection Density is a metric used by LEED ND to measure street connectivity. While there is no commonly accepted metric for assessing street connectivity, LEED-ND presents the most developed and standardized one. (Strangl & Guinn, 2011)

$$Intersection\ Density = \frac{\#\ \text{of Intersections}}{\text{Area in square miles}}$$

Cul-de-sac based auto network discourages through-traffic in the neighborhood while maintaining pedestrian connectivity as in Radburn. (

Figure 2.1) Gated subdivisions providing one entry point for autos and pedestrians promotes internal movement into circutious movements. (Strangl & Guinn, 2011) (Figure 2.2)

Figure 2.1. Radburn,NJ. A network of off-street paths maintains pedestrian connectivity,while the cul-de-sac-based auto network discourages through-traffic. Carthography by P. Stangl

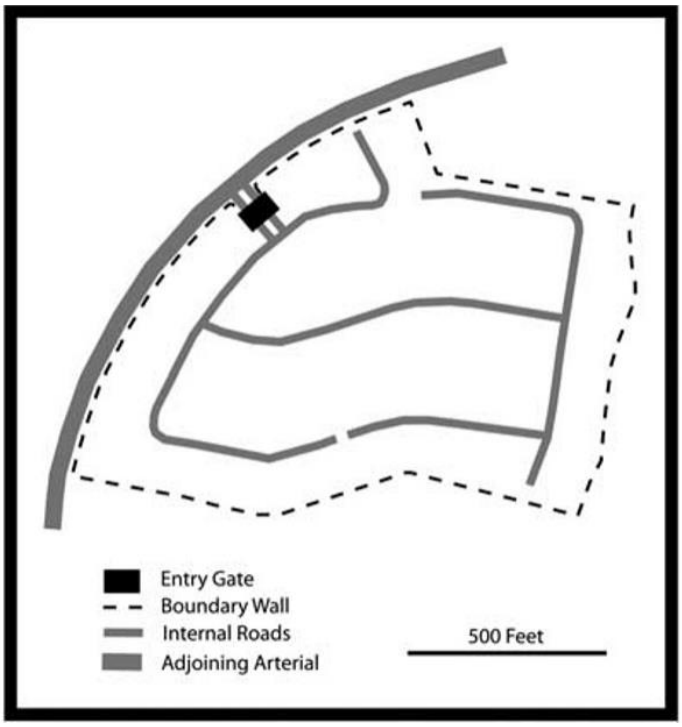


Figure 2.2. Las Vegas,NV. This emblematic gated subdivision provides one entry/exit point for autos and pedestrians, completely eliminating through-traffic and forcing internal movement into circuitious movements. Cartography by P. Stangl.

Brownfield Site means previously used site. Using brownfield sites for extension reduces the pressure on Greenfield Sites. It increases density since most brownfield sites are in the cities. (Sassi, 2006) Brownfield Sites that are contaminated require remediation before settlement.

Infill Development means restoring or reusing land that has already been built. (Wheeler & Beatley, 2014) Infill development should aim to fill the gaps in the urban fabric with necessary urban functions so that density is increased, the urban texture becomes more continuous and the urban space get qualified. It is a more complex development and often more expensive development that suburban sprawl. Reduced automobile traffic, reduced local government costs, dense and uninterrupted urban fabric and protection of wetlands are the advantages of infill development. (Wheeler & Beatley, 2014)

Traditional Neighborhood Development (TND) features, continuous and narrow streets enhancing slow traffic, pedestrian and bicycle dominant design, smaller

setbacks, porches, clustering of homes, town centers as attractive gathering places, public uses on ground floor of the buildings and residential on upper floor. (Flint R. , 2013)

Transit Oriented Development (TOD) -emerged in 1990s-2000s - refers to development located within walking distance of nearby transit mode. Mixed-use development is a must for TOD. When jobs, shops, and other activities kept close with living units transportation need to decrease, and human interaction increase hence more time and energy will be left to people for social interactions. The urban areas are activated more our in a day. This enhances safety and gather majority to start or support an activity. (Flint R. , 2013)

Conservation Based Development integrates environmental and social issues to mixed used urban or rural developments enabling for economic viability (Arendt 1996) Protection of watershed through landscape to improve water quality and natural habitat protection, choosing the site to avoid the disturbance of ecosystem are the key elements.

Low Impact Development (LID) design is focused on stormwater management to control water pollution and protecting watershed in already urbanized communities.

Lakes, streams and coastal waters are polluted through the urban runoff. This can be avoided through vegetation shields to infiltrate rainwater to feed underground water. The associated vegetation has many more to be beneficial to the urban environment such as livability, sense of place, aesthetics, enhanced property values, redevelopment potential, greater marketability, improved wildlife habitat, reduction with the heat island effect, smog reduction and increased air quality, enhanced wetlands protection and decreased flooding. (Flint R. , 2013)

Gehl simplifies outdoor activities in public spaces under three categories: necessary activities, optional activities, and social activities. (Gehl, 1980)

> **Necessary activities** include activities such as going to school, work, shopping, waiting for a bus, etc. The participants have to carry out these activities throughout the year.

Optional Activities depend on the mood of the participant and he chooses whether to realize them or not according to outdoor conditions. If the place invites them or the weather is nice. Optional activity frequencies are significantly affected by urban quality.

Social Activities are all activities that include other people in the urban space. These activities happen at the moment when necessary and optional activities occur. The intensity of interactions vary from close friendships to passive contacts (when you only see and hear people). (Gehl, 1980) (Figure 2.3)While high-intensity contacts improve close relations, feeling of security and belonging to a group, low-intensity contacts develop a sense of community, stimulate, give excitement, inspiration and coincidences. It is a prerequisite for other more complex interactions. Passive contacts lead to:

.contact at a modest level
.a possible starting point for contact at other levels
.a possibility for maintaining already established contacts
.a source of information about the social world outside
.a source of inspiration, an offer of stimulating experience.

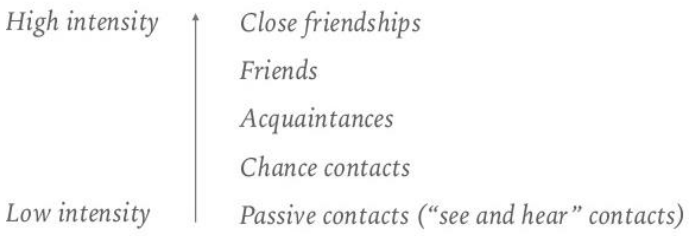


Figure 2.3. Different Types of Social Contact Points (Gehl, 1980)

"If activity between buildings is missing the lower end of the contact scale also disappears" says Gehl. The various contact types that occur between being alone and being together have been lost with the modern cities and the space that is produced under the strict rules of modernism have put sharp boundaries between isolation and contact (Gehl, 1980) Segregation of city functions and reliance on automobiles caused cities to become duller and monotonous.

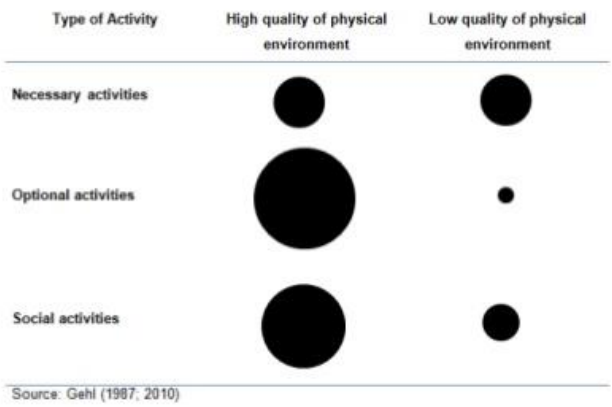


Figure 2.4. Frequency of activities changing due to the quality of the space

Optimal population density together with a connected space and mixed use development provides a ground for sharing economy, efficient transportation, energy efficient buildings and intensifies human interaction for social activities. However, it might have come with some disadvantages as well.

2.6.2. Community

Health, availability of education, employment, housing and time and place to spend with family, community and cultural activities, are all essentials for wealth that is a must for the wellbeing of the community and social sustainability. (Sassi, 2006) A life within an active and safe community offering access to these basic needs have a higher potential to have lower environmental impact. The focus of self-satisfaction will be shifted from materialistic desires to more intellectual level. Many recognizes that quality of life or happiness cannot be achieved with economic growth and material oriented lifestyles after meeting basic needs but it can be achieved through social connections and the ability of an individual to be stated in the society. (Sassi, 2006)

Aims of Sustainable Communities according to Phillips (2003) (Sassi, 2006)can be listed as follows:

- Minimize resource use and waste.
- Limit pollution to levels which natural systems can cope with without degradation.
- Meet local needs locally if possible.

- Enable everyone to have affordable access to safe food and water, shelter and fuel.
- Enable everyone to have opportunities for rewarding work. Unpaid work should be recognized. Payment for all work should be fair and fairly distributed.
- Protect everyone's health by providing clean, safe and pleasant environments as well as preventative measures and cures for the ill.
- Provide access to facilities, services, goods and other people without reliance on the car and not to the environment's detriment.
- Ensure people can live without fear of crime and personal violence because of personal beliefs, race, gender or sexuality.
- Provide access to skills, knowledge and information for everyone to contribute to society.
- Ensure community participation in decision-making.
- Make opportunities for culture, leisure and recreation available to all.
- Provide places, spaces and objects which are meaningful, beautiful and useful.
- Provide settlements that are human in scale. Ensure diversity and local culture are valued and protected.

2.6.3. Transportation

Cities have different strategies for transportation. Cervero (1998) talks about transit metropolises under following four headings:

Adaptive Cities are transit-oriented cities that have invested in rail systems to be a guide for urban growth. Low-income housing is developed around rail nodes. Stockholm, Copenhagen, Singapore, and Tokyo are the examples.

Adaptive Transit is that cities grow as low dense and spread out and they are served with high tech transit systems. Karlsruhe in Germany is one of them.

Strong Core Cities keep regional jobs and retail in their core. A good mix of mixed-traffic tram, light rail, bicycle ways, and pedestrian walks lead to healthy urban growth. Zurich and Melbourne are the cities with strong cores.

Hybrids are the combination of adaptive cities and adaptive transit. The high density is developed along the transit corridors and these systems connect the city core to the spread out suburbs as in Munich, Ottawa and Curtiba.

Traffic Calming is another key solution for a healthy city environment. It is the process of slowing down the traffic to keep street environment safer and more conductive to pedestrians, cyclists, shoppers, and residential life. (Newman & Kenworthy, 1999) Some benefits of traffic calming are;

- Reduces number of accidents.
- Increase air quality, reduce vehicle fuel consumption.
- Reduce noise pollution and disruption from the speed of the vehicle.
- Improve urban street environment for pedestrians.
- Gives space for other type of slow transit modes such as bicycle.
- Enhance local economic activity by creating a better environment for people.

2.6.4. Energy

District Heating and Cooling System is an energy solution to spend less energy and to have central control over the energy used for climatic conditioning of the neighborhood units. Districts energy systems are being used since the 14th century. (Rosen, 2012) Different energy sources such as geothermal, fossil fuel, biomass, and waste incineration have been used since then. (Table 2.1) Until the 1930s the primary energy transportation fluid has been steam through concrete ducts. However, steam is not efficient enough since large amount of heat loses and explosion risks. In 1970s, a Scandinavian district heating technology that is more efficient circulating lower temperature water with compact substations has been developed. In 1973 Sweden has switched from oil to coal for district heating as a result of oil crisis. Since 2014, 52% of fuel used for district heating in Sweden is composed of biomass. (Rosen, 2012)

Table 2.1. *Summary of Energy Resources*

Source	Description	Advantages	Disadvantages
Geothermal or ground source heat pumps [12]	Built in locations above large geothermal sources, typically those with naturally occurring hot springs, geysers or aquifers	Provides year around low cost heating and cooling using district energy technology	Geologically limited and usually only efficient in moderate temperature zones
Biomass [13]	Often using wood or energy crop based material to provide heat	Renewable resource that has strong advantages in a sustainable energy future	Low Availability in many places in Europe
Waste Incineration [14]	Combustion of urban waste to provide heating to nearby buildings	Utilization of heat generated from burning waste	Potential health effects from emissions when improperly managed
Waste heat [15]	Industrial and commercial process waste heat is used	Provides excess heat to nearby buildings and is able to offset some of the normal district heating fuel costs	Usually cannot provide sole source heating, but can be coupled with an existing DH system
Fossil fuels [16]	Burning of coal, oil and natural gas to provide heat	Processes and infrastructure often already in place, reducing fuel transport costs	Large source of greenhouse gas emissions, non-renewable energy source
Solar thermal [17]	Using sunlight and solar collectors to provide high temperature water for heating and cooling purposes	Passive and active systems with the option to also provide cooling during warmer seasons using absorption chillers.	Geographic assessments as well as proper planning are necessary; variations in peak demand may significantly influence performance

Net Zero Energy District concept is being observed as a pilot project in Östra Sale Backe in Sweden. District energy systems are adaptable to changing technology and can be controlled by central governments to limit urban pollution caused by heating. There are numerous opportunities to use the district energy systems in different fields such as the electric car infrastructures that are planned to be combined with district energy systems. It is a new field for engineers, investors, policy writers, designers, architects and planners to find new combinations to make the energy flow under control. (Rosen, 2012)

It is also very crucial to reduce the energy needed by households in the neighborhood, as much as making district heating systems efficient and sustainable. Results show that lower energy resources requires lower energy demands. So these projects should be handled as a whole. (Rosen, 2012)

Sassi (2006) defines some simple steps for designing buildings to minimize energy needed, these are:

Design with the Natural Environment: The most basic and cost free way of spending less energy and less expensive building solutions is designing with the natural environment.

-Orienting building to maximize solar gain. South façade is preferred to have larger surface area and glazing while north requires less glazing. It is preferred to control solar gain through sun blockers for hot seasons.
- Orient building to make use of planting and landscape. Planting may be placed to north facade to prevent north winds. Or prevailing winds may be turned into advantage for hot summers and vegetation may be used to cool the house. Planting is an efficient way to keep the microclimate milder in very cold or very hot seasons.
Design the building envelope to minimize lighting needs: Using natural light in an efficient way is important. If natural light cannot reach to some parts in deep rooms or dark mezzanines or basements use light ducts. Energy efficient lightening appliances makes significant reduction for the energy spend.

Encourage a resource saving lifestyles: Keeping showers 5 min or preferring showers instead of baths. Using water efficient appliances makes a great difference to control our wasteful use of water.

Use energy efficient equipment: Heating and cooling should be provided by natural ways as much as possible, if mechanical solutions will be used they should be energy efficient. Communal heating and electricity should be used where possible. Monitor building energy use and set energy targets. Educate users and implement energy saving policies.

Use green energy sources: Free energy sources such as wind, sun or geothermal heating should be preferred primarily. Renewable energy resources such as timber from managed forests or bio-oil may be a second alternative.

> "In the new energy economy, our cities will be unlike any we have known during our lifetime. The air will be clean and the street will be quiet, with only the scarcely audible hum of electric motors. Air pollution alerts will be a thing of the past as coal fired power plants are dismantled and recycled and as gasoline and diesel burning engines largely disappear." (Brown, 2011)

2.6.5. Water

Stormwater run-off in agricultural, industrial and urban areas and landfills will cause polluting substances to find their way through watercourses contaminating groundwater. In natural landscapes, such as forests, rain water is kept close to surface by plants. However, in the case of urban runoff, water flows into drains causing erosion, water pollution, flooding and diminished groundwater. (Sassi, 2006) (Figure 2.5)

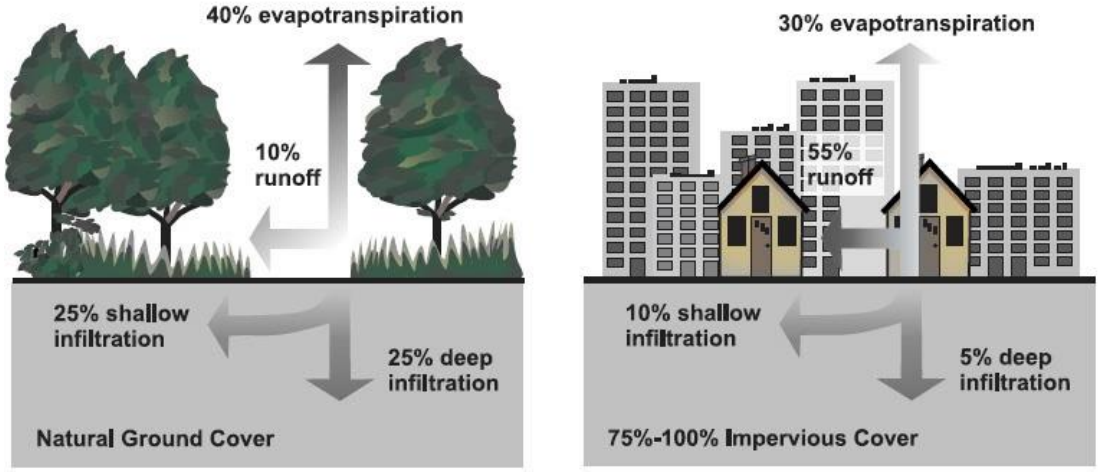


Figure 2.5. Relationship between impervious surfaces and surface runoff (Source: Environmental Protection Agency)

There are a mix of strategies that can be applied to avoid water contamination and save water.

The first step is to reduce the water use. Education combined with financial pressures have been proven to be successful. It does not need much financial support and have quick returns. (Sassi, 2006)

Water saving utilities is the second important strategies particularly for common places where user don't pay for the water bill. Dual flush WC, vacuum toilets, waterless toilets such as compost toilet, aerated taps and showers, automatic basin taps with infrared sensors, self-closing taps, water and energy saving laundry equipment should be chosen. Aerated taps use 3.6 liters instead of 20 liters per minute which is equal to 80% reduction. Water saving dishwasher can save up to 50%. (Sassi, 2006)

For Landscaping drought tolerant species (cactus, succulent etc.) and grass species require less water should be chosen if possible. Automatic irrigation with moisture sensors optimizes the use of water by irrigating only when required. Mulching reduces water evaporation. (Sassi, 2006)

Rainwater Harvesting, is used to accumulate the rainwater from roofs or rivers in deep wells or storages. Rainwater is usually used for irrigation, domestic use and indoor heating. (Sassi, 2006)

Rain gardens, absorb the rainwater flowing through hard ground covers such as roof, parking lot, and asphalt areas instead of letting the water flow through drains. The purpose of rain gardens is to improve the groundwater quality. Rainwater can cut down the pollution filtering rainwater through plants, soil and gravel. They are usually located to be the end point of drains. (Sassi, 2006)

2.6.6. Waste Management

There are different ways to deal with solid ways in the cities. Burying trash in landfill is the more widespread in US, incineration has been more common. Lyle (1994) have mentioned about the problems of dealing with trash widely in his book Regenerative Design for Sustainable Development:

> Landfills are responsible from the most of the soil and groundwater pollution. There are some solutions such as using a thick plastic linen to avoid leakage, surface drainage systems to avoid chemicals being leached through trash, covering trash with a layer of soil using methane collection pipes. Such

precautions made landfill relatively harmless. However decomposition of waste in landfills are extremely slow.

Incinerators are the complexes where the trash is burned that are more common in Europe. Burning makes waste disappear relatively and energy can be produced from the process. However inclinators release carbon monoxide, sulfur and nitrogen dioxides, dioxin, lead and mercury. Burning still remove trash completely but leaves ash behind which causes groundwater contamination.

Exporting Trash have been considered as another way. Especially dessert town economies in US may be willing to except exported urban pollution for a price. But this creates dangerous situation for the fragile dessert ecosystems. Exporting trash supporters claim that it is beneficial for the economies of the people who do have a little to offer for global economy. Opponents of waste trade claim that lack of regulations and failed policies have allowed developing countries to become toxic dump yards. Most of the hazardous waste is produced by Developed Countries such as EU and US but people in suffer from negative health effects in poor countries.

Repair, is a way to reuse a broken, unusable or malfunctioning product through fixing. Majority of malfunctioning or broken products can be fixed through simple steps however it is disregarded due to lack of knowledge, unwillingness to spend time or lack of tools for fixing. Besides, buying a new product is cheap and it is more appealing to have something new, latest fashion, top model.

Refurbishment, is a more reliable way to buy a used or broken product. Mostly it is a term used for electronics. If a product is returned to a manufacturer or vendor for various reasons, it is tested, repaired and resold by ensuring the proper function.

Recycling, is a mechanical process that requires reshaping or remanufacturing of an old material into a new form thus involves energy use (Lyle, 1994) Recycling metals are especially important for the reason that they are nonrenewable and the process of mining is expensive. As recycling becomes more common recycling facilities, composting sites, drop off nodes should be superimposed to urban structure.

Upcycling, is known as creative reuse process, fixing different objects or parts of objects together that are malfunctioning, broken or not used to create a new product for a different purpose of use. Upcycling have also been used for art, for music and industrial design.

Freecycling, is the way to give away useful items that people don't need anymore. Free cycling networks communicates and shares through online groups mostly.

Composting, biologically decomposes materials with aerobic process involving a community of bacteria, fungi and microorganisms. The output can be used as a beneficial soil amendment without adversely affecting the environment.

Aquatic sewage treatment**,** is a system which uses the capacities of both plants and microorganisms to apply organic recycling. Plants and organism are capable of any material out of water including nutrients, metals and pathogens. Depend on degree of treatment and given time the treated water can be suitable for human consumption. Water in polluted streams can be cleaned through wetlands. This is the reason why protecting wetlands and water bodies are important for urban design. Wetlands are also vital for ecosystems. Aquatic treatment systems do not need and steel or concrete structure. The only disadvantage is they occupy more land then mechanized systems.

2.6.7. Food Systems

Community Farming and supporting Local Food Producers will reduce the distance between food and consumer, it will buffer the unwanted and unsustainable impacts from other regional and even global influences. If this strategy is integrated in the Strategic Sustainability Plan it will be one of the alternatives to make money for the participants of the community members, will guarantee that all the members access to safe food, will promote the health. (Flint R. , 2013)

2.6.8. Materials

Life Cycle Assessment (LCA), is an evaluation system for environmental performance of materials during processes of extraction, processing, manufacture, distribution, use, repair, maintenance, disposal or recycling (Europa Innova; Biochem, 2011) There are five key stages;

- Raw materials – sourcing the materials required for the product or service
- Production – converting raw materials and assembling the products
- Distribution – getting the product to the end user
- Use – where the end user derives the direct value from the product or service
- End of life – what happens when the end user has finished with the product or service.

Life cycle Assessment Method is usually mentioned with "cradle to grave" approach. However the pronunciation evokes linear approach and sustainability is always supported by circular approaches where waste is the beginning instead of an end. A term "cradle to cradle" is mentioned for a more sustainable life cycle. (Europa Innova; Biochem, 2011)

Material Resourcing: The first issue when extracting the natural material is to consider the availability of the natural resource for the future generations. Materials such as stone, coal, metal ores are non-renewable. Timber, flax, hemp, cork is renewable materials. However if these materials over harvested their availability for future generations will be a question. Moreover apart from the resource availability overusing these materials will affect the surrounding environment, associated with pollution, the destruction of natural habitats, and the reduction of biodiversity. Increased concerns have resulted in some improvements in sustainable extracting methods such as small scale mining sustainable tree harvesting. (Sassi, 2006)

Manufacturing Process: Manufacturing requires energy which is often derived from fossil fuels. It has side products which is usually toxic polluting air, water and ground. But there are also natural materials such as timber and stone which requires minimal processing. For example adobe brick is made with earth and dried under sun producing almost no pollution or waste. Also there are materials such as metals or plastics. Metal smelting industries and chemical industry are the top two to contribute emission of toxins. Greenpeace have announced that PVC production process is seriously hazardous releasing organio chlorides, dioxins, PCBs, furans, ethylene dichloride and vinyl chloride monomers, as well as mercury pollution resulting from the production of chlorine. Reactions from people and governmental policies are forcing factories to operate Environmental Management Systems. (Sassi, 2006)

Transportation: Building Materials is mostly used in high amounts and massive weights. As a result transportation plays an important role for CO_2 emissions since energy required for transportation is still mainly sourced by fossil fuels. Either using transportation methods which is fossil fuel free or reducing transportation distance is required. Reducing transportation distance also supports local employment which is related to sustainable economy and social sustainability. (Sassi, 2006)

Maintenance: Minimizing energy and water requirements for maintenance. Using less chemicals for cleaning process is also helps to reduce life impacts. (Sassi, 2006)

Material Disposal: Reuse and recycle of the material should be encourage through design process and material selection. (Sassi, 2006)

Design for Longevity: Reusing and recycling of the material is as much important as producing qualified material for the longevity. The priority order to provide longevity should be as here; Reusing existing buildings, reusing building components and using recycle materials. (Sassi, 2006)

Sassi (2006) defines the issues to be considered for building materials below:

Minimising the need for materials

– Build only when really necessary.

– Build small.

– Design for effective use of materials.

– Design for durability and for reduced maintenance.

Use existing materials

– Reuse existing buildings.

– Reuse existing building components.

– Use recycled materials.

Design to enable future buildings and material reuse and recycling

– Design for flexibility and desirability to maximize the building life.

– Design for durability and desirability to maximize building component life.

– Design for recycling or to enable the biodegrading of materials.

Select new materials with care

– Specify renewable materials with short regeneration cycles.

– Specify timber from managed and accredited sources (e.g. FSC accreditation).

– Specify plentiful resources and avoid scarce resources.

– Specify materials mined, harvested or extracted with minimal impact on local and global environment.

– Specify materials associated with low manufacturing pollution.

– Specify materials associated with low levels of CO_2 emissions over the life of the building considering their impact on saving running energy.

– Consider manufacturers' environmental policies, track record and reporting.

– Specify materials that do not pollute the indoor air.

– Select locally produced materials requiring minimal transport

Material disposal and waste minimization

– Segregate timber, inert, metal and soil waste during construction and demolition and ensure their recycling.

– Arrange for excess material ordered and where possible waste material to be taken back by material suppliers.

– Include recycling provisions in buildings.

(Sassi, 2006)

2.7. Urban Regeneration

By 2050 the world population is expected to increase to 9 billion. Over two thirds of the population will be living in the cities. This means that the urban population that used to be 3 billion in 2009 will be doubled and most of the population increase are expected to happen in low and middle income countries. (Sclar & Volavka-Close, 2013) In today's chaotic urban atmosphere, regeneration of the urban environment holds the key for healthy, productive and secure cities. Yet it also has the potential to lead to "a planet of cities divided by great affluence for a few and crushing poverty for the many, a scenario that is borne out by the paradigmatic images of vast swaths of slums juxtaposed against modern high-rise buildings in the cities of the developing world." (Sclar & Volavka-Close, 2013)

Urban Regeneration is defined by Robert (2000) as "Comprehensive and integrated vision and action which seeks to resolve urban problems and bring about a lasting

improvement in the economic, physical, social and environmental condition of an area that has been subject to change or offers opportunities for improvement" He defines main objectives of regeneration of urban environments as;

- Redevelopment and revitalization of an economic activity that has already disappeared.
- Enabling social integration in the places that social exclusion exist.
- Reorganization of environmental quality and ecologic balance in the places that these issues have already disappeared. (Robert, 2000)

According to Özden (2008), urban regeneration is defined as an activity of transformation, improvement, revitalization and reproduction of the urban fabric that is not satisfying the needs anymore. Ülger (2010) specifies the definition for the case of Turkey as a term that refers to an arrangement of property whose land has crooked and dilapidated constructions, sensitive to natural hazards and urban risks, with insufficient and poor infrastructure, dense, illegal and unsettled. (Ülger, 2010)

Urban renewal, urban regeneration, urban development and urban rehabilitation have similar meaning but urban renewal and regeneration are usually used for large scale projects. (Zheng, Shen, & Wang, 2013) Although Urban renewal and urban regeneration used as synonyms in practice the meaning defers. Urban Renewal includes the process of slum clearance and physical development while urban regeneration considers multi-faced urban problems in deprived urban areas aiming to improve economic, physical, social and environmental conditions. (Ercan, 2011) Urban renewal is seen by Couch (1990) as "a process of essentially physical change".

Below are a number of principles that are identified by Robert (2000) reflecting the challenges of urban regeneration:

- A detailed analyses of the condition of the urban area should proceed to the design.
- Physical fabric, social structures, economic base and environmental condition of the urban area should be adapted simultaneously.

- Resolution of urban problems should be achieved through a comprehensive and integrated strategy in a balanced, ordered and positive manner.
- Strategy or resulting program of implementation should be developed with the aims of sustainable development.
- Quantified operational objectives should be set clearly.
- Natural, economic, human and other resources should be considered.
- The participation and co-operation of all stakeholders with a legitimate interest and seek for consensus through partnerships or other modes of working should be ensured.
- The progress of strategy and monitor the changes should be measured.
- Initial program of implementation is needed to be revised in the process.
- Various elements of a strategy may progress in different speeds, in such cases a redirection of resources in order to maintain a balance to achieve the aims.

2.8. Urban Regeneration in Turkey

Turkey has been through a rapid socio-economic, cultural and physical-spatial transformation process during last decades that is reflected on urban environments. Although urban regeneration is necessary through multifaceted reasons, today it is frequently mentioned by earthquake disasters in Turkey. (Özden, 2008) To understand the urban regeneration it is necessary to talk about a brief history of it.

Özden (2008) defines urbanization process as "modern, conscious, systematic and persevering" during republican period until 1950s. After 50s industrialization gained a momentum and automation in agriculture decreased the need for workforce. Farmers who cannot cope with economic constrains have moved with their families in metropolises rising accommodation issue as a problem. Together with increased speed of industrialization, squatter houses within the urban peripheries started to occur.

Following 1960s squatter houses occupying state lands are accepted as a mediator to gather votes from the citizens. Squatter owners are given land titles, municipal services such as electricity, water and road. (Özden, 2008) Furthermore, new legislations such as Act No.307 Municipal Law 1963), Act No.775 Squatters Law (1966), Act No. 6735,

Construction Law (1972) were put into force to overcome the non-planned urbanization. The aim was to transform these areas into legal residential zones to overcome the negative effects of squatter housing. The process of transformation were divided into three stages; Stage 1: Upgrading the infrastructure of squatters. Stage 2. People were moved to the newly constructed zones. Stage 3. The squatters were demolished and roads and houses were constructed in accordance with the well-integrated plan. (Ataöv & Osmay, 2007)

Between 1980 and 2000, the urban regeneration was still conducted together with the comprehensive planning and construction activities to improve the quality of life and increase the average income in the area. Following 2000 the current urban conservation plans were ignored, new transformation plans were prepared. The process became an unauthorized urban problem. (Güzey, 2009) The regeneration applications in Turkey does not have a holistic approach. Project-based urban design is destroying the urban fabric with unbounded housing islands. (Güzey, 2009)

There are four main reasons for the emergence of urban regeneration in Turkey according to Özden (2008).These are; Migration; unauthorized and unhealthy construction and shutter housing; problems of old urban parts; and natural disasters. Rapid urbanization following migration from rural to urban bring along the urgent need for accommodation. (Özden, 2008) Shutter housing emerged as an innovation of migrant population in market conditions in which the government remained incapable (Şengül, 2013) City centers in Turkey that are usually a core focus of historical assets have experienced urban decline. The city centers have lost their identities due to aged housing stock, incapable infrastructure, and commercial functions losing its favor. Lack of conversation and revitalization implementations have led to the solutions including demolishment. (Durmaz, 2014) Finally, following 1999 Earthquake in Turkey it has been necessary to eliminate the destructive effects of disasters. “6306 numbered Law for Regeneration of Disaster Risky Areas” is executed aiming to determine the risky buildings and replace the old housing stock with housing resistible to natural disasters. (Kiraz, 2014)

Table 2.2. *New Residential Unit Estimations for 2023 in Turkey* (Gürlesel, 2012)

TABLO.26 TÜRKİYE'DE KONUT İHTİYACI ÖNGÖRÜLERİ 2023 (BİN ADET)

YILLAR	NÜFUS ARTIŞI VE KENTLEŞME KAYNAKLI	KENTSEL DÖNÜŞÜM KAYNAKLI	YENİLEME KAYNAKLI (ESKİYEN KONUTLAR)	TOPLAM
2012	353	30	50	433
2013	352	90	50	492
2014	358	200	50	608
2015	401	200	50	651
2016	406	200	50	656
2017	412	200	50	662
2018	413	200	50	663
2019	419	200	50	669
2020	426	200	50	676
2021	430	200	50	680
2022	440	200	50	690
2023	430	200	50	680
TOPLAM	**4840**	**2120**	**600**	**7560**

According to the report "Real Estate Sector in the Vision for 2023" prepared by GYODER (Gayrimenkul ve Gayrimenkul Yatırım Orteklığı Derneği), urban population will increase from 57.39 million to 71. 14 million between 2011 and 2023. (TUIK) The total housing demand is going to be 7.56 million units. 64% (4.84 million) of the units will be needed due to increase in urban population and decrease in household size while 28% (2.12 million) is due to meet the deficiency caused by demolition of unlicensed residential stock or the housing that is exposed to earthquake risk. Besides 600 thousand housing stock that is older than 50 years will be reconstructed. (Gürlesel, 2012)

In 2011 number of housing units in urban areas was 18 million. (Gürlesel, 2012) The estimations of GYODER reveals that our cities will expand 142% in number of dwelling units until 2023. 7.56 million Units being added to this number means the total number of dwellings is going to increase 142%. These numbers indicates that it is a fragrant necessity to intervene to the current trends of urban transformation which is a complete fatality for our cities.

Kural (2009) mentions sustainability issues in the urbanization of Ankara:

1. Decentralization and Boundaries: Decentralization caused an increased cost of urban infrastructure. Also, agricultural land and natural resources are occupied.

2. Open Space Allocations: Green Belt System of Ankara is a successful planning attempt acting as air corridors and serving as recreational areas. However, speculative and dispersed urban planning in 2025 Plan Proposal does not contribute to the green system.
3. Road Building Programs: Car ownership is above expected projections in Ankara. Southwest region is heavily dependent on a limited mass transportation service. A hierarchical regional network that allows a center of urban culture is needed to be established.
4. Micro-centers and Urban Design: In 2025 Plan the southwest region will contain micro-centers with no hierarchical ordering of towns and districts causing urban sprawl, poor management of resources and mobility based on car ownership. (Kural, 2009)

The republic of Turkey Prime ministry- Housing Development Administration or "TOKİ" (Toplu Konut İdaresi Dairesi Başkanlığı) is the state lead organization that is providing affordable housing for low-income groups since 2012. The number of dwelling units produced by TOKİ between 2012- 2018 is around 837,000 which is 15% of the housing production on the national scale. Of these, 143,000 of the dwelling units are part of the regeneration projects aiming to transform slums. (TOKİ, 2018) In her study regarding TOKI housing projects Parlak (2015) has identified the main problems through a typological analysis and listed the common problems encountered in urban regeneration projects built by TOKİ.

Her study is based on forty TOKİ housing projects that are located in twenty-nine different cities with different geographical and climatic conditions, and she has arrived at the following conclusions:

- Majority of the sites have introverted traffic plans that are independent of the city network and consist of ring roads branching into cul-de-sacs and car parks. Usually, the sites also contained within boundary walls or fences and have one or two controlled entrances to the site. These internal roads remain deserted for most of the day increasing the risk of burglary.

- Opportunities for commercial or public interaction do not exist because buildings are set back from the streets and surrounded by fences.
- Introverted housing blocks do not encourage effective communal environments in all but two of the case studies where an appropriate street layout and communal spaces exist.
- Angular placement of the buildings is used to maximize the view and solar gain causing the lack of definition with street frontages.
- Although the communal areas and green spaces appear to be well-defined in the two-dimensional plans, the heights of the building blocks render them remote and disconnected.
- Standard building designs are used regardless of the location.
- Architectural diversity and quality are compromised to maximize time and cost-efficiency.
- Due to symmetric floor plans, some housing units lack direct sunlight during the day. (Parlak, 2015)

To overcome the problems listed above, Parlak (2015) recommends the following solutions.

- Site circulation should be designed as a part of the overall circulation network of the city.
- The ground floor organization is vital; hence building fronts should define streets and communal areas thus linking them to the outside spaces.
- Building entrances should facilitate social interaction and provide surveillance to open spaces as active streets. (Parlak, 2015)

2.9. The Neighborhood Sustainability Assessment Tools

Neighborhood Sustainability Assessment Tools (NSA Tools) evaluate the performance of the neighborhood against a set of criteria to be a guide for future improvements (Sharifi & Murayama, 2012). NSA Tools are also referred to as District Sustainability Assessment Tools, Neighborhood Sustainability Rating Tool, or

Sustainable Community Rating Tools (Sharifi & Murayama, 2012). As Charlot Valdieu (2004) stated, "Assessment tools transfer data overload into information for better decisions". In other words, sustainable neighborhood assessment tools have to regulate excessive amount of data gathered from the studies of different disciplines for comprehensive design approaches.

Certification systems have emerged for the necessity to rate the efficiency of green buildings. In the wake of Agenda 21, for the first time the idea of rating sustainability in urban scale has emerged. One of the forerunners was the HQE2R, developed by EU in 2001-2004. (Blum & Grant, 2006) Following it Earth Craft Communities (ECC) was launched in 2003 developed by the U.S. Between 2006 and 2009 four more rating system were launched; CASBEE Urban Design (CASBEE-UD, Japan), the U.S. Star Community Rating System (STAR-CRS, the U.S.), LEED Neighborhood Development (LEED ND, the U.S.) and BREEAM Communities (BREEAM-C, the U.K.). German system DGNB New Urban Districts and Australian System Green Star Communities are the recent additions. (Table 2.3) (Wangel, Wallhagen, Malmqvist, & Finnveden, 2015)

Table 2.3. *Some of the most well-known NSA tools* (Sharifi & Murayama, 2012)

	Tool's name	Developer(s)	Country/region
Spin-off tools	LEED-ND	USGBC, CNU, and NRDC	US
	ECC	The Greater Atlanta Home Builders Association, the Atlanta Regional Commission, the Urban Land Institute Atlanta District Council, and Southface	US
	BREEAM Communities	Building Research Establishment (BRE)	UK
	CASBEE-UD	Japan Sustainable Building Consortium (JSBC), and Japan Green Building Council (JaGBC)	Japan
	Qatar Sustainability Assessment System (QSAS) Neighborhoods	Gulf Organization for Research and Development	Qatar
	Green Star Communities	Green Building Council of Australia	Australia
	Green Mark for Districts	Building and Construction Authority (BCA)	Singapore
	Green Neighborhood Index (GNI)	Malaysian Institute of Architects (PAM) and the Association of Consulting Engineers Malaysia (ACEM)	Malaysia
	Neighborhood Sustainability Framework	Beacon Pathway	NZ
Plan-embedded tools	HQE^2R	CSTB	EU
	Ecocity	EU research project	EU
	SCR	Victorian State Government	Australia
	EcoDistricts Performance and Assessment Toolkit	Portland sustainability institute (POSI)	US
	Sustainable Project Appraisal Routine (SPeAR)	ARUP	UK
	One Planet Living (OPL)	BioRegional Development Group and WWF International	UK
	Cascadia Scorecard	Sightline Institute	US

Certification systems force the planning organization to define and use sustainability target early in the process by means of predefined indicators on environmental, social and economic sustainability. The tools can be used for marketing by property owners, landlords, architects and municipalities. A platform and a common language to

communicate and collaborate between various stakeholders are also provided via these certification systems. Evaluation of a number of pre-defined sustainability criteria during the assessment process are carried out by third parties. (Wangel, Wallhagen, Malmqvist, & Finnveden, 2015)

Among 17 Assessment Tools LEED, BREEAM and CASBEE are chosen to be studied further for this research. Most significant criterion for the selection of the tools is the availability of technical manuals and literature resources. Besides, these tools are most commonly used and have been applied on various urban design projects.

2.9.1. LEED for Neighborhood Development (Leed ND)

The USGBC (United States Green Building Council) is an independent nonprofit organization with a comprehensive knowledge on sustainability of the built environments. LEED (Leadership in Energy and Environmental Design) is an instrument for the Green Building Council to assess sustainability performance of the buildings during design, construction, operation and maintenance phase. (LEED, 2018) Being the most widely used green building certification system in the world, LEED has recently developed a version for urban scale, LEED ND. (Zuniga-Teran, et al., 2016) The first pilot version for Neighborhood Assessment has been released in 2007. (Sharifi & Murayama, 2012)

LEED ND is a shift in scale compared to previous LEED certifications. The concern of LEED ND is site selection, compact development, neighborhood design, urban infrastructure, a strong base for social interactions and economic activities, seeking for biodiversity and water resources. LEED ND has five main categories that are Smart Location and Linkage; Neighborhood Pattern and Design; Green Infrastructure and Buildings; Innovation; and Regional Priority.

Five main categories includes twelve prerequisites that have to be met in order to continue with scoring. Five of the prerequisites are under Smart Location and Linkage category; Smart Location, Ecological Communities, Wetlands and Agricultural land Conservation, Floodplain avoidance. Three of the items are under Neighborhood Pattern and Design; Walkable Streets, Compact Developments, Connected and Open Community. Four of them are under Green Infrastructure and Buildings category;

Certified Green Building, Minimum Building Energy Performance, Indoor Water Use Reduction, Construction Activity Pollution Prevention

The basic level of certification requires minimum 40 points, silver level requires 50 points, gold is 60 and highest point platinum requires 80 points. Total obtainable points are is 110 in addition to fulfilling the prerequisites.

2.9.2. BREEAM for Communities (Breeam C)

Building Research Establishment's Environmental Assessment Method for Communities (BREEAM for Communities) has been launched in 1990 as the first environmental assessment method for built environment. In 2011, BREEAM has decided to expand environmental assessment system to a more holistic approach with consideration of the social and economic impacts of developments. BREEAM Communities (BRE Global Ltd., 2012) is tailored to the specified planning policy requirements of nine individual regions in England. If the certification system is applied outside the UK than it will require the creation of BREEAM C scheme for the particular country or region with Building Research Establishment (BRE) Global.

The standards BREEAM C provide ensure social and economic benefits while mitigating the impacts of the built environment. BREEAM C methodology is a framework that considers the issues and opportunities that affect sustainability at the earliest stage of the project. There are three steps involved in the assessment of sustainability at the master planning level. These are;

- Step 1- Establishing the principles of the development, where the developer must show the suitability and need for specific types of the developments on the site. Strategic plans should indicate the housing, employment and the services that are required.
- Step 2- Determining the layout of the development, where the layout of the development is determined. This includes detailed plans for how people will move around and how the buildings are going to be located.

- Step3- Designing the details, involves detailed design solutions such as landscaping, sustainable drainage solutions, transport facilities and the detailed design of the built environment. (BRE Global Ltd., 2012) (Table 2.4)

BREEAM puts consultation and engagement process as the most fundamental keystone of a sustainable community. There are many assessment issues that requires some form of consultation with community representatives and other stakeholders.

Table 2.4. *Assessment issues with a link to consultation* (BRE Global Ltd., 2012)

Step	Issue
Step 1	GO 01 - Consultation plan SE 02 - Demographic needs and priorities SE 03 - Flood risk assessment RE 02 - Existing buildings and infrastructure LE 01 - Ecology strategy
Step 2	GO 02 - Consultation and engagement GO 03 - Design review SE 06 - Delivery of services, facilities and amenities SE 07 - Public realm SE 11 - Green infrastructure SE 12 - Local parking LE 05 - Landscape
Step 3	GO 04 - Community management of facilities SE 14 - Local vernacular TM 05 - Cycling facilities TM 06 - Public transport facilities

BREEAM C has various criteria such as Economic Viability, Demographic Needs and Priorities and Labor and Skills to ensure long term economic success of a development. BREEAM 2012 approach takes account of the economic effects of increasing demand on resources, services and land. While doing so it does not set guidelines for development economics of a site. This is considered as the responsibility of the local authority and the developer.

Criteria do also includes Compliance Notes, Schedule of Evidence and Additional Information part. This structure is very useful to keep assessment criteria part simple and easy to understand while increasing the applicability of the criteria. The compliance notes provide additional guidelines that supports the application and interpretation of the main assessment criteria. So, the schedule of evidence enables

assessor to verify the development's performance against the assessment criteria and award the relevant number of BREEAM credit. BREEAM C certifies with a rating of Pass (25-39 %), Good (40-54 %), Very Good (55-69 %), Excellent (70-84 %) and Outstanding for the full achievement (85-100 %). If the completion level of criteria is below 25% is unclassified. There are also mandatory standards but unlike LEED they are not separate criteria but one of the first steps in the criteria.

2.9.3. CASBEE Urban Design (Casbee UD)

CASBEE, developed in 2004 in Japan, aims to improve sustainability performance of urban planning in municipalities responding to the Low Carbon City Promotion Act (Eco-City Act) and seeks solutions for the problems unique to Japanese and Asian culture. CASBEE family covers housing, building and urban scales. (Sharifi & Murayama, 2012) The Japan Sustainable Building Consortium (JSBC) has also launched CASBEE City however CASBEE Urban Design is more aligned with LEED ND and BREEAM C.

CASBEE has a different calculation system that can be considered more advanced than other rating tools. A new concept called eco-efficiency is introduced to integrate factors from outside and inside of the building site. In other words it is typically defined as value of a product or service per unit of environmental load. (Figure 2.6)

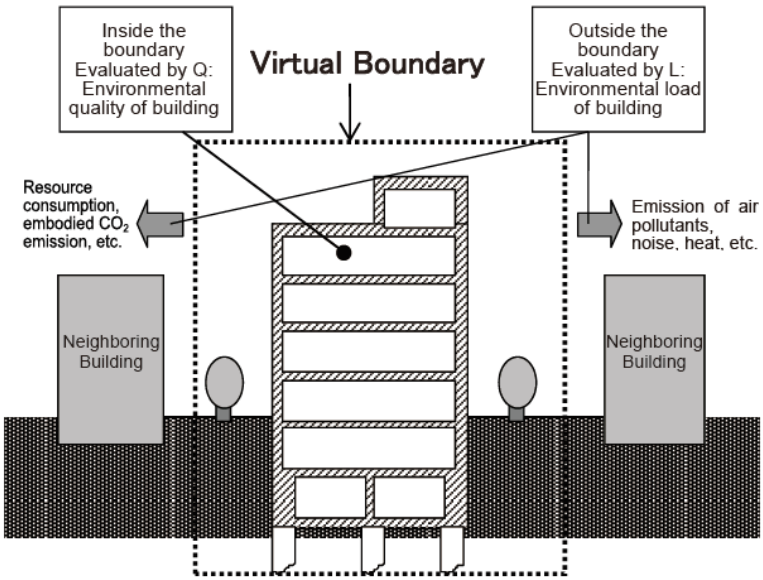


Figure 2.6. Division of the assessment categories for Q: Environmental Quality of Building and L: Environmental load of Building Based on The Virtual Boundary (CASBEE UD, 2014)

Assessment is maintained under two categories that are Q (quality) standing for the Environmental Quality of Building and L (Load) standing for Environmental Load of the Building. Q evaluates the positive aspects inside the virtual boundary that involves the entire project. L evaluates the negative aspects of environmental impacts that goes beyond the boundary.

$$\text{Built Environment Efficiency (BEE)} = \frac{\text{Q (Environmental quality of building)}}{\text{L (Environmental load of building)}}$$

Built Environment Efficiency (BEE) is an indicator calculated from, Q as the numerator and L as the denominator. The results are graphically represented which is a very efficient way to show the progress of the project. (Figure 2.7)

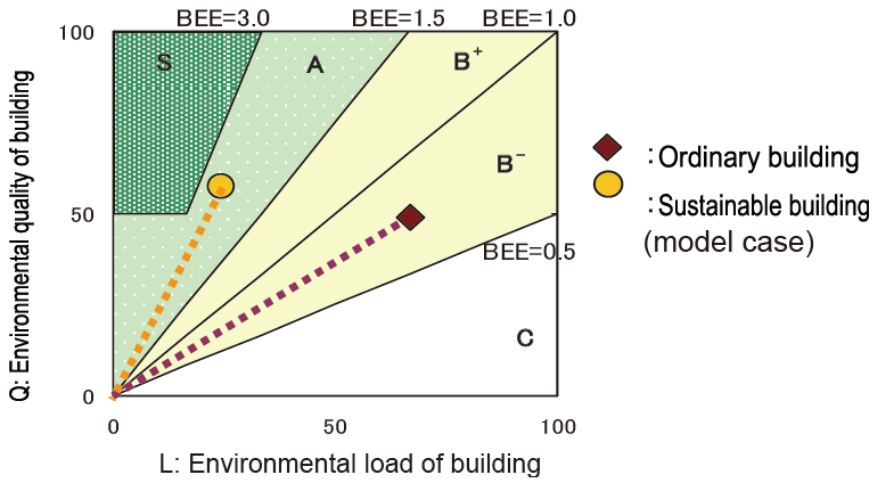


Figure 2.7. Environmental Labeling based on BEE (Building Environment Efficiency)

CASBEE has six categories. Three of them are under Environmental Quality and Urban Development (Qud) part. These sub categories are specified based on the triple bottom lines concept, environment (Qud1), society (Qud2), economy (Qud3). The other categories belong to Environmental Load of Urban Development (Lud) Lud1 measures the CO_2 emissions from traffic sector. Lud2 CO_2 emissions from building sector, Lud3 is CO_2 absorption in green sector. (CASBEE UD, 2014)

2.10. Case Studies

Case studies are essential part of the research in terms of data gathering to compose the list of problems encountered in regeneration projects. Two regeneration project from Ankara, Turkey are chosen to search in depth. Both cases are chosen from Ankara for accessibility reasons. Also the two cases have material on sustainability data.

2.10.1. The North Entrance of Ankara Urban Regeneration Project (The NEARP)

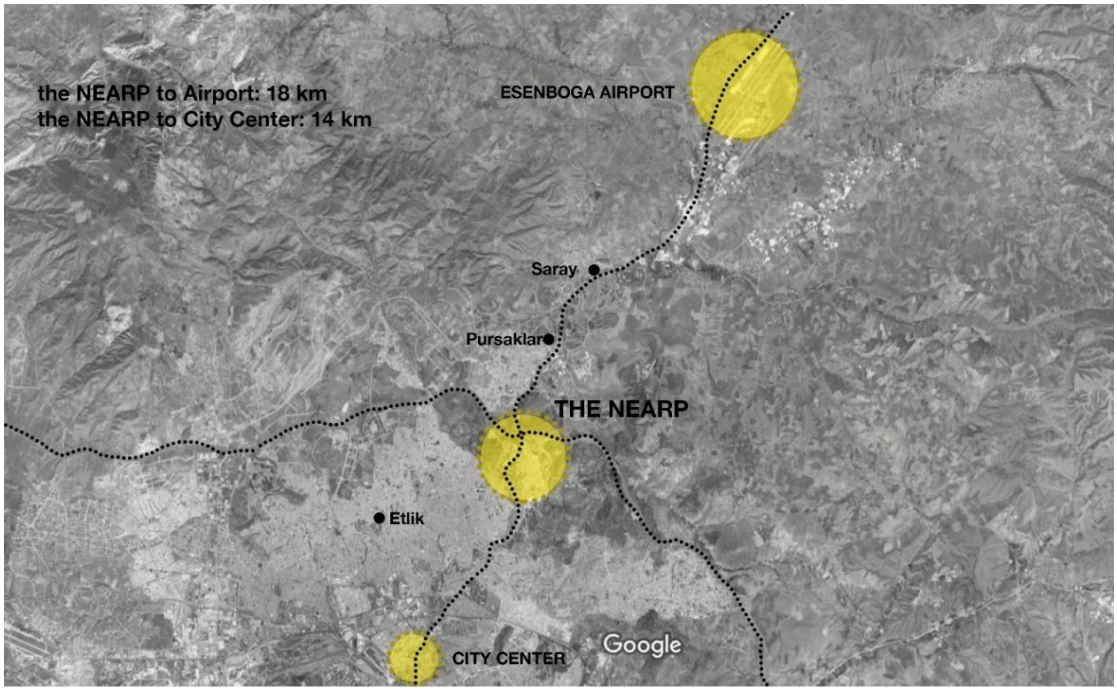


Figure 2.8. Satellite map of Ankara showing the location of the NEARP

The North Entrance of Ankara Urban Regeneration Project (The NEARP) is an urban regeneration project located within the peripheral highway of Ankara, which is also called the Airport Protocol Road (Figure 2.8) covering approximately 1,586 hectares area. It is an exemplary project for the favored position with special law and implementation process. The project is implemented in three phases. A greater part of the first phase is completed and residents have already moved in. (Korkmaz, 2015) Hence, this case study covers “the first major project phase” of The NEARP. (Figure 2.9)

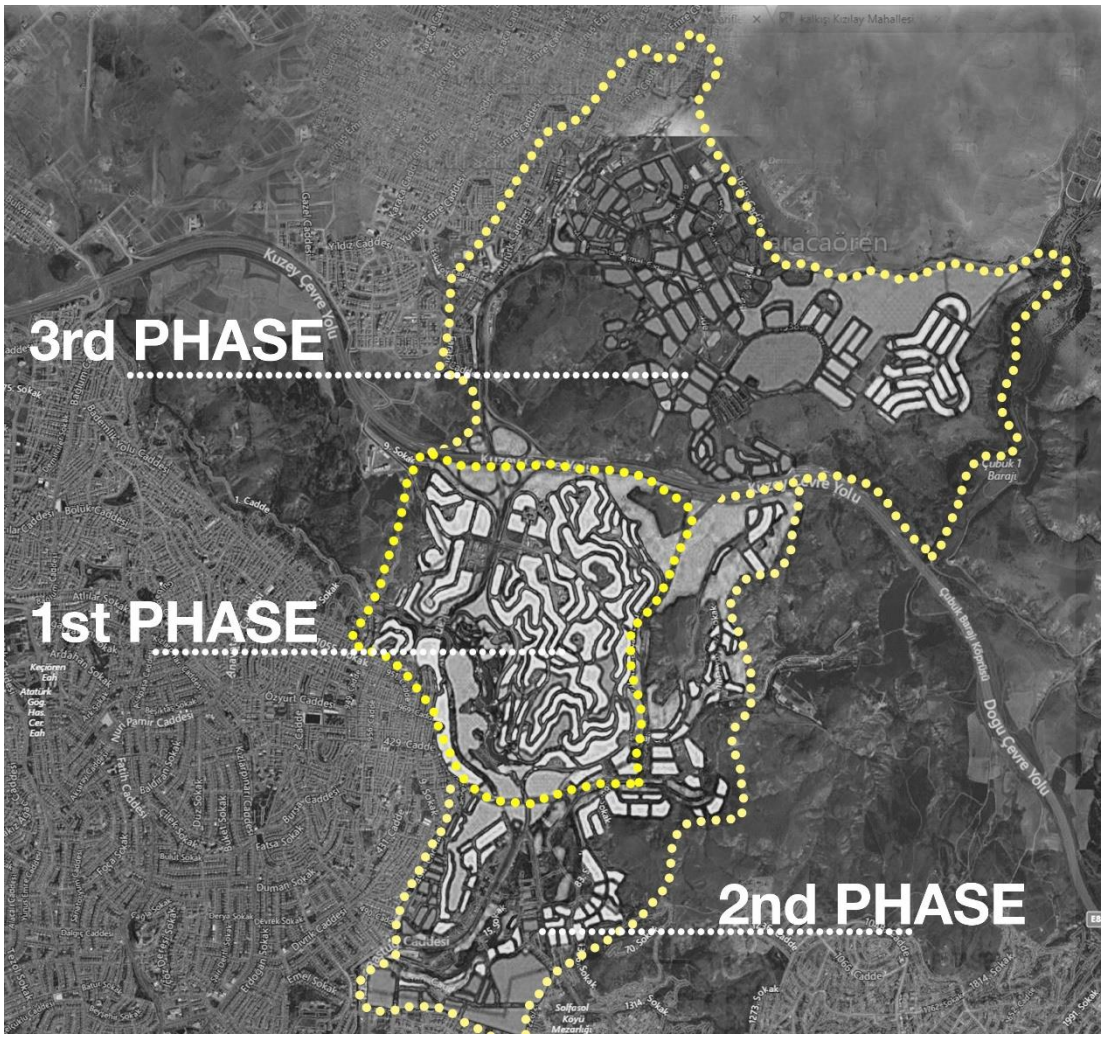


Figure 2.9. The NEARP is planned to be applied in three phases

The first major phase of the project that is located along the Airport Road is about 360 hectares and the planned population capacity is 70,000 people within 18,000 dwelling units. The second phase is located along the south and east borders of the first phase that is also Çubuk River Basin Area covering 510 hectares with 100,000 people planned population. Finally, the last phase located on the north of the first phase covers 650 hectares land with 50,000 people planned population. (Aluç, 2014) (Figure 2.9)

Table 2.5. *Features of the project phases*

Phase	Squatter Number	Planning Area (ha)	Planning Population	Housing
1.First Major Project	5,807	360	70,000	18,000
2.Çubuk River Basin	3,900	510	100,000	25,000
3.Karacaören	-	650	50,000	12,500
Total	9,707	1,520,000	220,000	55,500

Source: Aluç, 2014

Figure 2.10. Model of the First Major Phase (Korkmaz, 2015)

As noted by Yüksel (2007), the illegal housing started to spread around Altındağ area around the 1970s. By 1980s the illegal housing stock had already reached 9,000 units. Over time, the municipality provided infrastructure facilities, such as fresh water, electricity and sewage system. The number of squatter units had reached 10,500 just before the project was launched. (Yüksel, 2007)

Since 1983 there have been a couple of attempts to carry out squatter improvement plans, master plans that were based on a competition, and to increase urban density with four-story buildings in the region partially until March 2004 when the Law No: 5104 is enacted. (Yüksel, 2007) The project was carried out following the rules and

principles determined by this law, i.e. “Law on Urban Transformation Project for the North Entrance of Ankara” (Korkmaz, 2015)

According to this law the aim of the project was declared as follows: “The region that is located on the North Entrance of Ankara is occupied by illegal housing and the urban plans is not proceeding as expected. Hence, it is aimed to improve the quality of urban life by beatification of the city entrance, improvement of the city image and formation of healthier living conditions.” (Yüksel, 2007, pp:78- 114)

Figure 2.11. The NEARP Map (Source: Google Maps)

The first major project area is located on the site of two different municipalities. Eleven of the eighteen housing groups are within the jurisdiction of Keçiören Municipality and remaining seven are in Altındağ.(Figure 2.11) The right holders’ houses and

commercial houses are spatially separated from each other through valley and roads. The former are mostly located along the west side of the Airport Road whereas the latter are along the right side of the road. (Korkmaz, 2015)

Korkmaz(2015) also remarks that the topography of the region is a limiting factor for the design of the project. Municipality has indicated that high rise buildings having ten floors were considered to be appropriate.

Yüksel (2007) points out that 2400 TOKİ dwelling units were constructed between 2006-2007 in Karacaören Region for squatter owners who have proven their ownership before 2000. Those who could not prove their ownership had the right to buy a dwelling in Karacaören in return for 10 years payments. (Figure 2.12, Figure 2.13)

Figure 2.12. Karacaören Neighborhood bird eye view (Source: www.emlakkulisi.com)

Figure 2.13. Karacaören Neighborhood satellite view (Source: Google Maps)

Below are the problems experienced in the NEARP that Korkmaz (2015) has mentioned based on the information obtained via interviews with key actors of the project and a questionnaire survey with residents in the project site, in the year 2015. Some of these problems may have been solved by now but those that are connected with the built environment have been grouped according to the concerns of this thesis; i.e. Compactness & Connectivity; Transportation; Streets & Public Space; Urban Facilities; Social Wellbeing; Disaster Management; Ecology; Energy & Resources that are in line with the categories found in the three assessment tools.

5. Compactness & Connectivity

- The connections between buildings and main roads are through cul-de-sacs and staircases which makes it difficult for pedestrian. (Korkmaz, 2015)

6. Transportation

- Until the metro line that will connect the site to the city center and the airport is completed, the inhabitants will be obliged to use bus services that circulate once in every 45 minutes.
- Car parking is restricted to 20-30 cars for 90 dwellings. Inadequate means of public transportation has perpetuated high percentage of car ownership and ensuing parking problems. (Korkmaz, 2015)

7. Streets & Public Space

- There are sufficient amount of green areas in the project. However, the majority of the inhabitants don't often use them because of the location and connectivity problems; which are caused by the steep topography and wide roads surrounding the park.
- Residents cannot use the parks in the evening because of security problems. (Korkmaz, 2015)

8. Urban Facilities

- Although social and cultural facilities seem to be adequate. However, they are not well integrated to the master plan. They are located within the main park which is disconnected from the neighborhood.
- Although occupants are able to supply their daily needs, some crucial facilities such as cash machines, and pharmacy are not present and health services are insufficient in the area. (Korkmaz, 2015)

9. Social Wellbeing

- Security is a serious problem in the region since the house thefts are often. The acquaintanceship of the neighbors in the previous settlement that used to constitute a natural defense for the neighborhood security is broken with the weak connection between street and the dwellings.
- Eight different housing types including high tech houses and terrace houses are implemented in the project. Diversified housing types increase the chance of different user profiles enhancing social sustainability. However the houses that are built for right holders were separated by valley from the commercial dwellings. (Korkmaz, 2015)

10. Material

- The residents reported that in one year after they moved in the paints, kitchen cabinets, doors, elevators started to break down. (Korkmaz, 2015)

2.10.2. Çukurambar-Kızılırmak Neighborhoods Urban regeneration Project

Çukurambar and Kızılırmak Neighborhood presents a different urban settlement character unlike other regeneration projects in Turkey. Mainly because it is transformed with the revision of an improvement plan instead of a partial regeneration project. Being a part of the improvement plan resulted in the housing constructions taking place at parcel level. Also in contrast to other squatter housing regions that are mostly settled on governmental land, Çukurambar was owned predominantly by the private sector. The neighborhood is a continuing construction site. The plan is not delivering a good performance regarding socio spacial character because of the unfinished structure of the neighborhood. (Afacan, 2014)

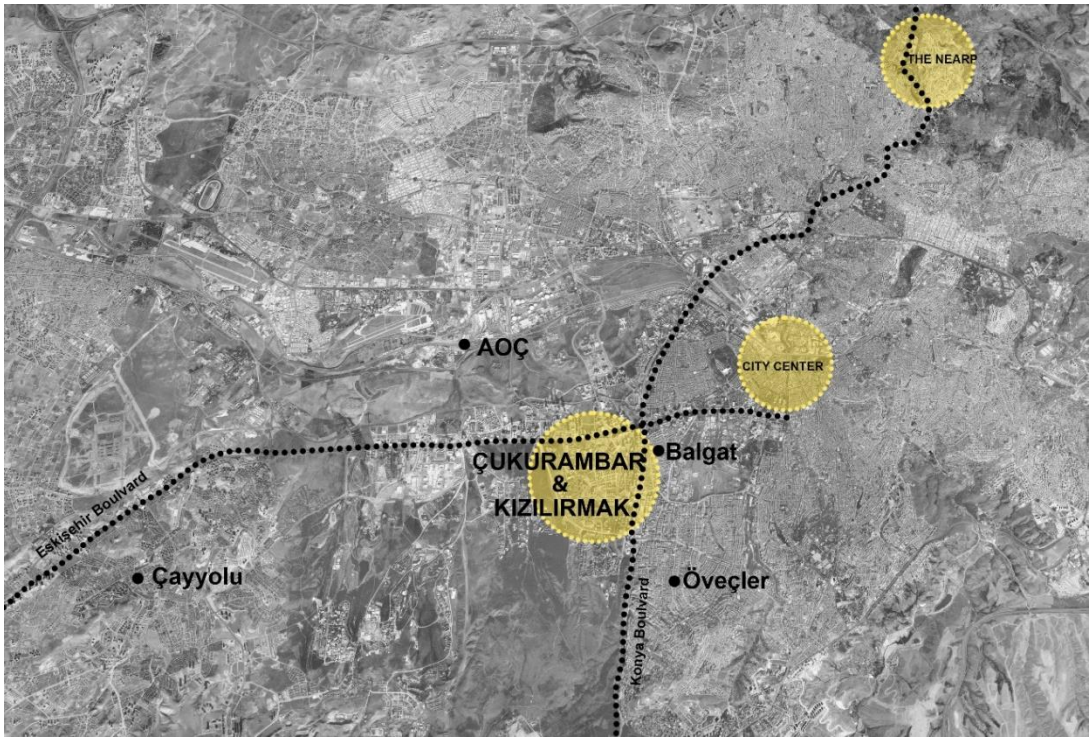


Figure 2.14. Sattelite map of Ankara showing Çukurambar & Kızılırmak Neighborhood Location. (Source: Google Maps)

Çukurambar is located on the junction of Eskişehir Highway (Inonu Boulevard) and Konya Highway (Mevlana Boulevard) connecting east-west and south-north regions. (Figure 2.14,

Figure *2.15*) This strategic location is strengthened with its proximity to the Universities (METU, Ufuk University, Çankaya University, TOBB), government offices, ministries, party headquarters and business centers.

Before the initial settlements started in the 1950s, the area was used for agricultural activities. The crops were kept in storages in this region. The name "Çukurambar" which means hollow warehouse is based on the previous functional use of the land. The first inhabitants who came from different regions of Turkey have suffered from inadequate infrastructure. (Durmaz, 2014)

Figure 2.15. Map of Çukurambar Kızılırmak Neighborhood (Source: Google Maps)

The neighborhood density was planned as 200 people per hectare in the first improvement plan that was prepared in 1982 by Ankara Metropolitan Municipality. (Armatlı-Köroğlu & Yalçıner-Ercoskun, 2006) According to the first improvement plan, the buildings were planned as 2 stories with a minimum plot area of 2500 m2. However, 1/1000 Implementation Plan with a density of 300 people per hectare was approved instead of the first plan. While the plot sizes did not change, 10 to 5 story

buildings with the FAR (Floor Area Ratio) ranging between 2.00- 1.65 were planned. In the process, 50% parts of the right holders' property rights were assigned for DOP (Development Readjustment Share) and KOP (Public Partnership Interest). (Ankara Metropolitan Municipality, 1991)The revision plan was a parcel based solution rather than an integrated urban planning approach. (Afacan, 2014)During the implementation process, the population density was raised from 160 people per hectare to 330 people per hectare. (Durmaz, 2014) The population in Kızılırmak neighborhood had reached 6494 people while Çukurambar had 13283 people according to 2017 population census. (TUİK, 2017) According to the dwelling number based calculations of Durmaz (2014) approximate residential population of Çukurambar is 25000 people while Kızılırmak is 8000 people. The numbers are not including daily visitors coming for working, shopping or using healthcare and education services.

Afacan (2014) has completed a self-assessment questionnaire with 200 participants accommodating in Çukurambar Neighborhood. The questionnaire is composed of a comprehensive list with 55 items both covering physical and social dimensions. Green areas, pedestrian access, traffic, density, accessibility, lightning, and local government services are measured under the physical dimensions while interactions with others, safety from crime and traffic, comfort and safe usage, sense of belonging are under social dimensions.

Below are the problems derived from the resident satisfaction results of the study of Afacan(2014) and the problems derived from the study of Durmaz(2014). These are listed below under the headings of Compactness & Connectivity; Transportation; Streets & Public Space; Urban Facilities; Social Wellbeing; Disaster Management; Ecology; Energy & Resources that are in line with the categories found in the three assessment tools. The study is furthered under the heading of Case Studies.

1. Compactness & Connectivity

- Pedestrian access to stores and cafes are not satisfying. (Afacan, 2014)
- Streets are not designed considering accessibility for all, regardless of age or circumstance. Residents are complaining about problematic characters of

narrow footways, poorly connected streets, level changes without ramps and heavy traffic. (Afacan, 2014)

2. Transportation

- Business centers and malls concentrated in Kızılırmak Neighborhood, universities, private schools, hospitals, luxury cafes, restaurants, pharmacies, baby stores concentrated in Çukurambar Neighborhood attracts an excessive amount of daily users depend on private vehicle. High rate of private vehicle use, low capacity of urban transport infrastructure and lack of car parking facilities cause traffic congestions in Muhsin Yazıcıoğlu Street, 1425th Road, Ufuk University Road. (Durmaz, 2014)
- The highest satisfaction levels are public transportation and distance to shops according to residents. (Afacan, 2014)

3. Streets & Public Space

- Majority of the participants were dissatisfied about traffic safety.
- Nearly all participants complained about congestion and outdoor noise.
- The trees and presence of green areas are not enough. (Afacan, 2014)

4. Urban Facilities

- Local government services are not enough. (Afacan, 2014)

Variety of functions such as residential, office, commercial, health and education spread within the neighborhood. The daily user number who use

- services other than residential (18000 people) is close to the number of residents (33000 people). (Durmaz, 2014) Mixed used neighborhoods are preferred to improve the sustainability of the neighborhood.

5. Social Wellbeing

- Cars occupy too much urban space causing noise, pollution, and carbon dioxide output more than citizens can tolerate. (Afacan, 2014)
- Streets are not designed considering accessibility for all, regardless of age or circumstance. (Afacan, 2014)
- In recent years real estate values can only address high-income people, forcing the previous residents who owned their houses in the regeneration process to leave the neighborhood. (Durmaz, 2014)

CHAPTER 3

MATERIALS AND METHODOLOGY

The materials used and the methodology followed in this study are presented in this chapter. The process of the research that defines the Methodology are introduced as compilation of the data on Case Studies through literature review; site survey and interviews; determination of the framework and the weightings of the assessment tools according to categories; and deriving solutions from the criteria.

3.1. Materials

The material of this research consists of the Neighborhood Sustainability Assessment Tools (the NSA Tools), a literature review on urban regeneration in Turkey and case studies in Ankara (the NEARP and Çukurambar-Kızılırmak Neighborhood).

Three assessment tools have been selected amongst the well-known ones. Besides being widely used, the availability of literature and technical manuals were important considerations for the selection criteria. Leadership in Energy and Environmental Design (LEED) for Neighborhood Development; Building Research Establishment's Environmental Assessment Method (BREEAM) for Communities; and Comprehensive Assessment System for Building Environmental Efficiency (CASBEE) for Urban Development.

Case studies are used to derive the problems encountered in urban regeneration projects. Cases are chosen from the projects in Ankara whose sustainability performances have been studied before. Also, it was an important factor that the current inhabitants have already experienced the conditions in the neighborhood. In the literature review the problems are gathered from the secondary resources. In the results and discussions part, further research is conducted through on-site observation,

interviews and map analysis to complete the data collected from the secondary research.

3.2. Methodology

This research begins with a comprehensive literature review on “Sustainability” and “Sustainable Development Issues” and “Urban Regeneration”. It was important to comprehend the principles of sustainable neighborhood in order to be critical in the comparative analysis of NSA Tools.

Sixteen well-known NSA Tools have been identified in the study of Sharifi and Murayama (2013). After the review of these tools three assessment tools, LEED, BREEAM, CASBEE, were selected among the most frequently mentioned ones in the academic studies for further research. The availability of the literature and technical manuals were also vital considerations. A literature review has been conducted on the NSA Tools from various academic papers and the technical manuals.

The primary objective of the study was to evaluate the rating tools in order to derive the criteria that are able to respond to the problems in urban regeneration projects in Ankara. The problems were determined through the urban regeneration projects in Ankara. The selection criteria of case studies were that the project was completed to a large extent and the inhabitants had experienced the conditions in the project for a considerable period. Also, it was important that literature sources on the sustainability of the projects were available. Consequently, the NEARP and Çukurambar-Kızılırmak Neighborhoods were chosen to determine the status of urban regeneration projects. The secondary resources is used to collect to derive the problems in literature review. Further research was conducted on case studies under results and conclusion to complete the research on case studies.

Thereafter, a new framework is proposed to be able compare the three assessment tools. The structures of the existing rating tools were evaluated to understand the assessment categories. Hence, core neighborhood sustainability categories were derived from the selected NSA tools and interpreted according to the literature review

on Sustainable Urban Development and Urban Regeneration in Turkey. Below are the ten categories determined for the Framework:

- Consultation and Management
- Compactness and Connectivity
- Transportation
- Streets & Public Space
- Urban Facilities
- Social Wellbeing
- Economy
- Disaster Management
- Ecology
- Energy and Resources

Besides, Energy and Resources category have six sub-categories that are:

- Utility
- Energy
- Water
- Material
- Waste and Resources
- Green Building

Thereafter, a matrix was created to check the availability of indicators across the chosen assessment tools. The criteria have been reordered in the matrix. Eventually, a table was composed that shows the weights of the categories for each NSA Tool. (Table 3.1) Hence, we are able to compare each assessment tool by how much it weighs a specific issue in order of importance. However, quantitative data derived from the credit systems of each NSA tool is not reliable on its own to compare these

assessment tools. For this reason, qualitative information regarding similar categories and criteria of each rating tool had to be examined for comparison.

Table 3.1. *Table showing the weights of the categories for each NSA Tool.*

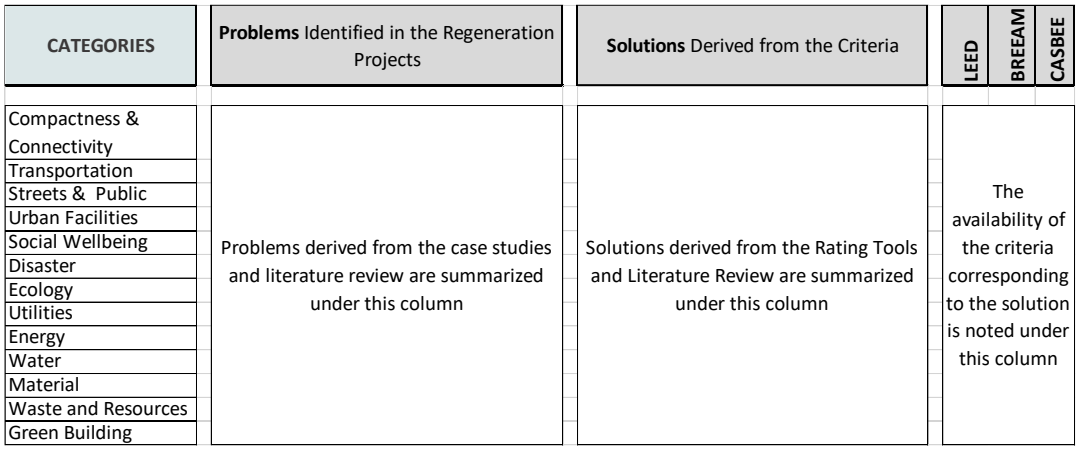
	LEED ND		BREEAM COMM		CASBEE UD	
Consultation & Management	1,8	%	6,3	%	5,6	%
Compactness & Connectivity	16,4	%	0,0	%	0,0	%
Transportation	11,8	%	10,3	%	5,6	%
Streets & Public Space	12,7	%	16,7	%	10,3	%
Urban Facilities	7,3	%	5,6	%	8,4	%
Social Wellbeing	9,1	%	6,3	%	3,1	%
Economy	0,9	%	4,0	%	11,3	%
Disaster Management	0,0	%	6,3	%	3,7	%
Ecology	7,3	%	7,9	%	7,0	%
Energy & Resources	23,6	%	31,0	%	42,3	%
UTILITIES	0,0	%	2,4	%	15,5	%
ENERGY	8,2	%	8,7	%	2,8	%
WATER	8,2	%	5,6	%	4,9	%
MATERIAL	0,0	%	4,8	%	2,1	%
WASTE AND RESOURCES	2,7	%	4,8	%	2,8	%
GREEN BUILDING	4,5	%	4,8	%	14,1	%

Before examination of qualitative data further research is conducted on case studies in order to complete the data gathered from secondary resources. In this scope the site of the NEARP was visited on 29th of April 2018 and 2nd of February 2019. The problems caused by the misapplications on built environment were documented through photos. The unobservable problems were determined through an interview with the Ankara Municipality on 8th of January 2019 and through map analysis that is produced on Autocad. Same procedure was carried out for the Çukurambar-Kızılırmak Neighborhood. The site was visited on 29th of December 2018 and 6th of February 2019. The problems encountered are documented through photographs. The maps were prepared for connectivity and transportation analysis.

A qualitative comparison method forms the final step of the research. The problems encountered in the case studies and literature review related to regenerated urban

projects in Ankara were listed under the assessment categories identified in the previous step. Following this, some solutions were proposed that are derived from the relevant criteria in the rating tools and literature review. In other words, the proposals gathered from the literature review and rating tools are summarized under categories, in the form of a chart presenting the problems derived from the urban regeneration projects and criteria that are able to respond the problems (Figure 3.1). If a criterion exists in the rating tools that can be used to solve a problem identified in the regeneration projects then its availability is indicated in the table under the columns belonging to NSA tools (LEED, CASBEE or BREEAM).

Figure 3.1. *The chart showing the availability of the criteria in the NSA Tools for each category in accordance to the problems and solutions identified through case studies and literature review.*



In conclusion the responsiveness levels of the NSA tools to the problems caused by regenerated environments in Turkey was understood and the solutions that were identified from LEED, BREEAM and CASBEE have been gathered and presented as a guide in the form of a unified chart. The chart represents the summarized criteria that are gathered through the NSA Tools listed under thirteen previously defined categories.

CHAPTER 4

RESULTS AND DISCUSSIONS

This chapter begins with the analysis of the structures of the existing NSA Tools. A new framework interpreted from the existing tools is composed to be used for the ensuing analysis. The criteria of the NSA Tools were aligned in a chart under the same categories. A comparison chart that show the weighted values assigned to each category is presented and the results discussed. The further research is conducted through site surveys, interviews and map analysis on case studies to derive the problems on urban regeneration. The criteria that are able to respond to the problems are presented and discussed under each category.

4.1. Evaluation of the NSA Tools

4.1.1. Examination of Assessment Categories

The main concern on evaluating the three assessment tools is how to find a common language between them. Each assessment tool has criteria covering similar contents but with different names. Besides the criteria are arranged according to the categories specific to the NSA Tool. As a result, analyzing the existing structures of the NSA Tools and composing a new unified structure or common categories is essential to formulate a useful and clear guideline in order to move on to the evaluation stage.

The assessment tools use “criteria” to qualify sustainability of urban developments. Each criterion defines the standards for a specific issue to achieve sustainability. For example, CASBEE UD has a criterion called “Corridor Quality” that contains requirements about how to establish a network with peripheral natural space through a corridor.

Each rating tool seeks to provide clarity about the intentions of the criteria by assigning them “categories”.

> "It is difficult to categorize sustainability issues definitively, as they often affect all three dimensions of sustainability (social, environmental and economic)" (BRE Global Ltd., 2012)

As it is mentioned by the authors of the BREEAM UD, it is hard to clearly group the criteria since they are all interrelated. Such as "Light Pollution" criteria being under "Social and Economic Wellbeing" category while it also seeks to preserve biodiversity which is an issue related to ecology.

Hence we should always keep in mind that our aim is to simplify the evaluation phase for the NSA tools through finding a coherence between different criteria. Before formulating the new unified categories, it was necessary to comprehend the available ones. The three assessment tools have three different way of categorizing as can be seen from the following devoted sections.

i. LEED ND

LEED ND groups the assessment criteria under five categories. The majority of the criteria are collected under the first three categories that are "Smart Location and Linkage", "Neighborhood Pattern and Design", "Green Infrastructure and Building". (Figure 4.1).These are explained as follows:

> "Smart Location and Linkage" is mostly about avoiding the adverse effects of urban sprawl on society and environment. New developments should have high connectivity with adjacent sites and within itself, also alternative transportation systems should be provided. Housing and jobs proximity is vital to encourage balanced communities. Finally, ecological concerns are mostly addressed in this section. Protecting imperiled species and ecological communities, avoiding settlements on water bodies, wetlands, and agricultural land are recommended with the help of designers and experts on ecology.
>
> "Neighborhood Pattern and Design" involve issues such as walkability, compactness and public space that aims to improve social sustainability. Also, this part has strong requisites that prevent a neighborhood from becoming a gated community. The streets with high connectivity, façade arrangement sensitive to human scale, ground floor services to enhance the livelihood of the

neighborhood, accessibility to public space and recreational facilities all encourage public to be active in common spaces. Local food production promotes the environmental and economic benefits of community-based production and improves nutrition through better access to fresh food.

"Green Infrastructure and Buildings" deals with resource efficiency through requirements such as certified green buildings, water use reduction, minimum energy performances, and waste management. Additionally, prevention of pollution is also mentioned in this category.

"Innovation" aims to encourage projects to achieve exceptional or innovative performances.

"Regional Priority" addresses geographically specific environmental, social equity and public health priorities.

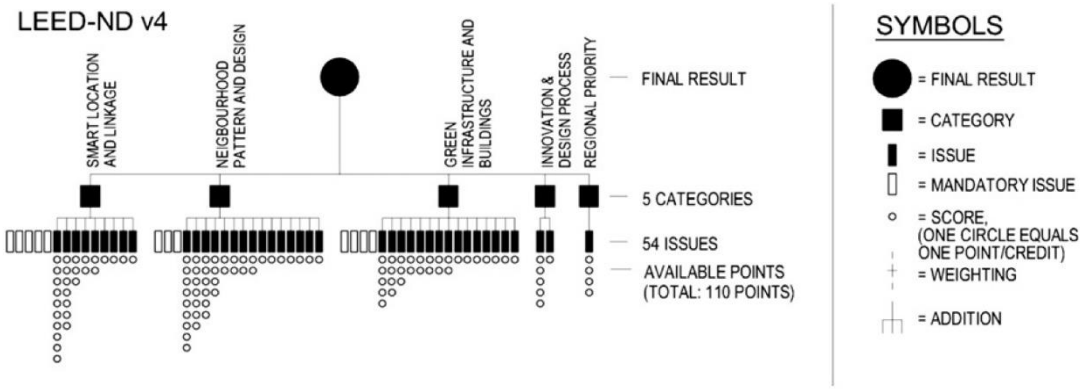


Figure 4.1. LEED ND Framework (Wangel, Wallhagen, Malmqvist, & Finnveden, 2015)

This categorization fits into the design phases of the urban developments. Such as the first category, "Smart Location and Linkage", can answer to the large scale design decisions including choice of location and ensuring the connection of the development with the surrounding. Besides, it seeks for the questions if the location of the settlement affects the biodiversity or house-jobs proximity negatively. The second category "Neighborhood Pattern and Design" follows it. This part mostly includes design decisions about neighborhood pattern, street design, neighborhood uses, internal connection, and universal design. Finally, last category "Green Infrastructure and

Buildings" are related to issues that require technical solutions which is the last design phase.

ii. BREEAM COMM

BREEAM has accomplished a well-functioning structure since it covers well both design phases and the content of the criteria. The assessment issues are; "Governance", "Social and Economic Wellbeing", "Resources and Energy", "Land Use" and "Ecology and Transportation and Movement". (Figure 4.2)

The order of criteria in the catalog are adjusted according to the design and construction phases, STEP 1, STEP2 and STEP3. Sorting criteria according to phases of the project enable the implementation of the certification system with a better performance than other tools. Since the design, construction and maintenance process takes for years. It will be easier to follow the process through steps.

"Governance" addresses community involvement which is a critical aspect for BREEAM. Consultation takes place in design, construction, operation and long-term stewardship of the development.

"Social and Economic Wellbeing" addresses societal and economic factors. It covers a wide range of issues including demographic needs, economy, public realm, adequate housing, and access to employment. Issues such as local parking and light pollution that have been identified differently by other rating systems are also ranked in this part.

"Resources and Energy" addresses the use of resources, reduction of carbon emissions.

"Land Use and Ecology" addresses pollution and protection of biodiversity.

"Transport and Movement" encourages the use of sustainable transportation systems and enhance walkability.

"Innovation" aims to encourage projects to achieve exceptional or innovative performances.

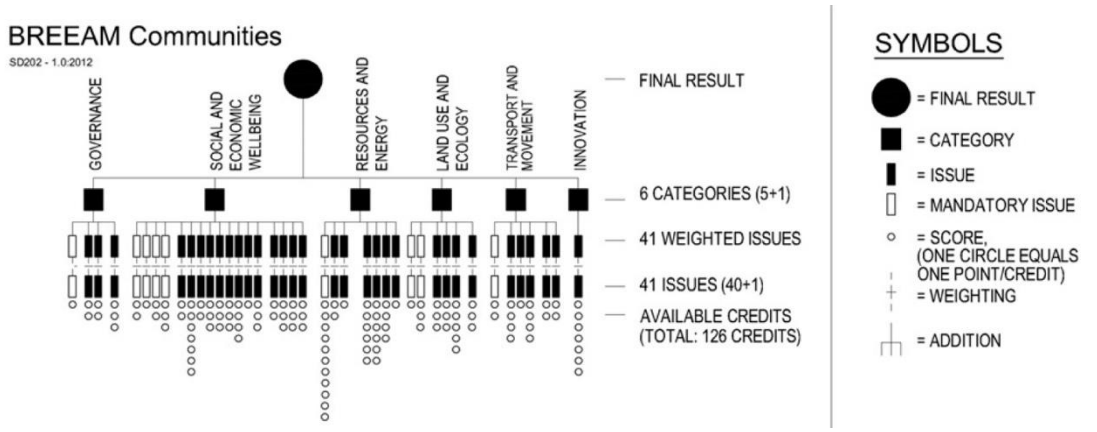


Figure 4.2. BREEAM Comm Structure (Wangel, Wallhagen, Malmqvist, & Finnveden, 2015)

BREEAM widely gives place to consultation and engagement not only under the category called "Governance" but also mentioned in sixteen criteria. Hence, the border of this category is fuzzy, unlike others. For example, to complete "Cycling Facilities" criteria that is under transport and movement, it is needed to consult local authority and community to establish similar facility requirements. The public consultation that is obligatory in many aspects might slow down the design and application process. However, the result will show the advantages of participatory design. Moreover, if an effective communication system and proper environment for workshops are achieved, it will speed up the process.

BREEAM has robust definitions to achieve social and economic sustainability. "Social and Economic Wellbeing" category embraces the society through economic studies, development plans by local demographic trends and priorities, acts to minimize social inequalities.

"Land Use" criterion, on the other hand, corresponds to "Smart Location" from LEED. However, it does not include definitions to achieve compact city as much as LEED. Since it belongs to "Land Use and Ecology" category, it only encourages the use of previously developed or contaminated land.

iii. CASBEE UD

Casbee UD follows the fundamental principles that sustainability relies on the three pillar, Environmental, Social and Economic. The three pillars are already told to be interrelated and have fuzzy boundaries, as a result, the structure is not useful in practice. The categorization technique of BREEAM complicates the application of the tool. But it makes Casbee UD a developing assessment tool since it is easy to enlarge subcategories. The categorization is based on a tree structure, starting with three basics of sustainability and branching into nine sub categories. (Figure 4.3)

“Environment” holds “Resource”, “Nature”, and “Artifact” sub categories. It is concerned with the preservation of biodiversity, avoiding the waste of all resources and promotes recycling and green building.

“Society” holds “Compliance”, “Security”, and “Amenity” subcategories. Creating equal condition for living, management, security of the streets, the urban uses located on a reasonable distance and protection of cultural values is covered under this category.

“Economy”, includes “Traffic” and “Urban Structure”, “Growth Potential”, and “Efficiency and Rationality” subcategories.

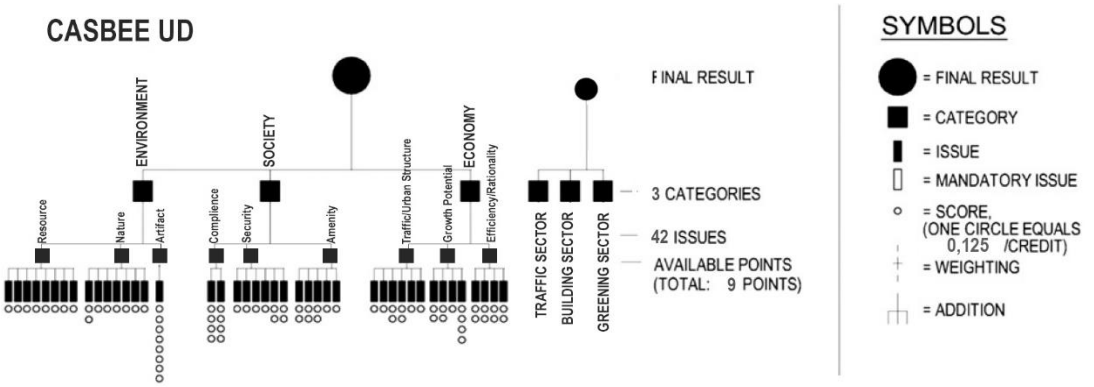


Figure 4.3. CASBEE Structure (Prepared by Zeynep Seyhan)

Casbee UD has confusing boundaries. For example, Transportation is only mentioned under “Economy” category but it affects both society and environment too. There is also no guide in which order to apply the criteria.

Briefly, categorization is essential to clarify the aim of the criteria and grouping the criteria simplifies the application of the assessment tool. If an issue is determined as a category in an assessment tool it indicates that the issue is well addressed. Such as LEED has a specific category named “Smart Location and Linkage” to control the location and connections of the settlement. Hence LEED has a higher performance than other tools on issues related to urban sprawl and gated communities. Also, BREEAM has a part called “Governance” and it covers the issue with all aspects from the collaborative design to facility management.

4.1.2. A Framework for Aligning Sustainability Criteria

It is essential to define categories to create a common ground for the comparative analysis. Categorization will allow the alignment of similar criteria in assessment tools. After analyzing the structures (with regard to categorization) of LEED, BREEAM and CASBEE common categories have been determined. Each NSA Tool has a reasonable explanation for the structure they use to align the criteria in their own way.

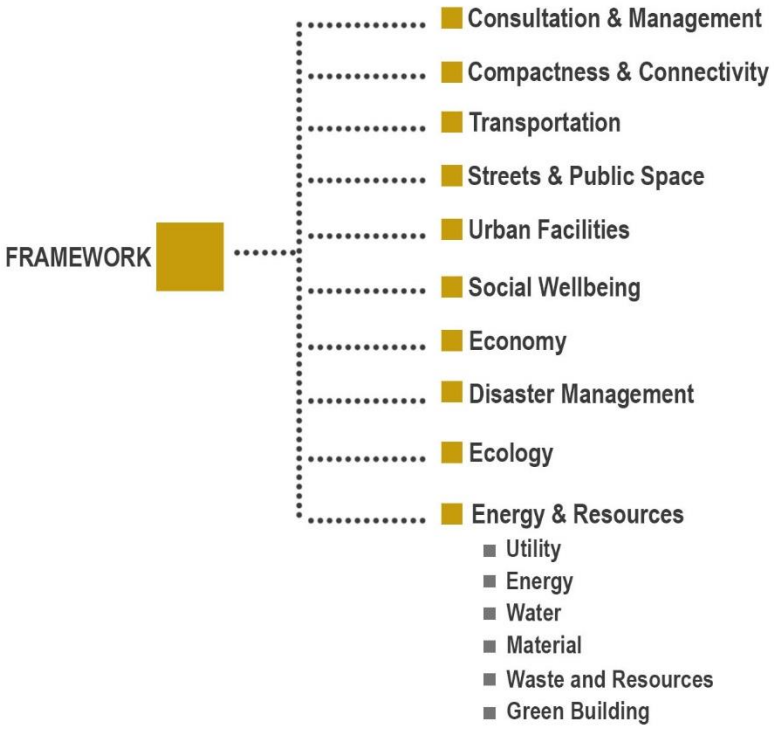


Figure 4.4. The framework interpreted from the existing NSA Tools

The definitions of the ten framework categories have been summarized through a review of the rating tools below.

i. **Consultation & Management:** Responsiveness to community needs is encouraged by involving the people who live and work in the community in project design and planning in decisions about how the project should be improved or changed over time. The community should be involved in phases of the design, construction, operation and long-term stewardship of the development. It is also important to create an active communication between parties. These parties might include local government, constructors, experts, interdisciplinary fields, communities from neighboring settlements.

ii. **Compactness & Connectivity:** Developments are encouraged to be settled within, near existing communities or public transit infrastructure. An appropriate number of connections with nearby developments and within itself is fundamental for the connectivity ratio of the settlement. The development footprint should be limited and improvement and redevelopment of existing

settlements should be encouraged. Conserving the land, promoting livability, walkability, and transportation efficiency are the aims. Reducing vehicle distances and providing adequate density will leverage and support transit investments. Hence, public health, social bounds, and economic activities will be promoted.

iii. **Transportation:** Reducing motor vehicle use by encouraging developments to have multimodal transportation choices and providing access to public transit is essential. Improving networks and facilities for bicycles, restricting local parking while providing a satisfied public transportation system is needed. Thereby air quality will be improved, by reducing intimidating factors for pedestrians such as noise, speed, and pollution that are caused by motor vehicles. Environmental and public health risks associated with motor vehicle use will be diminished.

iv. **Streets & Public Space:** Aims to encourage social interaction by creating comfortable and vibrant spaces in the public realm. Providing safe and comfortable street environments. Control of microclimate of the public spaces are vital for pedestrians and bike users through trees or other landscape elements and providing continuous pedestrian and bicycle networks are important. Safety of the streets should be provided through applications to avoid pedestrian injuries and crime. Appealing streets supported by different uses will encourage walking and biking hence will support human interaction and economy.

v. **Urban Facilities:** Mixed-use neighborhoods reduce automobile dependence, encourage daily walking, biking, and transit use. Providing access to diverse land uses, and achieving house and jobs proximity will encourage balanced communities and economies. Welfare, educational and cultural facilities should be accessible by everyone to support social equity.

vi. **Social Wellbeing:** The urban development should support social equity, diversity, social cohesions and quality of life. Socially equitable and engaging neighborhoods should be promoted by diversifying housing types and increasing affordability. The community should be a mix of residents from a wide range of economic levels, household sizes and age groups to live in a community. For this reason, universal design principles that enable a broad

spectrum of people, regardless of age or ability should also be considered for an equal society. History and culture is another keystone that respects local and national landmarks, generating designs that ensure that the development relates to local character while reinforcing its own identity. Local demographic trends and priorities should be well studied for an integrative development plan.

vii. **Economy:** A development that attracts inward investment, creates jobs and complements and enhances existing economic activity in the local area. Besides, contributing to adding employment opportunities also skills training should be provided. Local food production also supports the economy together with environmental, social and health benefits.

viii. **Disaster Management:** Precautions should be taken in case of a disaster such as flood, earthquake, and fire. Also, development should be ensured to be resilient to the known and predicted impacts of climate change.

ix. **Ecology:** It is crucial to avoid settlement on wetlands, water bodies or agricultural lands while encouraging the cleanup of contaminated lands and developing sites that have been identified as contaminated. Experts should study imperiled species and ecological communities on the land. The ecological study of the region should guide designing ecological corridors and proper elements to enhance the ecological value of the project. Light pollution has some consequences of development wildlife and people and should be reduced.

x. **Energy & Resources:** This part includes sustainable applications such as green energy, efficient water systems including wastewater and rainwater, low impact materials, resource efficiency and waste management and finally green building practices.

4.1.3. Comparison of Assessment Categories

Following the composition of the new framework all criteria in the rating tools are re-aligned under new categories according to their content. (Table 4.1) The main focus for the composition of the new framework was to be able to align all the criteria from existing assessment tools in a meaningful context. For example, the criteria that are related to “Flood Avoidance” is under the category “Disaster Management” in the

framework while LEED ND places it under “Location and Linkage”; CASBEE UD under “Society/Security and Safety”; and BREEAM under “Step1- Social and Economic Wellbeing”. As a result, all the criteria related to disaster management will be aligned under the same category. The following table presents the re-aligned criteria (Table 4.1) is composed as the new framework to be used in more detailed research on Assessment Tools.

Re-alignment of the criteria allows to measure the importance level of each category for the assessment tools. The Chart below is a matrix composed of the Assessment Tools on x axis and the categories on y axes. Similar criteria from different rating tools are aligned under the same category. NSA tools give points to each criteria with a scoring system. The points assigned to each criteria by the NSA Tools are given a weighting coefficient to calculate the percentages. The weightings indicate the importance of the category for the NSA Tool. The summary of the analysis is presented in *Figure 4.5*.

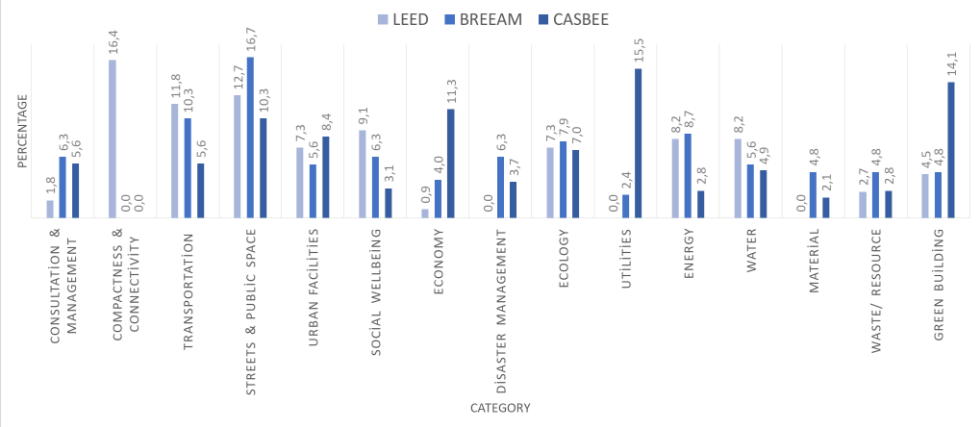


Figure 4.5. Comparison of LEED, BREEAM and CASBEE according to the weights of each category.

LEED is the only rating tool that has defined specific issues related to location, compactness and connectivity of the site that are critical in terms of sustainable neighborhoods, sparing a high percentage with 16,4. Also Transportation and Streets and Public Space Category has high weights with 11,8 and 12,7. This may be attributed

to the urban sprawl, high rates of private car usage and gated communities are one of the main problems in United States. Besides giving high percentages to this issues, LEED also have expedient quantitative definitions to control these issues through defining optimal the number of intersection points, street center line- building height ratio, distance of bus stops and amount of gated zones in the circulation network.

BREEAM, on the other hand, spares the highest weight for Streets and Public Space with 16,7. Beside pointed definitions on public realm such as using glazing on store frontages or spread of public activities on communal areas, it also asks for a study on how the space is going to be used for social interaction. Leaving the decisions to the control of experts is widely used in BREEAM. While it gives a flexibility for the design, if the applied country is a developing country the concept may be exploited.

CASBEE allocates the highest percentages for the energy and resources part. Utilities Category has 15,5 percent and Green Building Category is 14,1 percent . The outstanding difference of CASBEE from other tools is that the criteria it demands a high technology which is a specific issue for Japan considering its advances technology. Also Economy Category have the highest percentage in CASBEE.

Table 4.1. *Table of criteria in LEED,BREEAM and CASBEE aligned under each category.*

		LEED ND				BREEAM COMM				CASBEE UD			
CATEGORIES		CRITERIA OF LEED	Points	Percent	Total Percent	CRITERIA OF BREEAM	Points	Percent	Total Percent	CRITERIA OF CASBEE	Points	Percent	Total Percent
Consultation & Management		Community outreach and involvement	2,0	1,8	1,8	Consultation Plan	1,0	0,8	6,3	Area Management	0,5	5,6	5,6
						Consultation and Engagement	2,0	1,6					
						Design Review	2,0	1,6					
						Community Management of Facilities	3,0	2,4					
Compactness & Connectivity		Smart Location	Requir	0,0	16,4				0,0				0,0
		Connected and Open Community	Requir	0,0									
		Connected and Open Community	2,0	1,8									
		Preferred Locations	10,0	9,1									
		Compact Developments	Required	0,0									
		Compact Developments	6,0	5,5									
Transportation		Bicycle Facilities	2,0	1,8	11,8	Cycling Facilities	2,0	1,6	10,3	Logistics Management	0,3	2,8	5,6
						Cycling Network	1,0	0,8					
		Access to Quality Transit	7,0	6,4		Access to Public Transport	4,0	3,2					
		Reduced Parking Footprint	1,0	0,9		Local Parking	1,0	0,8					
						Public Transport Facilities	2,0	1,6					
		Transit Facilities	1,0	0,9		Transport Assesment	2,0	1,6		Development Levels of Roads	0,1	1,4	
		Transportation Demand Management	2,0	1,8		Transport Carbon Emmissions	1,0	0,8		Usability of Public Transportation	0,1	1,4	
Streets & Public Space		Walkable Streets	Requir	0,0	12,7	Safe and appealing streets	4,0	3,2	16,7	Traffic Safety	0,3	3,8	10,3
		Walkable Streets	9,0	8,2		Public Realm	2,0	1,6		Crime Prevention	0,3	3,8	
		Access to Civic and Public Space	1,0	0,9		Microclimate	3,0	2,4					
		Access to Recreation Facilities	1,0	0,9		Green Infrastructure	4,0	3,2		Ground Greening	0,3	2,8	
		Heat Island Reduction	1,0	0,9		Landscape	5,0	4,0					
		Tree-Lined and Shaded Streetscapes	2,0	1,8		Noise Pollution	3,0	2,4					
Urban Facilities		Housing and Jobs Proximity	3,0	2,7	7,3				5,6				8,4
		Mixed-use Neigborhood	4,0	3,6						Consistency with and complementing upper level planning	0,3	2,8	
										Convenience	0,3	2,8	
		Neigborhood Schools	1,0	0,9		Delivery of Services, facilities and amenities	7,0	5,6		Distance toWelfare/Educational/Cultural Facilities	0,2	2,8	
Social Wellbeing		Housing Types and Affordability	7,0	6,4	9,1	Housing Provision	2,0	1,6	6,3				3,1
		Visibility ad Universal Design	1,0	0,9		Inclusive Design	3,0	2,4					
						Demographic Needs and Priorities	1,0	0,8					
		Historic Resource Preservation and Adaptive Reuse	2,0	1,8		Local Vernacular	2,0	1,6		History and Culture	0,3	0,3	
										townscape and landscape	0,1	1,4	
										Harmonization with the periphery	0,1	1,4	
Economy		Local Food Production	1,0	0,9	0,9				4,0				11,3
										Inhabitant Population	0,3	2,8	
										Staying Population	0,3	2,8	
						Economic Impact	2,0	1,6		Revitalization Activity	0,5	5,6	
						Labour and Skills	3,0	2,4					
Disaster Management		Floodplain Avoidance	Requir	0,0	0,0	Flood Risk Assesment	2,0	1,6	6,3	Understanding of Hazard Map	0,1	0,9	3,7
						Flood Risk Management	3,0	2,4		Disaster Prevention of Various	0,1	0,9	
						Adapting to Climate Change	3,0	2,4		Disaster Prevention vacant space and evacuation route	0,1	0,9	
										Continuity of business and life in the block	0,1	0,9	
Ecology		Imperiled Species and Ecological Communities Conservation	Required	0,0	7,3	Enhancement of Ecological Value	3,0	2,4	7,9	Natural resourcess	0,1	1,4	7,0
		Wetland and Waterbody Conservation	Requir	0,0		Ecology Strategy	1,0	0,8		Patch Quality	0,1	1,4	
		Agricultural Land Conservation	Required	0,0						Corridor Quality	0,1	1,4	
		Steep Slope Protection	1,0	0,9						Landform	0,1	1,4	
		Site Design for Habitat or Wetland and Waterbody Conservation	1,0	0,9									
		Restoration of Habitat or Wetlands and Waterbodies	1,0	0,9									
		Long Term Conservation Management of	1,0	0,9									
		Brownfield Remedation	2,0	1,8		Land Use	3,0	2,4		Handling of Brownfiled site	0,1	1,4	
		Minimised Site Disturbance	1,0	0,9									
		Light Pollution Reduction	1,0	0,9		Light Pollution	3,0	2,4					
ENERGY AND RESOURCES	Utilities				0,0	Utilities	3,0	2,4	2,4	Block Management	0,3	2,8	15,5
										Compliance	0,5	5,6	
										Utilization Level of Standard Floor Area Ratio	0,1	1,4	
										Updatability and expandatability	0,3	2,8	
										Information Service Performance	0,3	2,8	
	Energy	Minimum Building Energy Performance	Required	0,0	8,2	Energy Strategy	11,0	8,7	8,7	Possibility to make demand /supply system smart	0,3	2,8	2,8
		Optimize Building Energy Performance	2,0	1,8									
		Solar Orientation	1,0	0,9									
		Renewable Energy Production	3,0	2,7									
		District Heating and Cooling	2,0	1,8									
		Infrastructure Energy Efficiency	1,0	0,9									
	Water	Indoor Water Use Reduction	Required	0,0	8,2	Water Strategy	1,0	0,8	5,6	Reduction of sewage discharge amount	0,1	1,4	4,9
		Indoor Water Use Reduction	1,0	0,9		Water Pollution	3,0	2,4		Reduction of Rainwater Dicharge amount	0,1	0,7	
		Outdoor Water Use Reduction	2,0	1,8									
		Rainwater Management	4,0	3,6		Rainwater Harvesting	3,0	2,4		Rain Water Utilization	0,1	1,4	
		Wastewater Management	2,0	1,8						Treated Water	0,1	1,4	
	Material				0,0	Low Impact Materials	6,0	4,8	4,8	Wood Material	0,1	0,7	2,1
										Recycled Material	0,1	1,4	
	Waste/ Resource	Building Reuse	1,0	0,9	2,7	Existing Buildings and Infrastructure	2,0	1,6	4,8	Garbage Seperation	0,1	1,4	2,8
		Recycled and Reused Infrastructure	1,0	0,9		Resource Efficiency	4,0	3,2		In-area resource circulation	0,1	1,4	
		Solid Waste Management	1,0	0,9									
	Green Building	Certified Green Building	Required	0,0	4,5	Sustainable Buildings	6,0	4,8	4,8	Environmentally Considerate Buildings	1,0	11,3	14,1
		Certified Green Buildings	5,0	4,5									
		Construction Activity Pollution Prevention	Required	0,0						Roof Top Greening	0,1	1,4	
										Wall Greening	0,1	1,4	
	Innovation	Innovation	5,0	4,5	4,5	innovation	7,0	5,6	5,6				0,0

4.2. Urban Regeneration Projects in Ankara

In this Chapter, results of investigations carried out in the case study areas, i.e. the North Entrance of Ankara Urban Regeneration Project (the NEARP) and the Çukurambar - Kızılırmak Neighborhood urban regeneration projects is presented. The information gathered to supplement the information obtained through the literature research is based on site investigations, interviews with the officials of Ankara Metropolitan Municipality and the master plan analysis.

4.2.1. Case Study 1: The North Entrance of Ankara Urban Regeneration Project(The NEARP)

Figure 4.6. Distribution of Residential, Commercial, Public and Green Areas in the NEARP.

i. Compactness & Connectivity

It is estimated that the number of dwellings will increase from 6000 unit to 18000 units when the project is completed. The population of the first phase will increase up to 70000 people. (Korkmaz, 2015) According to calculations with the data on previous and current dwellings, density has increased from 16.1 Dwelling Units (DU) per Ha to 50.0 DU per Ha which is considered to be a positive effect for compact cities. (Table 4.2)

Table 4.2. *Population / Density of the NEARP Before and After the Transformation*

1st Project Phase	Planning Area(Ha)	Dwelling Number	Planning Population	Density (Du/Ha)	Density (Popl/Ha)
Before	360	5807	22583	16,1	62,7
After	360	18000	70000	50,0	194,4

Connectivity has been measured according to the number of intersections of interior roads, the number of intersections on the boundary and number of intersections within 400 m of the boundary. The results calculated through map analysis are shown in Table 4.3.

Table 4.3. *Values obtained through the Map Analysis to measure the connectivity level of the neighborhood.*

Density: 50,0 DU/Ha
Number of Intersection inside the Boundary: 16 int per km2
Number of Intersection on the Boundary: 1,1 int per km
Number of Intersection outside the Boundary: 32,2 per km2

Internal Connectivity (16 intersection per km2) is weak according to LEED standards that require a minimum 54 intersections per km. The number of connectivity with the adjacent site is 1.1 intersections per km2. The minimum requirement of LEED

standards is 5.5 intersections per km. (*Figure 4.7*) Connections with the adjacent site on the southwest of the boundary are denser than north and east sides that are adjoined to the highway and a low-density neighborhood. However, when the map including the second and third phase analyzed it is seen that green areas and highways are obstructing connections between the 3 phases.

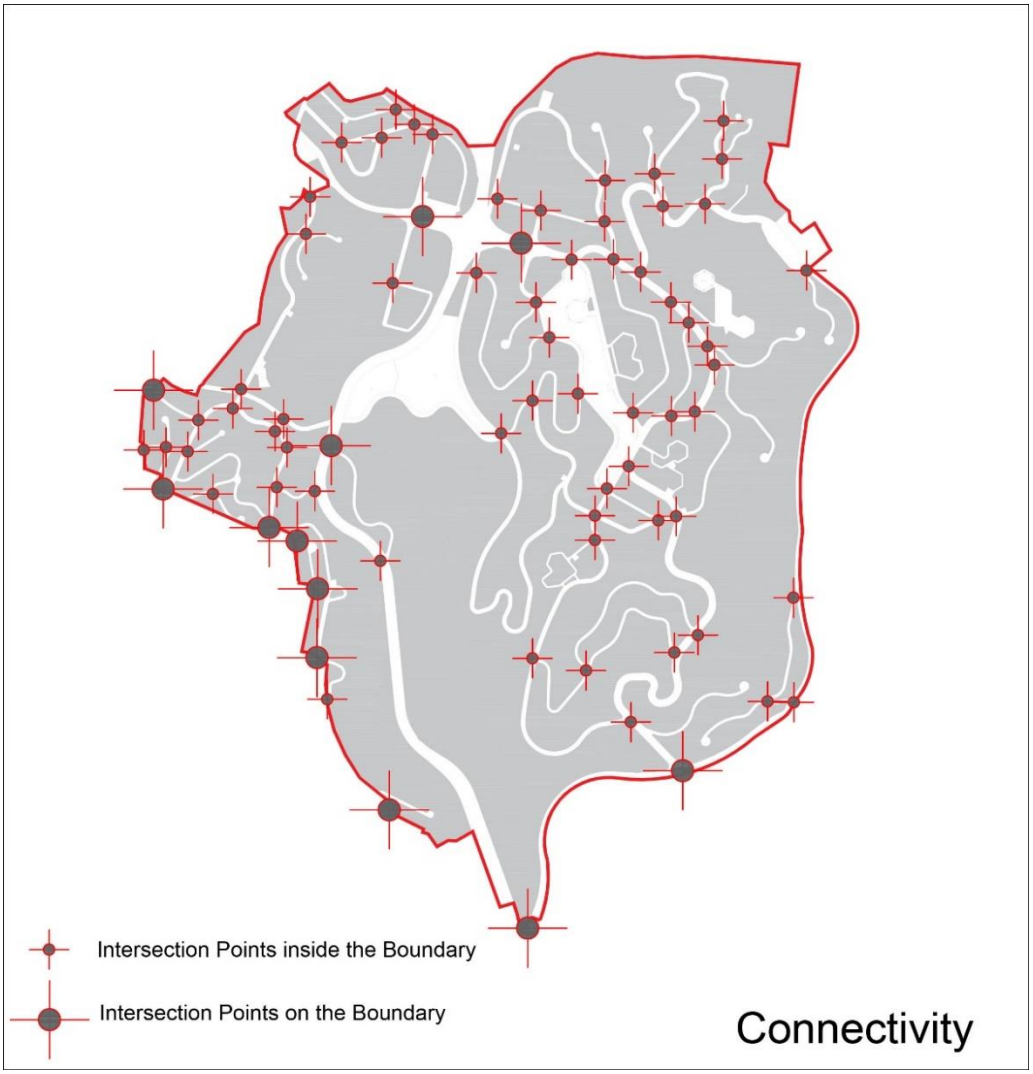


Figure 4.7. Connectivity map showing the intersection points inside the boundary. (Calculated according to LEED standards)

The number of the intersection points outside the boundary is 32.5 per km2 which is a little lower than the minimum requirement of 35 intersections per km2. (*Figure 4.8*) The value is close however majority of the connections are collected on south of the site which leaves the north site completely deserted and weakly connected.

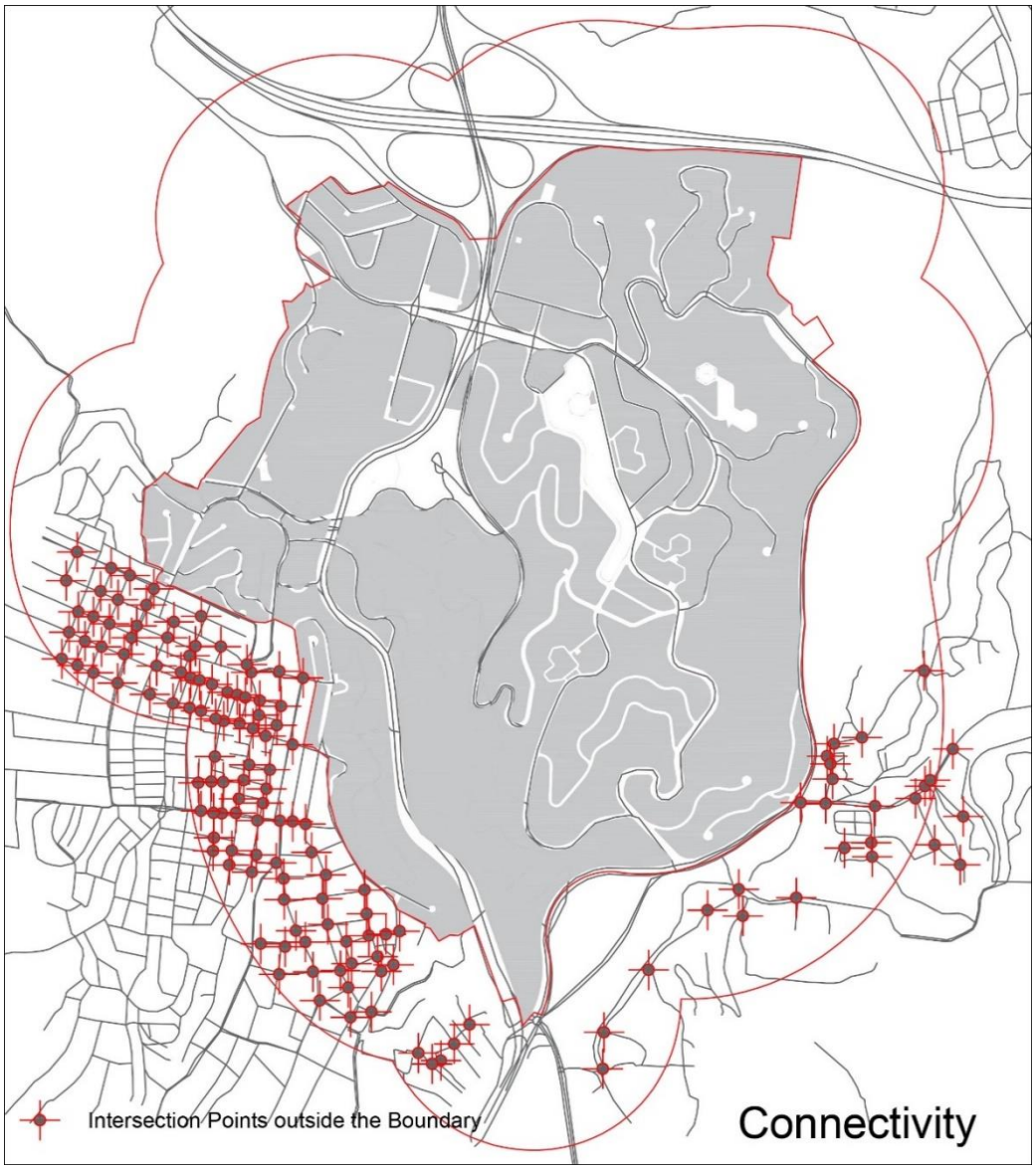


Figure 4.8. Connectivity map showing the intersection points in 400 m zone outside the boundary.(Calculated according to LEED standards)

ii. Transportation

A map showing the bus stops in the NEARP was prepared and distances were calculated (Figure 4.9).The circles are showing 400 m distance from the bus-stops. The distances seem appropriate for the existing dwellings. However, the walkability factor effects the transportation negatively. The pedestrian routes reaching to the bus stops are obstructed by retaining walls, steep slopes, long staircases, and insecure streets.

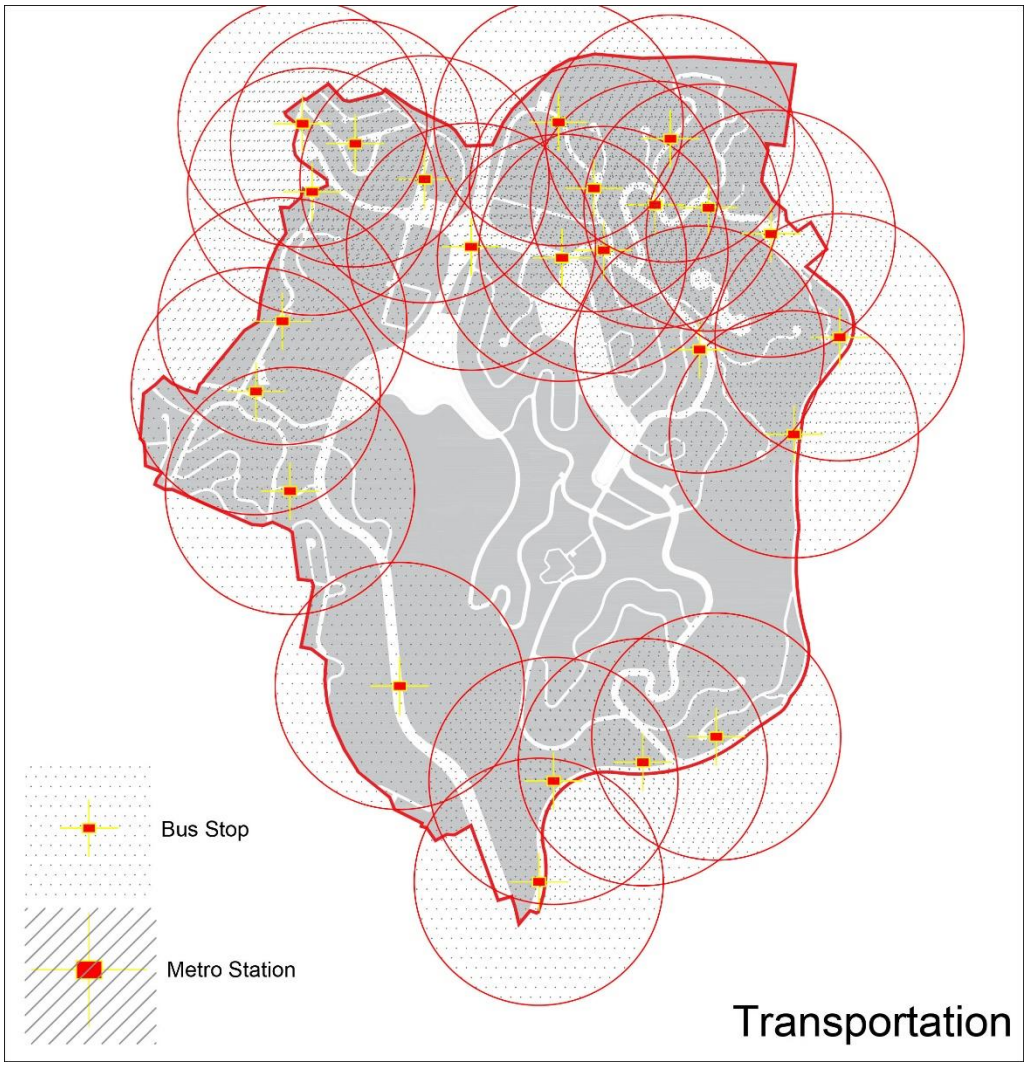


Figure 4.9. Transportation map showing bus stops in 400 m distance

Moreover, the transportation facilities, i.e. bus stops are not satisfactory. Shelters protecting from wind and sun, sitting facilities and real-time bus arrival information are lacking. (Figure A.1) Furthermore, no attempts observed for alternative transits such as bikes. There are no bike facilities or bikeways secured from motor vehicles.

iii. Streets & Public Space

Figure represents the common street sections that are 10 m wide with 1m pedestrian pathways on each side. Pedestrian paths are not shaded with trees. Some of the footpaths are near green areas. Currently, trees are not capable of shading the surrounding, but it is hoped that in 10 years or so they will grow enough to increase pedestrian comfort condition on the site.

Below are the observed problems considering walkability;

- The roads are wider than necessary that allow cars to reach speeds dangerous for pedestrians. (Figure)
- Barriers dividing the roads are restricting pedestrian crossings. (Figure)
- There are no traffic signs to secure pedestrian safety. (Figure)
- The pedestrian footpaths that are provided between roads and retaining walls without any shading element do not encourage use by pedestrians. (Figure)
- There are some attempts to implement pathways for partially sighted people. However, these paths are not provided throughout the site. Pathways are not adequately designed considering the movement of wheelchair, baby carriages or shopping trolleys. (Figure A.7)

All of the above factors contribute to uncomfortable street environments for pedestrians and it prevents them walking to the facilities and recreational areas in the site.

iv. Social Wellbeing

The master plan has failed to deal with the steep topography. Tall sustaining walls dominating the design creates unsurpassable boundaries for pedestrians. Few stairs have been built to connect the bottom and upper levels divided by retaining walls. This application is violating the ability to achieve universal design standards. People who are using wheelers or low capacitated people such as the handicapped, elders, toddlers, mothers with baby carriages, people with shopping buggies and bikers are the disadvantaged ones. Also, tactile pavements are applied partially. But continues application is not observed and tactile pathways are being intercepted frequently. (Figure A.8)

No attempts have been observed with respect to adaptive reuse, enhancing local vernacular architecture, preserving historical or cultural values. There are no traces left from the previous settlement, hence previous social interactions supported by diversified open spaces are taken up by monotonous building blocks.

v. Disaster Management

- All of the structures are designed according to the fire & earthquake regulations. (Ankara Municipality, 2018) However, in May 2018 water flooding incidence occurred on the roads surrounding the pool. (Kuzey Ankara Sel Felaketi, 2018)
- There is no study on the possible shortcomings of climate change in the site. (Ankara Municipality, 2018)

vi. Ecology

- Project is located 15 meter away from the wetlands. The land surrounding the river is reserved for green areas. However, the river is turned into an artificial lake made of concrete. The habitat of the river is not protected.
- Nature Protection Agency or qualified ecologist are not consulted in the process. (Ankara Municipality, 2018)
- The ecology corridors are interrupted by the highways.
- Native plants and plants needing less irrigation are selected for vegetation. (Ankara Municipality, 2018)
- Excessive amount of light use to enlighten facades and landscape are observed, which leads to light pollution.

vii. Energy

- On site non-polluting renewable energy generation is not applied. (Ankara Municipality, 2018)
- District heating and cooling systems are available. (Ankara Municipality, 2018)
- Smart house systems are not applied. (Ankara Municipality, 2018)

viii. Water

- Rainwater harvesting system exists. (Ankara Municipality, 2018)

- Grey water recycling for reuse is not available. (Ankara Municipality, 2018)
- Water saving fittings and fixtures are not applied. (Ankara Municipality, 2018)

ix. Waste & Resources

- Waste management and recycling strategies are not applied. (Ankara Municipality, 2018)
- The minarets of the previous religious buildings were not demolished in order to be reused. (Ankara Municipality, 2018)However, there is no trace from the previous development.
- Industrial wood is not used as construction material. (Ankara Municipality, 2018)

x. Green Building

- There are no new buildings that have been certified as green building in the site. (Ankara Municipality, 2018)
- Some green roof applications exist but there are no vertical gardens. (Ankara Municipality, 2018)

4.2.2. Case Study 2: Çukurambar & Kızılırmak Neighborhood Urban Regeneration Project

Figure 4.10. Distribution of Residential, Commercial, Public and Green Areas in Çukurambar-Kızılırmak Neighborhood.

i. Compactness & Connectivity

Durmaz (2014) indicated that the population has increased from 6795 people to 51000 people (residents and daily visitors) According to the author's calculations with the data about previous and current dwelling number, density has increased from 5.4

Dwelling Units (DU) per Ha to 40.5 DU per Ha which is considered to be a positive effect for compact cities.

Table 4.4. *Population/ Density of Çukurambar Kızılırmak Neighborhood before and after transformation.*

	Planning Area(Ha)	Dwelling Number	Planning Population	Density (Du/Ha)	Density (Popl/Ha)
Before	315	1698,75	6795	5,4	160,0
After	315	12750	51000	40,5	330,0

Connectivity has been measured according to the number of intersections of interior roads, number of intersections on the boundary and the number of intersections 400 m of the boundary. The results calculated through map analysis are shown in Table 4.5.

Table 4.5. *Values obtained through the Map Analysis to measure the connectivity level of the neighborhood.*

Density: 40,5 DU/Ha
Number of Intersection inside the Boundary: 36,7 int per km2
Number of Intersection on the Boundary: 2,5 int per km
Number of Intersection outside the Boundary: 35 per km2

LEED standards require minimum 54 intersections per km while the internal connectivity in Çukurambar –Kızılırmak Neighborhood is 37.7 intersections per km2. The number of connectivity with the adjacent site is 2.5 intersections per km. The minimum requirement of LEED standards is 5.5 intersections per km. The large governmental lot & universities that covers 1/3 of the total area, the highways on the north side and the east side may have resulted with low intersection values although the plan supports walkability more than gated communities. (Figure 4.11)

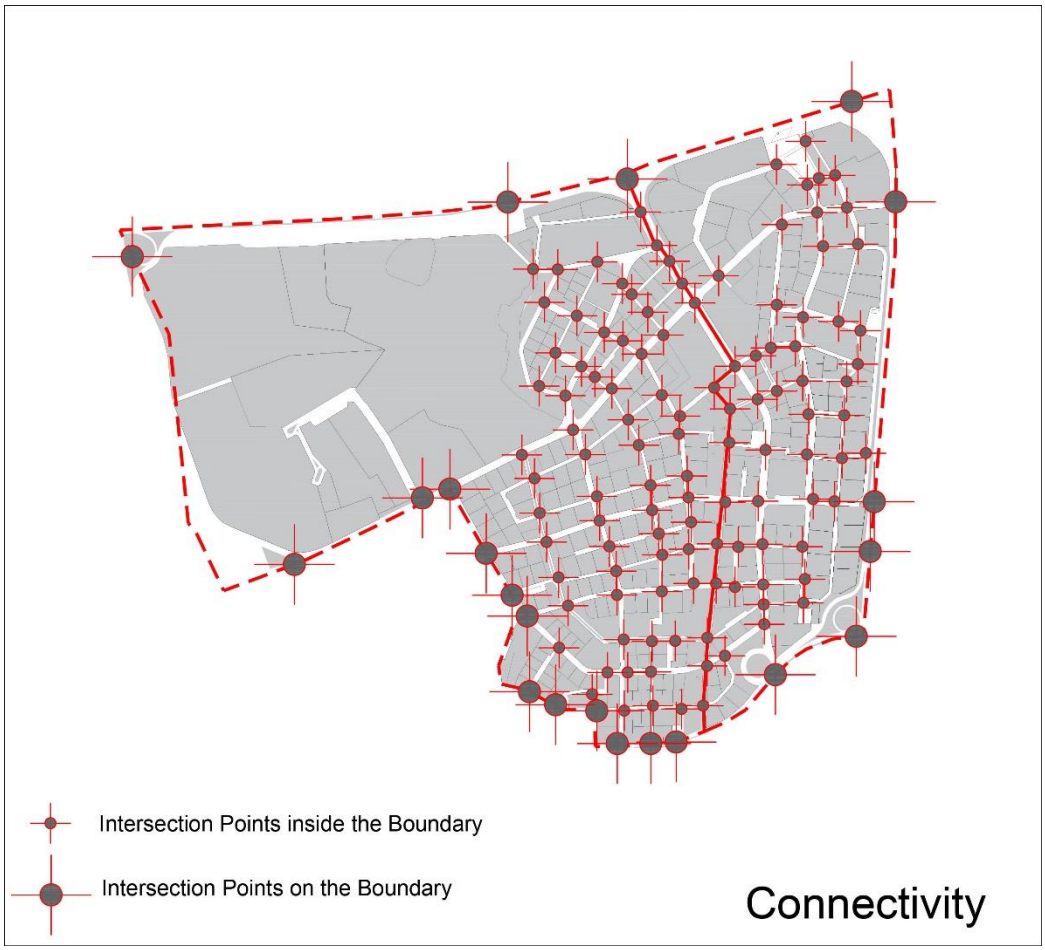


Figure 4.11. Map of Connectivity showing the intersection points inside the boundary. (Calculated according to LEED standards)

The number of intersections outside the boundary is 35 per km2 which is equal to the minimum requirement of 35 intersections per km2. (Figure 4.12)

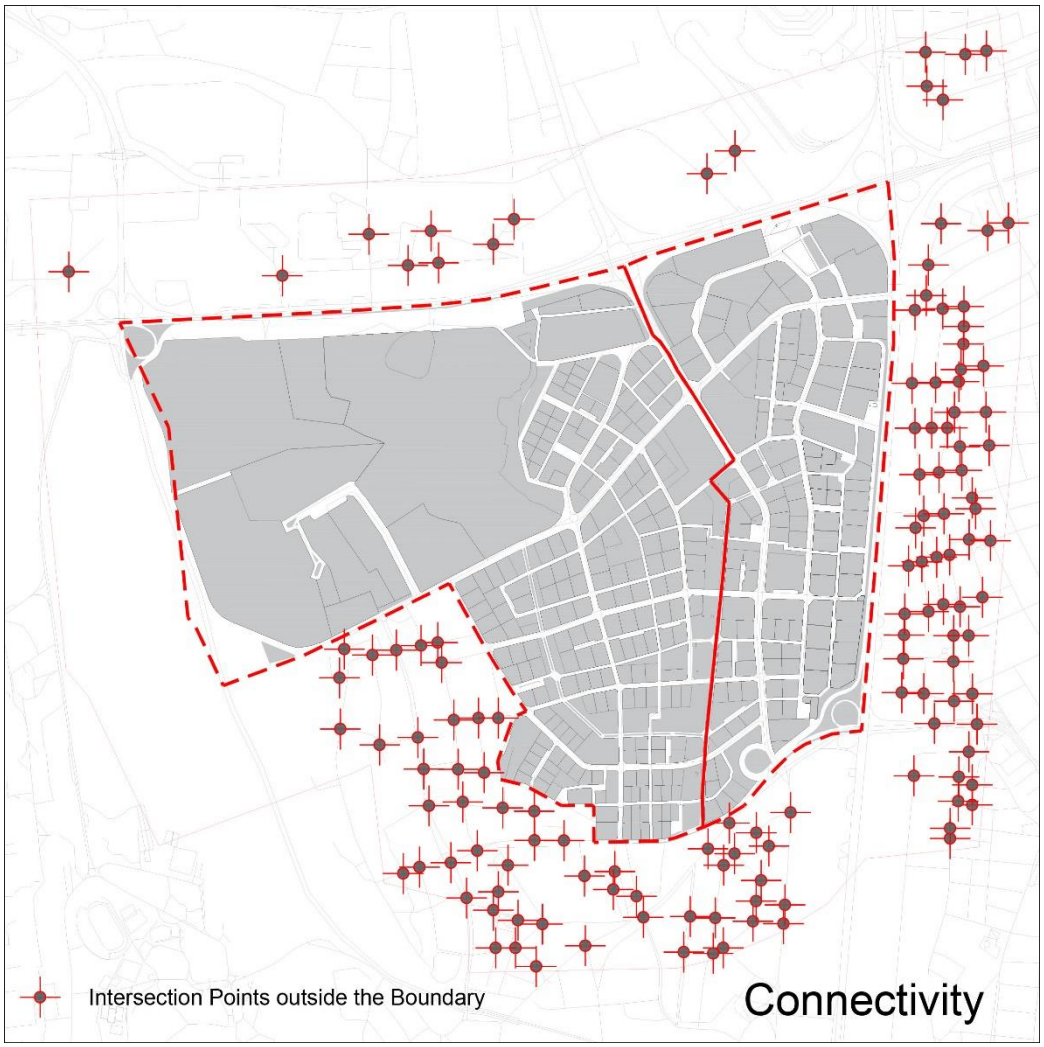


Figure 4.12. Connectivity map showing the intersection points in 400 m zone outside the boundary.(Calculated according to LEED standards)

ii. Transportation

Figure 4.13 shows the map of transportation stops and the coverage areas. As Afacan(2014) have previously indicated the residents are satisfied with the frequency of the transportation and the distance to bus stops. However, the majority of the transportation facilities are not protected from weather conditions and none of them have a digital board to inform about the arriving time. (Figure B.1)

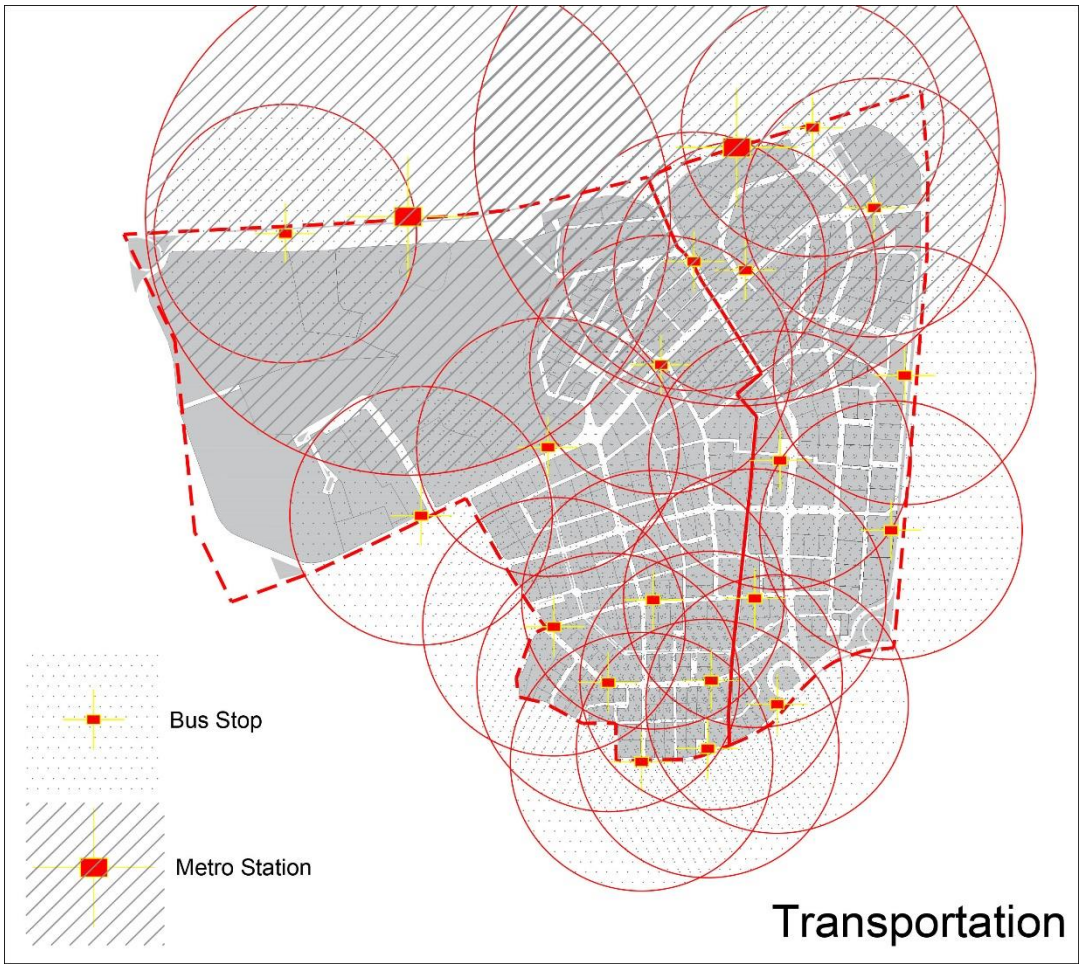


Figure 4.13. Transportation map showing bus stops in 400 m distance

iii. Streets & Public Space

A green corridor passing through Çukurambar and Kızılırmak Neighborhood aims to improve the connectivity between the neighborhoods and between them. However, the continuity of the park is interrupted by the lack of proper design implementations. These shortcomings are listed below;

- Lack of traffic signs together with wide roads that promote fast traffic avoid secure pedestrian crossings. (Figure B.2)
- Incomplete zones of the park discourage users. (Figure B.3)
- Lack of implementation of universal design standards such as stairs without ramps breaks the continuity of the green area. (Figure B.4)
- The trees are unable to provide shadow since the vegetation has just been planted, although the revision plan was approved in 1991 (Ankara Metropolitan Municipality, 1991) which gave enough time for trees to grow. (Figure B.2)
- Çansera Park that is the largest green area in the region is detached from residential areas by the fenced borders of universities, Tarım ve Köy İşleri Şap Enstitüsi and MTA.

Below are the author's observations effecting the walkability quality in the neighborhood:

- There are some attempts to implement universal design standards however, tactile paving are not continuous or the ramps on the pavements are not appropriately made. (Figure B.5)
- There are no pavements around sites under construction or empty land. (Figure B.6)
- There is inadequate parking space and cars are interrupting pedestrian routes on the streets where commercial and office buildings exist. (Figure B.7)
- Streets are not shaded to improve the microclimatic condition. (Figure B.8)

iv. Utilities

During the site visit, the asphalt deformation was observed due to fiber-optic cable installation. (Figure B.9)

4.3. Adaptation of NSA Criteria to Mitigate Problems in Urban Regeneration

i. Compactness and Connectivity

Independent city networks designed as ring roads, cul-de-sacs, gated zones, satellite cities, an insufficient number of connection points of the streets are the common problems causing a low level of connectivity with regenerated environments in Turkey. The countries that have inequality of income and private vehicle dependence tend to demonstrate an urban pattern composed of patches of independent islands. The US is one of these countries that is struggling with suburbs and gated communities. For this reason, LEED being a US certification system allocates 16.4 % of its credits to this category.

LEED has a criterion to avoid gated communities limiting the gated areas with 10% of the circulation network. Also, it proposes the new development to be located within an infill site, near a developed site or on a transit corridor to prevent problems encountered by settlements such as Karacaören Neighborhood.

Moreover, LEED encourages high connectivity levels by defining;

- The minimum number of intersection points within the site boundaries.
- The minimum number of intersection points within the zone outside 400 m of the site boundaries.
- The minimum number of intersection points on the site boundaries and the minimum distance between the intersections on the site boundaries.

Table 4.6. *Problems Identified in the Regeneration Projects and Criteria to Mitigate Problems related to Compactness and Connectivity Category*

	Problems Identified in the Regeneration Projects	Criteria to Mitigate Problems	LEED	BREEAM	CASBEE
Compactness & Connectivity	Independent city network designed as ring roads and culdesacs and site boundary enclosed by walls or fences cause disconnected sites.(Parlak, 2015)	No more than 10 percent of the circulation network of the project should be gated.	*		
	Internal connectivity is lower than standards. (Map Analysis, the NEARP) (Map Analysis,Çukurambar-Kızılırmak)	The intersecsection points of the streets within the site boundaries should not be lower than a certain amount.	*		
	Connectivity outside the site boundaries is lower than standards. (Map Analysis,the NEARP) (Map Analysis,Çukurambar-Kızılırmak)	The intersecsection points of the streets wihtin the zone of 400 meters outside the site boundaries should not be lower than a certain amount.	*		
	Connectivity between the adjacent sites is lower than standards. (Map Analysis,the NEARP) (Map Analysis,Çukurambar-Kızılırmak)	The intersecsection points on the site boundaries should not be lower than a certain amount.	*		
	Karacaören Neighborhood is isolated and far from developed settlements. (Korkmaz,2015)	The project should be near a developed site, infill site or on a transit corridor.	*		
	Culdesacs and staircases makes it difficult to move in the site. (Korkmaz,2015)	The calculation of the connectivity ratio should include total street network lenght/ intersection ratio.	Proposed		

Besides, LEED requires a minimum density ratio for urban developments to conserve land; to promote livability and walkability; to leverage transit investments by transportation efficiency and reduce vehicle distance traveled.

The missing criteria here is that LEED is interested in the intersection number within a certain area. However, the road network is circuitous so the results might be misleading. For this reason, the calculation should include the total length of the street network and the number of intersection points within the site boundaries.

In short, LEED has very effective definitions to overcome the issues caused by satellite cities, gated communities and low level of connectivity that is often encountered in Turkey while other rating tools cannot act on the issue as successfully as LEED.

ii. Transportation

High rate of private vehicle use, traffic congestion, insufficient transportation shuttle frequency, transportation facilities in poor condition, lack of alternative transportation

systems and lack of safe pedestrian routes reaching to the transportation facilities are the confronted problems in the regenerated urban environments in Turkey.

All rating tools include criteria that define the minimum walking distances to bus stops for a certain number of dwelling and commercial units to encourage the use of public transportation. BREEAM is the only rating tool highlighting the issue that the walkable distances to public transit should be safe pedestrian routes while others only mention walkability in general. LEED and BREEAM both require a certain frequency for bus shuttles and improved transportation facilities that are sheltered and include digital boards.

Besides all rating tool have criteria for alternative transit systems such as bike lanes and bike facilities. LEED asks for a certain amount of facilities and rapid transit should be reached within 400 meter distance from the bike lanes which is an effective rule to apply for functioning bike routes. While BREEAM and CASBEE care for continuous, direct, safe and segregated bike lanes from pedestrians and vehicles. Also, LEED and BREEAM require cycling facilities such as long term and short term bike storages and showers for users.

LEED requires reduced parking footprint while BREEAM doesn’t condition it. But it asks for a consultancy service from the local authority, highway authority, and developer and community representatives to determine parking need.

Table 4.7. *Problems Identified in the Regeneration Projects and Criteria to Mitigate Problems related to Transportation Category*

	Problems Identified in the Regeneration Projects	Criteria to Mitigate Problems	LEED	BREEAM	CASBEE
Transportation	High rate of private vehicle use cause car parking problems. (Durmaz, 2014) Car parking is restricted but not supported by frequent bus shuttels.(Korkmaz,2015)	Parking footprint should be reduced.	*		
		10% of the offstreet parking should be reserved carpool, parking fees should be applied, guaranteed ride home programs should be arranged.	*		
		Local autority, highway authority, developer, community representatives should be consulted to define a parking strategy.		*	
	Culdesacs and staircases makes it difficult to reach to bus stops. (Korkmaz, 2015)	Walking distance between public transit and each building entrance should encourage users to use public transport	*	*	*
		Safe pedestrian routes should be provided to bus stops.		*	
	Bus shuttle frequency is lower than expected. (Korkmaz,2015)	Access to quality transit (frequent bus shuttles) should be provided.	*	*	
	Transportation facilities are in poor condition. (Onsite Observation, the NEARP) (Onsite Observation, Çukurambar-Kızılırmak)	The stops should be sheltered and should have a digital board.	*	*	
	There are no alternative transits systems and supportive structures such as bike ways and bike facilities. (Onsite Observation, the NEARP) (Onsite Observation,Çukurambar-Kızılırmak)	Certain amount of facilities and rapid transit should be within 400m distance to bicycle network.	*		
		Cycling network should be continious, direct,safe, segregated from vehicles and pedestrians.		*	*
		Cycling facilities such as bicycle storage, showers should be provided.	*	*	

To sum up, the problems mentioned above can be effectively solved by fulfilling the criteria in the rating tools. All rating tools rank alternative transportation such as bikes. However, CASBEE does not mention cycling facilities which is a supportive feature for bike use. Moreover, the way LEED guides to achieve an effective cycling network is very successful while BREEAM only asks to provide a movement framework. In the case of Turkey, it will be more effective to define certain rules instead of asking for a movement framework. In Turkey, the distances to the bus stops are not a common problem which all the rating tools mention. However, interrupted pedestrian routes, quality of transportation facilities and bus schedules are the problematic factors. LEED specifically mentions the walkability to the transportation facilities. LEED and BREEAM mention the schedules and the quality of the transportation of the facilities.

iii. Streets & Public Space

Lack of definition with street frontages; distance, accessibility and security issues of green areas; interrupted pedestrian routes; heat island effect; lack of all-weather routes; fast traffic; lack of traffic safety for pedestrians; and outdoor noise and air pollution are the problems that are also encountered in the regenerated urban developments in Turkey.

Definition of street frontages is the most important factor to achieve safe, appealing and comfortable street environments. LEED asks for minimum value (1: 1.5) for building height and street centerline ratio while BREEAM defines ground floor with requirements such as transparent glazing on store frontages, public realm designed for multiple uses and activity overspill. BREEAM goes further asking for a study for how space is going to be used for social interaction. Moreover, LEED defines an effective criterion that asks for the public spaces to be within walking distance to 90 % of the dwellings and non-residential buildings.

Continuity of the pedestrian routes is a requirement in LEED. BREEAM asks for a study on movement framework which refers to the continuity and safety of the pedestrian routes. However, even though a project might have a complete movement framework in the design phase during the long construction process the continuity of the pedestrian routes might be disturbed. None of the rating tools mention a criterion to solve this problem. Hence a rule that requires the proof of the continuity of the routes according to phases might be needed.

Safety of the streets has two dimensions. One is the safety of pedestrians from the high-speed vehicles and other is crime prevention. All rating tools ask to ensure the safety of the pedestrians and cycling roads from the large vehicles and fast traffic. Crime prevention will be mentioned under “Social Wellbeing” category.

LEED defines heat island effect precautions such as open grid pavement system, providing shading over pavement and continuity of green network/trees through pedestrian routes while BREEAM asks for a microclimatic simulation to be a guide for all weather routes. Moreover, BREEAM proposes to work with a qualified acoustician to measure noise impact to solve outdoor noise problem.

Table 4.8. *Problems Identified in the Regeneration Projects and Criteria to Mitigate Problems related to Streets and Public Space Category*

Streets & Public Space	Commercial and public interaction is avoided because of the lack of definition with street frontages. (Parlak 2015)	Building height and street centerline ratio should be min 1: 1,5.	*		
		Mixed use strategies such as transparent glazing on store facades and activity overspill should be provided on ground floor.		*	
		A study for how the space is going to be used for social interaction should be completed, local identity should be strenghtened through social spaces.		*	
	Distance, accesibility and security issues discourage residents to actively use parks although there are enough green spaces. (Korkmaz,2015) Large fenced boundaries of Cankaya University detach the largest park (Cansera Park) in the region from the neighborhood.(Map Analysis, Çukurambar-Kızılırmak)	Measures for crime prevention should be taken.			*
		Green areas should be within walking distance and safe or convenient pedestrian routes should be provided.		*	
		All streets should be overlooked by multiple dwellings.		*	
	Pedestrian are not satified from the access routes to stores and cafes. (Afacan, 2014)	Public spaces should be within 400 m walking distance to the dwellings or non-residentials.	*		
	Heat island effect occurs in streets and public spaces. (Onsite Observation,the NEARP) (Onsite Observation, Çukurambar-Kızılırmak)	Heat Island Effect reduction precautions such as open grid pavement system or providing shading over pavements should be applied.	*		
		Microclimatic simulation of the neighborhood should be done.		*	
	There are no green network or trees on the majority of the pedestrian routes . (Onsite Observation, the NEARP) (Onsite Observation, Çukurambar-Kızılırmak)	Streets should be shaded by trees and all weather routhes should be provided.	*	*	
	The roads are wider than expected promoting fast traffic. (Onsite Observation, the NEARP) (Onsite Observation, Çukurambar-Kızılırmak)	Ensure safety with regard to large vehicles.		*	
		Seperation of pedestrian roads and vehicles should be applied partially.			*
		Pedestrian and cycling roads should be designed according to traffic speed.	*		
	Residents complain about outdoor noise and air pollution. (Afacan, 2014)	Noise impact should be assessed by a qualified acoustition.		*	
	Traffic safety is low (Afacan, 2014) The traffic signs are inadequate to secure pedestrians. (Onsite Observation, KAKDP) (Onsite Observation, Çukurambar-Kızılırmak)	Safety of pedestrians should be secured.		*	*
	Sites under construction or empty sites break the continuity of the pedestrian routes and discourage users. (Onsite Observation, Çukurambar-Kızılırmak) Cars that can not find a proper parking space parks on pedestrian roads and interrupt pedestrians in commercial zones. (Onsite Observation, Çukurambar-Kızılırmak)	Continuous sidewalks should be provided.	*		
		Movement framework should be studied.		*	
		A construction phasing plan should be done considering funding through the process, the continuity of the pedestrian roads and critical facilities should be provided within the phases.	Proposed		

To sum up, BREEAM has the most efficient definitions to define a qualified public space asking for a social interaction study. Also, it gives the highest point rates to this category. However, the way LEED defines distance to public spaces can be an effective way for achieving a homogeneous urban texture in the case of Turkey. The same case is valid for pedestrian paths; while LEED asks for the continuous network, BREEAM asks for movement framework which may lead to a more flexible design. On the other hand, none of the rating tools mention the continuity of the pedestrian routes related to the phasing of the project which is the major problem on the continuity of the pedestrian roads in Turkey. Moreover BREEAM and CASBEE cares for pedestrian safety related to traffic speed which is also an important issue in the case of Turkey.

iv. Urban Facilities

Lack of services and facilities, weakly connected facilities and an insufficient number of jobs compared to resident population are the problems determined in Turkish urban regeneration projects.

All rating tools ask to apply mixed-used neighborhood features that propose an effective solution for problems related to the lack of services and facilities in general. CASBEE mentions neighborhood schools, everyday facilities, health, welfare and cultural facilities to be within walking distances which is a supporting feature for mixed-use neighborhoods. LEED also requires neighborhood school and facilities connected within walking distance and safe pedestrian routes.

LEED is the only rating tool that proposes a solution for low job opportunities in the region. It asks for dwellings to be 800 m walking distance to a certain number of jobs or to a rapid transit that is connected to a region that provides job opportunities.

Table 4.9. *Problems Identified in the Regeneration Projects and Criteria to Mitigate Problems related to Urban Facilities Category*

	Problems Identified in the Regeneration Projects	Criteria to Mitigate Problems	LEED	BREEAM	CASBEE
Urban Facilities	Majority of the facilities are weakly connected to the rest of the site. (Korkmaz,2015)	Facilities should be connected within walking distance and safe pedestrian routes should be provided.		*	
	Some crucial facilities such as bank, pharmacy are lacking. (Korkmaz,2015)	Mixed Use neighborhood should be achieved.	*	*	*
	The health services are insufficient in the area. (Korkmaz,2015)	Neighborhood schools should be within walking distances.	*		*
	Local government services are not enough. (Afacan, 2014)	Everyday facilities, heath wellfare,cultural facilities should be within walking distance.			*
	Job opportinities are low compared to number of housing within the site. (Korkmaz,2015)	Dwellings should be 800 m walking distance to certain amount of jobs or to a rapid transit that is connected to a region that provide job opportunities.	*		

To sum up all rating tools credit mixed-use neighborhood rules. LEED has an effective solution for jobs proximity. BREEAM cares for safe pedestrian routes to facilities and CASBEE defines the closeness of the facilities in a successful way.

v. Social Wellbeing

Security problem, insufficient application of universal design standards and lack of architectural diversity and quality are the problems encountered in the regenerated urban developments in Turkey.

BREEAM has effective interventions to provide security in an urban environment such as night lightning, avoiding blind spots, and streets that are overlooked by multiple dwellings while CASBEE asks for network monitoring systems.

Inclusive design that considers all groups in society regardless of age, gender and disability-related needs is a critical factor to achieve social wellbeing. LEED asks for all travel routes to be designed in accordance to universal design standards. Also, 20% of the units should be designed in accordance with Visitable Unit Standards. While BREEAM has more extensive requirements asking for inclusive design and management strategy which involves transport methods, housing and buildings, public

realm, open spaces, sports and recreation spaces, highways, footpaths and cycle ways, as well as emergency egress strategies.

LEED and BREEAM both have criteria to provide housing diversity. LEED asks to apply Simpson diversity index wile BREEAM asks for a demographic needs study to apply housing mix.

Local values are supported by BREEAM by identification of key aspects of the local character, Use of local materials, building forms, plants, and public art while CASBEE scores efforts of creating a new culture. CASBEE has criteria that lack definitions that may lead to subjective results about harmonization with the periphery and townscape such as consideration for wall surface position, harmonization of exterior material and color, consideration for human scale; consideration of skylines and the peripheral area.

Table 4.10. *Problems Identified in the Regeneration Projects and Criteria to Mitigate Problems Related to Social Wellbeing Category*

	Problems Identified in the Regeneration Projects	Criteria to Mitigate Problems	LEED	BREEAM	CASBEE
Social Wellbeing	Internal roads remain deserted increase the risk of burglary. (Parlak, 2015) Security is a serious problem in the region, burglaries happen often and parks are not safe. (Korkmaz,2015)	Night lightening , security patrol systems should be applied. No blind spots should be created in the urban fabric.		*	
		All streets should be overlooked by multiple dwellings.		*	
		Security should be assured by network monitoring			*
	Streets are not designed considering accesibility for all (Afacan, 2014)	Inclusive design and management strategy should be applied		*	
	Tactile paving is not continuously applied. (Onsite Observation, the NEARP) (Onsite Observation, Çukurambar-Kızılırmak) Staircases connect the site is not proper for universal design standards. (Onsite Observation, the NEARP)(Onsite Observation, Çukurambar-Kızılırmak)	All travel routes should be designed in accordance to universal dessign standards	*		
	Architectural diversity and quality is sacrifized to maximise time and cost efficiency (Parlak, 2015) The design of the bloks are repetitive regarless of the location (Parlak, 2015)	Efforts of creating a new culture should be demonstrated			*
		Simpson Diversity index should be used for the variety of housing sizes	*		
		Housing mix should be applied according to demographic needs study		*	
	No attempts have been observed in terms of adaptive reuse or enhance local characteristics. (Onsite Observation, the NEARP)	Use local materials/ building forms/ plants/public art and involve the community in the design stage		*	

In brief, as a solution to the lack of diversity in architectural expression, only LEED and BREEAM mention the diversity of housing. CASBEE and BREEAM support it with local values and creating new culture. Misapplication of universal design standards is a major problem in Turkey. CASBEE asks for a complete strategy for inclusive design while LEED ascertains it by asking the travel routes to be proper and a certain amount of houses to be designed in accordance while CASBEE does not give any credits for this criterion. Moreover, for the problems related to security CASBEE asks for technological solutions for safety while BREEAM and LEED define solutions related to space arrangement. BREEAM has this criterion that all the streets should be

overlooked by multiple dwellings but it does not define the distance, but LEED defines it.

vi. Disaster Management

Flooding of the roads and lack of climate adaptation plan is one of the detected problems in the literature review and case studies.

BREEAM is the only assessment tools that ask for the master plan to take into account evidence of climate change for the site and also a site-specific flood risk assessment.

BREEAM and LEED both ask to avoid flood hazard areas; if it is not possible the facilities should be still operable at the flood water levels.

CASBEE does not have a specific definition for flooding but has more broad definitions for disaster management; it asks for a hazard map which includes all types of disasters while it also mentions the infrastructure (communication systems, equipment, piping, sewerage pipes, storage for clean water, district heating and cooling, autonomous power supply) should be endurable to any disaster. Also, CASBEE asks to take precautions to provide continuity of business and life in case of disasters.

Table 4.11. *Problems Identified in the Regeneration Projects and Criteria to Mitigate Problems Related to Disaster Management Category*

	Problems Identified in the Regeneration Projects	Criteria to Mitigate Problems	LEED	BREEAM	CASBEE
Disaster Management	There are no climate change adaptation plan applied. (Ankara Municipality,2018)	The masterplan should take account evidence of climate change for the site.		*	
	Flooding is observed on the roads(Kuzey Ankara Sel Felaketi, 2018)(Korkmaz,2015)	Site specific flood risk assessment should be carried out.		*	
		Avoid flood hazard areas or design the facility operable at the flood water levels.	*	*	

To sum up, considering future climate is very important for the fate of the cities that BREEAM have considered. This issue should also be on the agenda of Turkey. The way CASBEE has a strict definition for disaster management is a country-specific case.

vii. Ecology

Discontinuity of the green areas, light pollution and lack of protection of wetlands, habitat, and wildlife are the determined problems encountered in regenerated urban environments in Turkey.

LEED proposes to use native plants to restore habitat and wetlands which may be a solution to turn wetlands into artificial pools.

Continuity of wildlife corridors and patch and corridor quality are both mentioned in BREEAM and CASBEE.

LEED and BREEAM have criteria that indicate to limit the lumens and define light boundaries to protect ecological communities.

Table 4.12. *Problems Identified in the Regeneration Projects and Criteria to Mitigate Problems Related to Ecology Category*

	Problems Identified in the Regeneration Projects	Criteria to Mitigate Problems	LEED	BREEAM	CASBEE
Ecology	The river is turned into an artificial pool made of concrete. The habitat of the river is not protected. (Onsite Observation,the NEARP)	Restore habitat, wetlands and waterbodies using native plants.	*		
	The light pollution is not considered. (Onsite Observation,the NEARP)	Light boundaries should be determined to protect ecological communities. Certain lumens should not be exceed.	*	*	
	Incomplete zones of the green areas breaks the continuity of habitats. (Onsite Observation, Çukurambar-Kızılırmak) The ecology corridors are interrupted by The highways. (Onsite Observation,the NEARP)	Wildlife corridors should be applied/ Patch & Corridor quality should be improved.		*	*

In brief, continuity of the green spaces is very important for wildlife which CASBEE and BREEAM mention. Ecology strategies are in the agenda of all rating tools however for the case of wetlands LEED has a specific criterion.

viii. Utilities

Utilities do affect efficiency of energy, water, and internet in the urban grid. For this reason, updatability of the infrastructure is vital for efficient water, energy and internet use. Problems encountered considering utilities are related to updatability and flexibility of the utility systems in the case studies.

While BREEAM defends a single installation point to access each service and flexible installation systems that are expendable in need, it also aims to avoid disturbance of the community through infrastructure maintenance. Also, CASBEE asks for a utility corridor for easy maintenance. Utility corridors or single access points answer the problems related to installation and updatability.

On the other hand, CASBEE looks from a broad perspective. First of all it has a criterion called "Block Management". The aim of this criteria is to optimize water, energy use and maintain waste disposal and resource usage through smart grid systems connected to the block. Also Digital Signage or Bulletin Boards to transmit information such as medical and public services, traffic management are recommended. There is another interesting criterion called "Compliance". Japan has special laws and regulations regarding wind damage, radio waves, traffic, sunlight, light damage, soil pollution, noise, vibrations, odors, air pollution, groundwater withdrawal and water quality. These laws aims to provide equal standards for its people regarding comfort. CASBEE asks for these regulations to be fulfilled. CASBEE also has understood that high-performance infrastructures are needed for high-density areas. If the Floor Area Ratio (FAR) is more than 4 than advanced utilization techniques are expected. Finally, internet quality is also mentioned in CASBEE. It asks for a sufficient capacity of the communication line and high-speed internet to be secured.

Table 4.13. *Problems Identified in the Regeneration Projects and Criteria to Mitigate Problems Related to Utilities Category*

	Problems Identified in the Regeneration Projects	Criteria to Mitigate Problems	LEED	BREEAM	CASBEE
Utilities	Asphalt deformation is observed due to fiberoptic cable installation. (Onsite Observation, Çukurambar-Kızılırmak)	Provide a single point access for each service running through the site.		*	
		Ducting/utility corridor should be provided in addition to necessary capacity to allow for future expension.		*	*
		Piping and wiring material should have long renewable periods.			*

To sum up, while both BREEAM and CASBEE are aware of the importance of flexibility of the systems to be updatable, which is critical in case of Turkey, LEED does not provide answer to any problems related to Utilities. Besides, CASBEE

conditions a smart management system in house, block and neighborhood levels. CASBEE also has spatial criteria for high-density areas (FAR >4) and asks for fulfilling the laws and regulations of Japan on quality of space regarding odor, noise, pollutions, quality of water etc.

ix. Energy

The problems related to energy experienced in the case studies are the lack of smart home systems and not providing renewable energy within the site boundaries.

There are two different approaches in the rating tools to control energy use. One is to measure energy use as in LEED. Another one is to control CO_2 emission as in BREEAM and CASBEE. Reduction of energy use does not necessarily mean reduction in emission levels. On the other hand, reduction of final CO_2 emission will not guarantee to stop draining limited resources.

LEED is asking for a reduction of energy through the application of ASHRAE standards. While BREEAM is trying to control energy consumption through CO_2 reduction and energy strategy. On the other hand, CASBEE does not give any credits for reduction of energy consumption rates. The reason here is that CASBEE provides CO_2 reduction through the final calculation method while calculating the Environmental Load. Hence, the emissions in the traffic sector and building sector subtracting the absorption of Green-house gasses is calculated at the end of the study.

$$\text{Built Environment Efficiency (BEE)} = \frac{\text{Q (Environmental quality of building)}}{\text{L (Environmental load of building)}}$$

On the other hand, LEED is the only system asking for solar orientation and on-site nonpolluting renewable energy. But this feature can also be utilized in the calculations of energy reduction or green building criteria. CASBEE is the only one emphasizing a lot on smart grid systems, smart meters, and community energy management systems.

Table 4.14. Problems Identified in the Regeneration Projects and Criteria to Mitigate Problems Related to Energy Category

	Problems Identified in the Regeneration Projects	Criteria to Mitigate Problems	LEED	BREEAM	CASBEE
Energy	Smart house systems are not provided in the majority of the houses. (Ankara Municipality, 2018)	Smart demand and supply systems should be applied			*
	Energy need is not provided by renewable energy sources within the site. (Ankara Municipality, 2018)	On site, non-polluting renewable energy generation such as solar,wind,geothermal, micro hydroelectric or biomass systems should be provided with production capacity from 5to 20 %.	*		
		CO2 reducions from 10to 100 % will be credited.		*	

As a result, CASBEE seems to achieve the ultimate result for CO_2 reduction. However, BREEAM and LEED are both good at defining the requirements for Low carbon energy, renewable energy, district heating and cooling systems and reduction of energy need.

x. Water

Lack of grey water recycling and reusing systems, as well as water use reduction systems are the problems reported by Ankara Municipality.

All assessment tools have regulations for rainwater harvesting, reduction of water use, and water utilization in the block. LEED ask for landscape elements that do not require irrigation while CASBEE is demanding landscape elements to treat urban runoff such as detention pond, retarding basin etc. BREEAM asks for the design of the landscape in accordance with water strategy.

Different than others BREEAM is asking for a water strategy that considers water reservoirs and rainfall frequencies that are going to be affected by climate change. And

it asks for the design of utilities and landscape according to these water targets set in the strategic plan. Also, it asks for a drainage plan to avoid water pollution.

Table 4.15. *Problems Identified in the Regeneration Projects and Criteria to Mitigate Problems Related to Water Category*

	Problems Identified in the Regeneration Projects	Criteria to Mitigate Problems	LEED	BREEAM	CASBEE
Water	Grey water recycling and reusing systems are not available. (Ankara Municipality, 2018)	25 to 50 % of average wastewater generated by the project should be reused to replace potable water.	*		*
	Water use reduction systems are not available. (Ankara Municipality, 2018)	Water saving utilities/ fixtures/ fittings should be applied in buildings.	*		*

In short, while similar techniques are used to reduce potable water use through rainwater and wastewater utilization techniques and threat water in the site through landscape. BREEAM has a more successful attitude since it asks for a climate change strategy different than others.

xi. Material

Problems related to material are often low quality or short lifetime. Also, environmental impact of construction materials are not considered and industrial wood is not used in the case study.

Each rating tool has a requisite to fulfill green building standards which include green materials. However, material and green building should be evaluated separately since the public realm and streets are not in the scope of buildings.

BREEAM suggests that more than 40% of the materials used in public realm should perform in range A+ to B according to Green Guide Standards. Moreover, 15% and more of the construction should be locally reclaimed or constituted from recycled material.

CASBEE takes apart wood material as criteria. It also demands the use of Eco Marked products and recycled materials. It also asks for recycled material with Eco Marked products.

The material applications have not been a concern in terms of sustainability in the case studies. CASBEE and BREEAM involve the use of low impact and recycled materials while CASBEE gives extra points for the use of wood obtained from sustainable forests. Moreover, life span of the regenerated buildings in Turkey is usually short because of low quality building materials. This implementation is likely to result in destruction and reconstruction, having negative environmental impacts. For this reason, an extra criterion that controls the durability of the materials is proposed.

Table 4.16. *Problems Identified in the Regeneration Projects and Criteria to Mitigate Problems Related to Material Category*

	Problems Identified in the Regeneration Projects	Criteria to Mitigate Problems	LEED	BREEAM	CASBEE
Material	Environmental impact of construction materials are not considered during design and application phase. (Ankara Municipality, 2018)	Recycled materials should be used.		*	*
		Low impact materials should be used.		*	
	Industrial Wood is not used as building material. (Ankara Municipality, 2018)	Wood from sustainable forests should be used.			*
	The paints, kitchcen cabinets, doors,elevators started to break down in one year after tenans moved in. (Korkmaz, 2015)	Life Cycle of the materials should not be below a certain duration.	Proposed		

Briefly, BREEAM does not neglect the green materials outside the buildings also and puts strong emphasis on the criteria to control it while CASBEE is lacking full definitions. LEED, on the other hand, does not even mention the materials used in public realm and streets.

xii. Waste and Resources

Problems related to the category is lack of waste management strategy, in site resource circulation and reuse of existing buildings.

BREEAM has a very detailed explanation for reuse of excavation waste and demolition waste. These are asked to be assessed by an onsite waste management strategy that is mandatory. It is asked for this strategy to consider Local Identity and Heritage; the location and condition of the buildings; the embodied carbon in the materials; potential uses of buildings and infrastructure; possible use of materials; and community and authority knowledge. Moreover, landscape designers are asked to

include this waste material in their design. Also, refurbishment of existing buildings is demanded.

LEED is the only one specifying required amount of buildings that should be reused. Also, minimum 50% of the infrastructure materials are suggested to be onsite reused material and recycled content. While CASBEE does not mention building reuse except for cultural heritage.

On the other hand, LEED has strong rules for solid waste management. At least one station for recycling and reuse, for hazardous wastes and household wastes are demanded. Recycling containers are asked to be placed at every 245 meters distance. Compost station is supposed to have a plan for post-collection use. While BREEAM is leaving the specifications on waste recycling to waste management strategy, CASBEE attributed to Municipality's designation of garbage separation. Also, CASBEE considers using compost and dead leaves as fertilizers and it has an article that proposes to convert garbage into RDF (refused derived fuel) on site.

Table 4.17. *Problems Identified in the Regeneration Projects and Criteria to Mitigate Problems Related to Waste and Resources Category*

	Problems Identified in the Regeneration Projects	Criteria to Mitigate Problems	LEED	BREEAM	CASBEE
Waste and Resources	There are no recycling containers with in the site boundaries. (Korkmaz,2015) Waste management and recycling strategies are not applied. (Ankara Municipality, 2018)	Solid waste management should be provided	*	*	*
		In area resource circulation/compost station should be provided.	*		*
	There is no trace left from the previous development except the minarets of the old mosques. (Onsite Observation, the NEARP) (Ankara Municipality, 2018)	Some of the infrustructure mareials should be reused or recycled.	*	*	
		Existing buildings or building materials are reused.	*	*	

In short, all rating tools have strong criteria for waste management. Only CASBEE does not mention the reuse of existing buildings and infrastructure.

v. Green Building

As mentioned before no building has been certified as green building in the case studies. Also, the TOKİ buildings are usually not designed to take advantage of the sun direction.

LEED defines a value for the percentage of the sustainable buildings in the project. CASBEE does not define a percentage, instead it has scales, such as; no building, some buildings, and majority of the buildings. On the other hand, BREEAM gives credits on green building in its own initiative. Each rating tool accepts a third party rating system other than their own branches.

LEED mentions the orientation of the building as an independent criterion while CASBEE gives extra credits for wall and roof greening.

Table 4.18. *Problems Identified in the Regeneration Projects and Criteria to Mitigate Problems Related to Green Building Category*

	Problems Identified in the Regeneration Projects	Criteria to Mitigate Problems	LEED	BREEAM	CASBEE
Green Building	Due to symetric floor plans some housing units lack direct sunlight. (Parlak, 2015)	Locate the longer facade within +- 15 degrees in accordince with solar radiation.	*		
	There are no new construction certified as green building in the site. (Ankara Municipality, 2018)	Majority of the buildings should be certified with third party sustainable building assessment tools.	*	*	*

In Brief, all rating tools demand green buildings that are essential for the condition of Turkey.

CHAPTER 5

CONCLUSION

Sustainable development concept has emerged as a result of experiencing the decline of environmental quality and resources in the last half-century. It has been acclaimed that cities being the major hubs of consumption should be the focus of the efforts to deal with the environmental crisis. Neighborhood Assessment Tools are the latest generation of impact assessment tools to measure the sustainability performance of the neighborhoods. There are various assessment tools focused on the neighborhood scale. LEED ND, BREEAM COMM, CASBEE UD are the well-known ones which are the interest of this study.

Within the scope of this study, the definition and principles of sustainability and sustainable neighborhood were examined. Dimensions of the current special transformation in Turkey related to urban regeneration were understood. The problems experienced in the forty TOKİ housing projects, the NEARP and Çukurambar-Kızılırmak Neighborhood were determined based on the information gathered from literature review, interview with Metropolitan Municipality and case studies. The structures of the NSA tools were reviewed to compose a new framework to be a base for the comparative analysis. Criteria adopted from the NSA Tools that are responding to the problems related to urban regeneration projects in Ankara were presented as a final framework.

The study reveals that the selected Neighborhood Sustainability Assessment Tools have the capacity to deal with deteriorating urban environments that are the results of the urban regeneration process in Turkey. Each tool depends on a list of criteria and a scoring system to reach the goal of achieving sustainable environments while they have slightly different strategies that are also related to the differences of the local characteristics of the region.

The literature findings reveal that current urban regeneration applications resulted from rapid urbanization, project-based applications and lack of holistic planning

approaches cause various urban problems. Majority of these problems are caused by improper applications of street network, location choice, interrupted pedestrian routes, gated communities and, independent street networks.

The most outstanding results of the comparative analysis are that LEED has the most effective definitions for the problems caused by gated communities and satellite towns in Turkey. BREEAM and LEED do have the capacity to answer many problems identified through the case studies. However, the difference is that LEED has more directive definitions usually supported by values while BREEAM has more extensive definitions. For example, in the case of waste and resources. While BREEAM is asking for the proof of waste management strategy LEED asks for the recycling containers to be placed at set distances. In this case, BREEAM is a more flexible system while LEED is more indicative. However, the concept of BREEAM might be misused in developing since the experts are needed to come up with new strategies. On the other hand, CASBEE is not as sophisticated as LEED and BREEAM but it has the most effective way of calculating CO_2 emissions. It has a final rating system that compares the environmental load and environmental quality of the site. In that sense, it is a more honest rating tool considering climate change. But the calculation method might be complicated and hard to apply for the case of Turkey. To sum up, LEED is able to answer most of the problems specific to Turkey such as gated communities and urban sprawl and it is a practical tool to apply while BREEAM has more criteria referring to the problems in Turkey. However, BREEAM is a more sophisticated system hence it might not be practical for developing country context. On the other hand, final calculation method in CASBEE will be hard to apply in case of Turkey and criteria in CASBEE should be explained more in detail for the eased application.

The outstanding contribution of this thesis is to summarize all the criteria adopted from the sustainable assessment systems, LEED, BREEAM and CASBEE in a final framework. This framework is presented in Table 5.1, which is composed of three columns. First column indicates the sustainability categories encompassing the criteria. The second column lists the guiding criteria that are derived from the research carried out on Assessment Tools. The last row is based on the applicability and importance of the criterion as determined in this study.

Table 5.1. *Framework composed of the criteria adopted from LEED, BREEAM and CASBEE to guide problems of urban regeneration projects.*

CATEGORY	CRITERIA ADOPTED FROM NSA TOOLS TO GUIDE PROBLEMS IN URBAN REGENERATION PROJECTS	DEGREE OF IMPORTANCE
COMPACTNESS AND CONNECTIVITY	The gated zones should be restricted to 10 % of the circulation network and a high connectivity ratio in the circulation network should be achieved.	COMPULSORY
	Locating the project in an infill site, near a development site or on a transit corridor.	RECOMENDED
TRANSPORTATION	Limiting the parking lots while promoting alternative transportation methods such as carpool, guaranteed ride home programs and bicycles.	RECOMENDED
	Locating the bus stops within the walking distance (400m) to each building entrance. The route should adapt walkability standards.	COMPULSORY
	The transportation facilities/ bus stops should be equipped with digital boards, shelters and seating.	RECOMENDED
	Cycling network should be continuous, direct, safe and segregated from vehicles and pedestrians.	RECOMENDED
	Considerable amount of facilities and rapid transit should be within 400 meter distance to bicycle network.	RECOMENDED
	Cycling network should be continuous, safe and direct.	COMPULSORY
	Cycling facilities such as bicycle storage and showers should be provided.	RECOMENDED
STREETS AND PUBLIC SPACE	Building height: street centerline ratio should be more than 1:1.5 for at least 15% of the building lengths.	COMPULSORY
	A study on social interaction in space should be completed. Transparent glazing on store facades and activity overspill should be provided on ground floor.	COMPULSORY
	Public spaces should be within 400 meter distance to dwellings or non-residential.	RECOMENDED
	Green areas should be within walking distance and safe pedestrian routes should be provided.	RECOMENDED
	Movement framework should be studied. Continuous sidewalks should be provided, safety of pedestrians should be secured.	COMPULSORY
	Continuous sidewalks should be guaranteed through phasing even though the construction takes long time.	RECOMENDED
	Microclimatic simulation of the neighborhood should be completed. Heat Island effect reduction precautions should be taken.	OPTIONAL
	All-weather routes should be provided. Trees should provide continuous shading.	COMPULSORY
	Pedestrian and cycling roads should be designed according to traffic speed, separation of pedestrians and vehicles should be applied partially.	RECOMENDED
	Noise impact should be assessed by a qualified acoustician.	OPTIONAL
URBAN FACILITIES	Facilities should be connected to dwellings within walking distance and safe pedestrian routes.	COMPULSORY
	Mixed use neighborhood principles should be applied.	COMPULSORY
	Neighborhood schools, health, welfare, cultural and everyday facilities should be within walking distance.	COMPULSORY
	Dwellings should be 800m walking distance to jobs or a rapid transit that is connected to a region that provides jobs.	RECOMENDED
SOCIAL WELLBEING	Streets should be overlooked by multiple dwellings, blind spots should be avoided.	RECOMENDED
	Night lightening, security patrol and network monitoring systems should be applied.	OPTIONAL
	Inclusive design strategies should be applied, all travel routes should be designed in accordance with universal design standards.	COMPULSORY
	Housing mix should be applied in accordance to the demographic needs study.	COMPULSORY
	Local materials, building forms, plants, public art should be applied involving community in design stage.	OPTIONAL
DISASTER MANAGEMENT	Avoid flood hazard areas or design the facility to be operable in flood level.	COMPULSORY
	Evidence of climate change should be applied to master plan.	RECOMENDED
ECOLOGY	Existing habitat, wetlands and water bodies should be restored.	RECOMENDED
	Habitat conservation plan should be studied with a qualified biologist.	COMPULSORY
	Native vegetation should be used, invasive vegetation should be avoided.	RECOMENDED
	Light pollution should be considered.	OPTIONAL
	Continuity of wildlife corridors, and patch quality should be considered.	COMPULSORY
UTILITIES	A single point access should be provided for utilities and future expansions should be considered.	COMPULSORY
	Piping and wiring material should have long renewable periods.	OPTIONAL
ENERGY	Smart demand management systems should be applied.	COMPULSORY
	On site non-polluting renewable energy generation should be provided.	RECOMENDED
WATER	Rainwater and wastewater generated in the project should be reused and recycled.	COMPULSORY
	Water saving utilities/fixtures/fittings should be applied in the building.	RECOMENDED
MATERIAL	Environment friendly materials with long life cycles should be used (Recycled, low impact, industrial wood)	RECOMENDED
WASTE AND RESOURCES	Solid waste management should be applied, resource circulation should be provided within the area with applications such as compost stations.	COMPULSORY
	Existing buildings, infrastructure or building materials should be reused.	RECOMENDED
GREEN BUILDING	Solar radiation should be considered during design process of the buildings.	OPTIONAL
	Majority of the buildings should be certified green buildings.	COMPULSORY

There is a growing interest in Turkey to transform cities into ecofriendly environments. However, if this interest stays superficial, it will pose a great danger for the transformation of the cities. Establishing a sustainable neighborhood is a highly complex exercise. Various interventions are needed in environmental, economic and social scale. For this reason, it is not possible to complete a sustainable neighborhood project with the current actors such as architects and engineers. The NSA tools require different disciplines such as acoustician or biologist, investors, municipality and community to decide together. Detailed analysis should be prepared such as inclusive design and management strategies, light pollution, demographic need and priorities, economic impact study, flood risk assessment, etc. The results of this analysis should be reflected to built environment properly. Such a detailed study will lead to reliable results.

The outcome of this research can also be useful to serve as an integrated residential design and development guide for a fundamental shift in urban design approaches in developing countries.

Finally, it is possible to prevent potential disastrous applications of urban regeneration projects through the guidance of a framework derived from the existing NSA tools. However, adaptation of the criteria to developing country context is challenging. Further studies should be carried on to simplify the process and avoid complex solutions. The criteria should include cost efficient solutions within the bounds of a developing country.

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APPENDICES

A. APPENDIX A

PHOTOS REGARDING THE SITE SURVEY IN THE NORTH ENTRANCE OF ANKARA URBAN REGENERATION PROJECT

Fig*ure A.1.* Transportation facilities lacking shelters, sitting facilities, real-time bus arrival information board etc.

Figure A.2. Common street layout

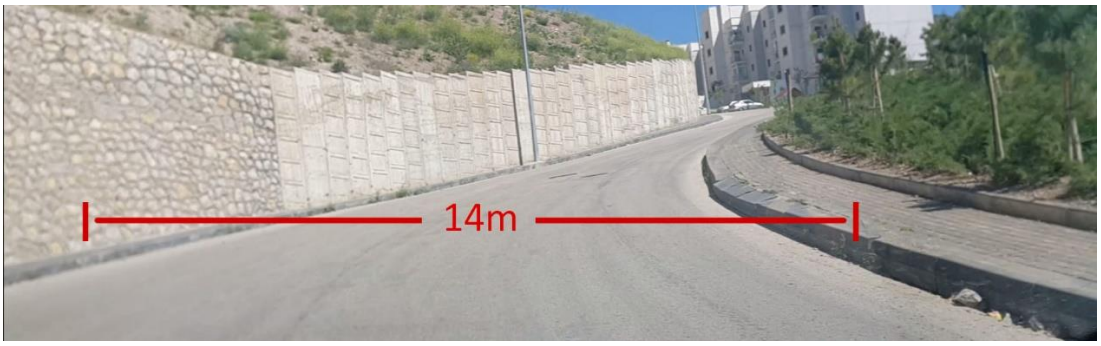

Figure A.3. Wide roads promoting high speed traffic.

Figure A.4. Midway-Barriers blocking pedestrian crossing over.

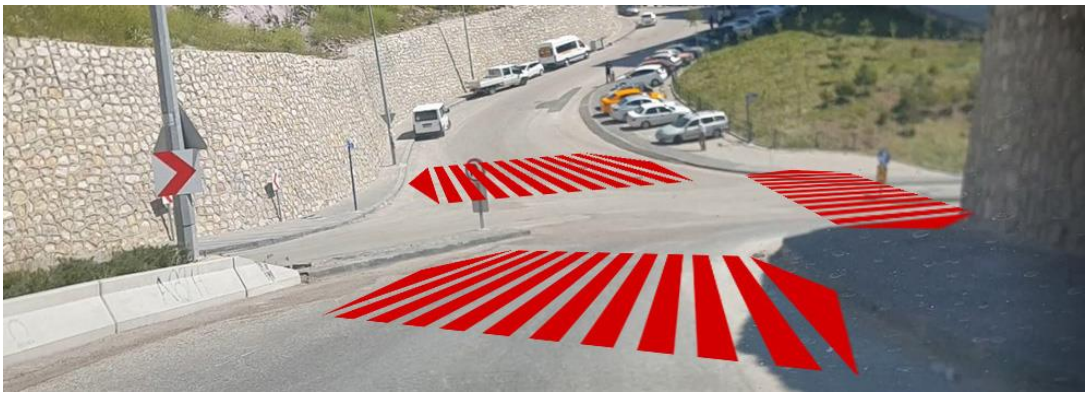

Figure A.5. Lack of traffic signs and zebra crossings to secure pedestrians' safety.

Figure A.6. Retaining walls

Figure A.7. Misapplication of tactile paving for partially sighted people.

Figure A.8. Misapplication of tactile paving for partially sighted people.

B. APPENDIX B

PHOTOS REGARDING THE SITE SURVEY IN ÇUKURAMBAR-KIZILIRMAK NEIGHBORHOOD URBAN REGENERATION PROJECT

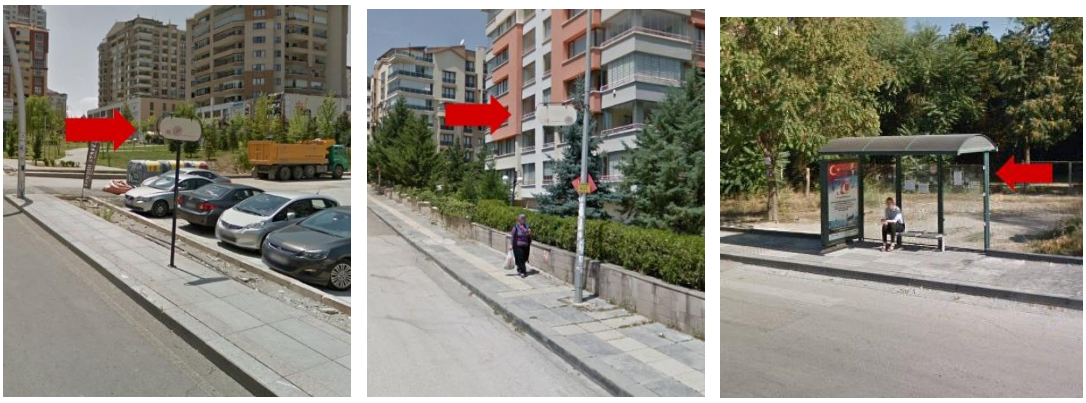

Figure B.1. Transportation facilities lacking shelters, sitting facilities, real-time bus arrival information

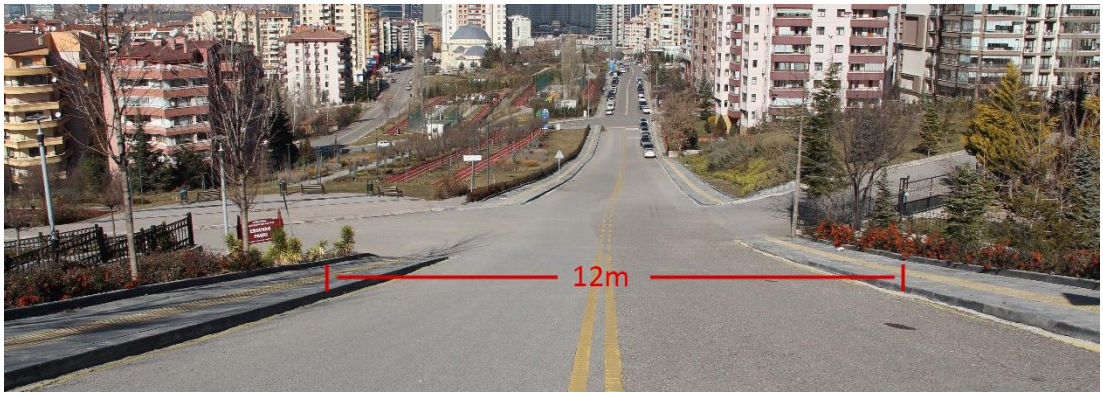

Figure B.2. Wide roads promoting high speed traffic and lack of traffic signs and zebra crossings to secure pedestrians' safety in between the green areas and parks.

Figure B.3. Incomplete parts of the green areas interrupting the continuity of the green zones. (Source: Google Maps)

Figure B.4. The green areas are not designed considering universal design standards lacking ramps.

Figure B.5. Ramp on the pavement is obstructed by a tree.

Figure B.6. Lack of pavement around construction sites

Figure B.7. Parked cars interrupting pedestrian routes.

Figure B.8. Traffic caused by dense commercial activity in 1425. Street

Figure B.9. Fiber-optic Cable Installation board etc.