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A Preliminary Study On Defining Urban Resilience for Urban Planning: The Case of Sultanbeyli, Istanbul

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Abstract
This study aims to present the findings of a field research on "urban resilience" as well as offering an overview of some recent theoretical developments concerning the concept, which has recently enjoyed wide currency in the field of urban planning. First, it discusses the scope of resilience assessment from the social-ecological systemic viewpoint and then scrutinizes the contribution of social-ecological network analysis to the field of urban planning by employing this method in an empirical case. For the social-ecological network analyzing and resilience assessment, this study deals with the case of Sultanbeyli, Istanbul. It is a district which came into being in a haphazard fashion in the 1980s and which has grown very rapidly ever since due to informal housing and shanty settlements. The residents of Sultanbeyli are particularly vulnerable in terms of a number of socio-economic and spatial issues. Moreover, the whole area of the district lies within the Ömerli Basin, one of the largest fresh water sources for Istanbul. Unplanned growth of the district gives rise to very important environmental problems such as the shrinkage of the basin and water pollution. Thus, a resilience assessment analysis on Sultanbeyli bears on some vital issues concerning the entire city. The study comprises two main parts. First of all, a literature overview is presented regarding the current definitions and scope of urban resilience as well as the attempts to develop methods to assess it. Secondly, an empirical case is examined so as to shed light on resilience assessment by employing the method of social-ecological network analysis. It is found that the analysis of resilience assessment alongside with its method and instruments contributes to sustainable urban development and strategic urban planning. It is also argued that the method of social-ecological network analyzing is of great benefit to partner analysis, information flow, and participatory processes in urban planning.

Öz
Bu çalışmanın amacı şehir planlama alanında çoğunlukla tartışılan bir konu haline gelen kentsel dirençlilik konusunda hazırlanmış teorik çerçeve ve saha çalışmasını sunmaktır. Çalışmada sosyo-ekolojik sistem bakış açısıyla kentsel dirençlilik değerlendirmesi kapsamı tartışması yapılmış ve literatürde önerilen sosyo-ekolojik ağ analizi yöntemi denenerek bu yöntemin planlama alanına katkısı tartışılmıştır. Sosyo-ekolojik ilişki ağları analizi ve dirençlilik değerlendirmesi için İstanbul ili, Sultanbeyli ilçesi seçilmiştir. Sultanbeyli İstanbul'un gecekondu ve kaçak yapılaşma ile 1980 li yıllardan itibaren düzensiz olarak büyümüş bir ilçesidir. Sultanbeyli halkı pek çok sosyo-ekonomik ve mekânsal kırılganlık sahiptir. Yanı sıra yerleşimin tamamı İstanbul'un önemli temiz su kaynaklarından biri olan Ömerli Havası içerisinde kalmaktadır. Kontrolsüz büyüme havzanın küçülmesinden, kirlenmesine kadar çok sayıda konuda etki etmektedir. Bu

1. Introduction

Resilience, the core concept of this study, has become an important object of debates and discussions revolving around the examination and interpretation of complex relationships between socio-economic and ecological components of urban systems in the field of urban planning since the 2000s *(Pickett et al. 2003; Sellberg et al. 2015)*. The term "resilience" refers to the capacity of a system to absorb such events as shock, surprise, and orderly or disorderly change and to adapt to new conditions while preserving its key components and relations *(Berkes et al. 2004; Walker 2007)*.

The concept of resilience was introduced into the scholarly literature by C. S. Holling's 1973 article "Resilience and Stability of Ecological Systems," in which he defines resilience as "a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables" *(Holling 1973, 14)*.

A number of ecology scholars such as Carl Folke, Brian Walker, Fikret Berkes, Johan Colding, and Stephen R. Carpenter developed a theoretical perspective creating socio-ecological system research utilizing Holling's framework. There are a wide variety of approaches to define social and ecological systems today. The concept of socio-ecological system was introduced into the scholarly literature in 1998 by Berkes and Folke *(Folke et al. 2010; Folke 2006)*. Alongside with the concept of socio-ecological system, they used resilience to refer to the ability of the system to maintain its essential structure and key components in the face of inevitable change by adapting itself to the new conditions and becoming flexible *(Folke 2006; Folke et al. 2010; Walker et al. 2002, 2006; Walker 2007)*. As Folke *(2006)* points out, after the concept was integrated into the socio-ecological systems research, it has become a major focus of scholarly interest in a large number of social sciences.

In the field of urban studies, resilience gained prominence in the same period when the socio-ecological systems and adaptation approaches were also on the ascendancy. Resilience thinking for urban development is significant as it represents the intersection of four major issue areas *(see Figure 1)*: firstly, intensive utilization by cities of the natural environment; secondly, their influence on and management of natural resources; thirdly, complexity and uncertainty issues on local and global scales; and finally, a wide variety of risks, crises, and shocks facing urban areas because of their constant change, growth, development.

Figure: 1
The relationship between resilience thinking and urban development (created by the author for this article).

nedenle Sultanbeyli için yapılan dirençlilik değerlendirmesi tüm şehri etkileyebilecek bir konu haline gelmektedir. Araştırma iki ana koldan oluşmaktadır. Birinci kol kentsel dirençliliği tanımlama, kapsam ve yöntem geliştirmeye çalışan literatür taramasını ifade etmektedir. İkinci kol ise bu kapsamda sosyo-ekolojik ilişki ağları analizi yöntemi ile kentsel dirençlilik değerlendirmesinin denendiği saha çalışmasını ifade etmektedir. Araştırma sonucunda dirençli kent değerlendirmesinin, yönteminin ve kullandığı araçların sürdürülebilir kentsel gelişme ve stratejik planlama deneyimlerine katkı sağlayacağı tespit edilmiş olup, sosyal ilişki ağları analizi yönteminin şehir planlamada paydaş analizi ve bilgi akışı, katılım sağlama amacıyla bir araç olarak kullanılabileceği kanaatine varılmıştır.

Keywords: Urban resilience, resilience assessment, social-ecological network analyzing, Sultanbeyli
Anahtar Kelimeler: *Kentsel dirençlilik, dirençlilik değerlendirmesi, sosyo-ekolojik ilişki ağları analizi, Sultanbeyli*

Within the context of urban space and development, the concept of resilience has been discussed in terms of three major issues: social resilience; resilience of urban ecosystems, and resilience against disaster *(Özyetgin Altun 2011)*. Moreover, we have witnessed in recent years that the theories of urban economic structure and planning have begun to deal with the concept of resilience *(Davoudi et al. 2013; Eraydin and Taşan-Kok 2013)*. These areas of scholarly discussion are not isolated at all, but rather they have to be viewed as interconnected. This paper rests on a piece of research conducted in Istanbul regarding the resilience of an urban ecosystem from the perspective of socio-ecological resilience. The main purpose of the research is to identify the resilience of an urban ecosystem particularly on the basis of a theoretical framework derived from the scholarly literature concerning social and disaster resilience.

The field[2] research was conducted in the district of Sultanbeyli, Istanbul. This district, which lies within the Ömerli Basin, came into being in a non-regulated, even haphazard fashion in the 1980s and has grown very rapidly ever since due to migration and informal housing—thus its population had reached 30.000 by 2010. The methods employed in this study are observation and socio-ecological network analysis.

The district exerts significant pressure upon the basin ecosystem, in which it is situated, because of insufficient infrastructural services. Moreover, the residents of Sultanbeyli, mostly migrants from rural areas, are particularly vulnerable in terms of a number of socio-economic issues. This district was chosen as the site of research since it represents an area where the problems of urban planning and social and ecological vulnerabilities appear to be interwoven, thereby providing fertile ground for an analysis of a socio-ecological system and resilience *(see Figure 2)*.

1 *This paper is derived from my master's thesis entitled "The Role of Social-ecological Networks and Structuring for Improving Urban Resilience," which I wrote under the supervision of Prof. Dr. Azime Tezer and submitted to Istanbul Technical University in 2011. I updated the literature overview and slightly modified the theoretical framework.*

2 *The field research conducted for my MA thesis comprises two separate parts. The first one involves observations and a survey covering all the neighborhoods of Sultanbeyli. As part of the survey, 178 questionnaires were administered with at least 11 questionnaires in each neighborhood. The second part of the thesis is about the spatial structure of Mecidiye Neighborhood, where an urban design study was conducted. This paper deals exclusively with the socio-ecological analysis, i.e. the first part of the thesis.*

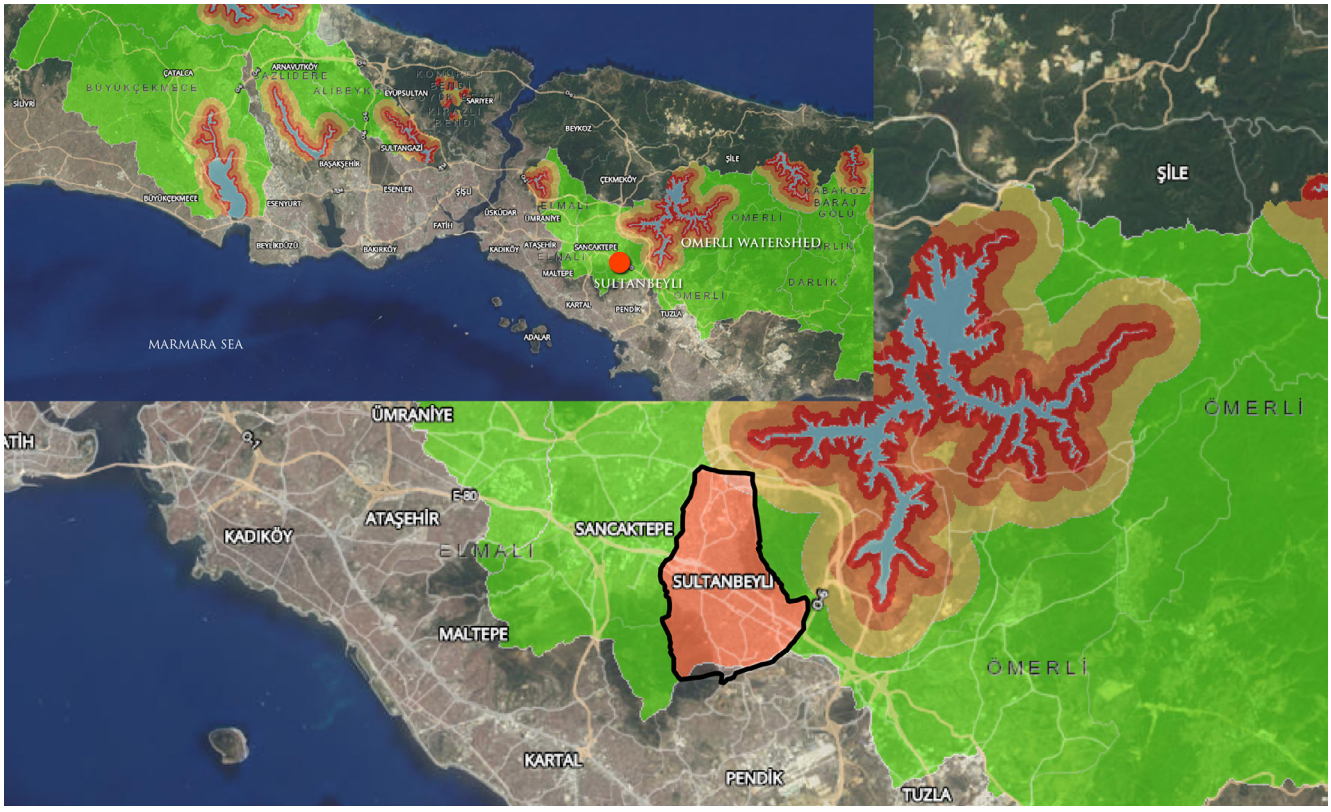

Figure: 2
The location of Sultanbeyli District and Omerli Water basin within its Shelter Belts. Reproduced from https://sehirharitasi.ibb.gov.tr/ (10.09.2018).

2. *Defining the Scope of Urban Resilience*

The term "cities of resilience" was proposed as a metaphor for "the flexibility of a social-ecological system over the long term," particularly for the adaptability of social, economic and institutional structures of urban areas in the face of uncertainty and change *(Piccet et al. 2004; Brand and Jax 2007)*. Brian Walker et al. *(2002)* offers a four-step framework involving for the analysis of linked social-ecological systems aiming to manage resilience. The first step focuses upon developing a conceptual model of the system, defining key processes, structures, and actors. The second step aims to construct a limited number of future scenarios, by examining external shocks, stakeholder visions, and possible policies. In the third step, the outputs of the earlier steps are used to explore the system for resistance, developing an analysis for each possible scenario. The fourth step "is a stakeholder evaluation of the process and outcomes in terms of policy and management implications" *(see Figure 3)*.

Cities are facing crises, hazards, and risk factors with increasing frequency and severity, involving spatial, temporal, and social aspects *(Medd and Marvin 2005)*. The variables regarding these factors define the parameters against which cities must be resilient. The relevant factors include terror attacks on various scales, threats to cultural and natural heritage or to agricultural land or production, disasters such as droughts, earthquakes and floods, global economic crises, and problems regarding the biological diversity of urban eco-system.

Although research on urban resilience has become much more widespread in the 21st century, there is no agreed-upon theoretical framework concerning its scope and methods. This paper combines three major issues and provides an integrated approach. The relevant issues are:

- Building the resilience of urban ecosystems impacted by urban development *(Alberti and Marzluff 2004; Colding 2006; Paavola et al. 2009; Beck 2005; White and Stromberg 2009)*.

- Urban resilience against natural and technological disasters *(Fleischhauer 2008; Bosheret et al. 2007; Godschalk 2003)*.
- Building social resilience for laying the ground for urban resilience *(Adger 2000; Mullin and Arce 2009; Walsh 2007; Wallece and Wallece 2008; Berkes and Ross 2013; Maclean et al. 2013)*.

The studies under these three headings explore the vulnerabilities, strengths, key units, threats, complexities, and uncertainties of cities in different ways in accordance with the relevant perspective.

2.1. Urban Ecosystem Resilience

Urbanization gained pace within the last 100 years, leading to the disintegration, fragmentation, degradation, diversity loss, and even total destruction of ecosystems within or around urban areas *(Alberti and Marzluff 2004; Colding 2006; Walker 2007)*. The cycles stemming from these destructive factors give rise to a decrease in the resilience of cities. For the ecosystems within or around cities not only help maintain the functioning of the natural cycle, but also provide social, economic, ecological benefits or—to use a more scholarly term—"ecosystem services" for cities. In order to sustain a healthy, high-quality urban life, it is necessary not to disturb the proper functioning of the natural cycle and to preserve the structural and functional features of ecological units *(Millennium Ecosystem Assessment 2005; McPhearson et al. 2015; Colding 2006; Andersson et al. 2014)*.

Urban ecosystems are managed by human actors, therefore, they can be considered simplified or made artificial *(Kışlalıoğlu and Berkes 2007)*. These ecosystems encompass human modified natural areas such as agricultural land, parks, forests, or artificial landscape. Moreover, cities tend to degrade natural areas, turning them into artificial ones. For this reason, one of the major concerns of the scholarly literature is building the resilience of the natural environment damaged by cities or that of ecosystems surrounding urban areas. Another major concern in the relevant literature is about the question how to make use of urban ecosystems as social and economic inputs and how to sustain the related flows. Ecosystems within or near urban areas are exposed to the destructive pressure of urbanization, thereby encountering the problems of functional or structural disorganization or instability. These problems, in turn, lead to the degradation or disruption of the vital services rendered by ecosystems to cities. The process causes vulnerabilities in urban socio-economic structures *(see Table 1) (Kışlalıoğlu and Berkes 2007)*.

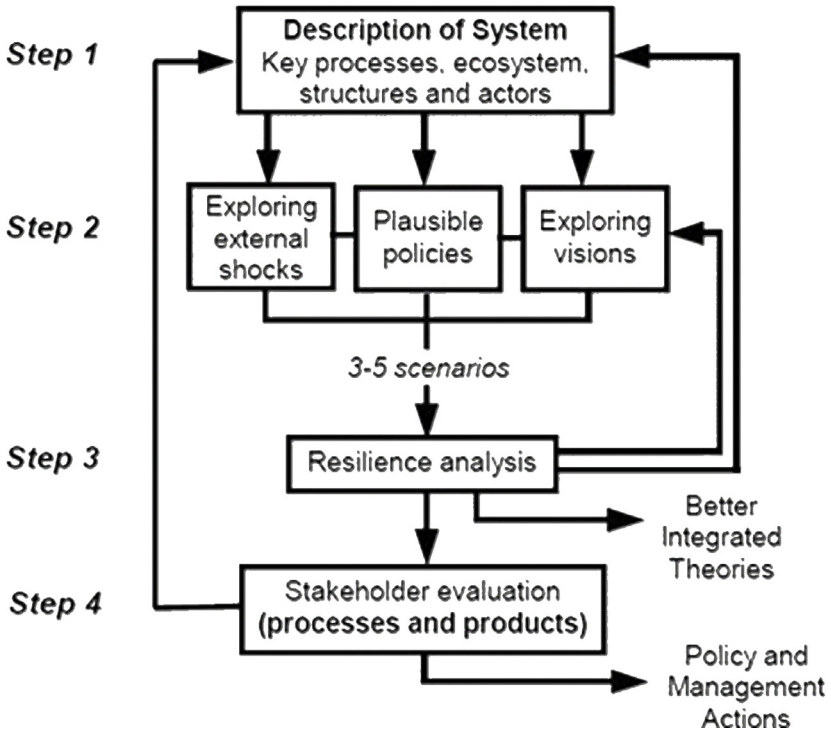

Figure: 3
A framework for the analysis of resilience in social-ecological systems (Walker et al, 2002).

The direct effects of urbanization on urban ecosystems include urban sprawl, harmful land and water use decisions, unchecked hunting and gathering activities, and biological, chemical and physical problems relating to waste disposal *(Alberti and Marzluff 2004; Colding 2006; Paavola et al. 2009; Beck 2005; White and Stromberg 2009)*. Scholars also examine the indirect effects of urbanization such as the micro-climatic change caused by the accumulation of heat in the built areas on the natural environment *(Alberti and Marzluff 2004; Colding, 2006; Kışlalıoğlu and Berkes 2007)*.

In order to achieve urban resiliency, it is necessary to build the resiliency of urban ecosystems, to limit urban sprawl which

Urban Ecosystem Resilience	
Subjects of risks	Ecosystem Services (Millennium Ecosystem Assessment,, 2005); • Provisioning services: food-clean water-fuel resources- wood- fiber-biochemical-genetic resources • Regulatory services: climate control- epidemic control-water loop-water waste treatment-pollen control • Cultural services: moral and spiritual-recreational-aesthetic- education-cultural • Supporting services: soil creation- food chain- output of raw material
Vulnerabilities	• Decreasing quality of air-water and soil • Loss of basin and river systems • Loss of forest and agricultural areas • Loss of biological diversity • Change of natural balance and components
Threats	• Complexities, uncertainties • Unrestrained urban extension • Uncontrolled human resource usage • Uncontrolled waste aggregation • Buildings inappropriate with natural environment • Uncontrolled energy usage • Climate change
Planning Tools	• Develop urban ecosystems according to ecologic basis (Colding 2006; Alberti and Marzluf 2004;; Andersson et al. 2014; Ernstson et al. 2010) • Integration of ecosystem patches in urban spaces (Colding 2006; Alberti and Marzluff 2004, Tzoulas et al. 2007) • Defining social-ecological relation networks (Andersson et al. 2014; Ernstson et al. 2010; Ernstsson et al. 2008; Alberti and Marzluf 2004; Olsson et al. 2004) • Implementing realistic and flexible governance models (Andersson, et al. 2014; Alberti and Marzluf 2004; Ernstson et al. 2010) • Develop collaborative management models (Ahern et al. 2014; Alberti and Marzluf 2004; Olsson et al. 2004; Prell et al. 2009; Carlsson and Berkes 2005)

Table: 1
Defining Urban Ecosystem Resilience (derived from Ozyetgin Altun, 2011)

directly impacts upon those systems, to stop the forms of land use harming ecosystem services, and mobilizing the experience and knowledge of local people *(see Table 1)*. Moreover, scholars state that those cities with degraded ecosystem services will be vulnerable in their socio-economic and ecological aspects. Vulnerable cities become less resilient in the face of socio-economic and ecological crises and hazards occurring on global and local levels. Therefore, building resiliency in urban ecosystem units implies both the ecological resilience of those units which are within the urban sphere of influence and the social and economic resilience of urban areas which are dependent upon ecosystem services.

2.2. Resilience Against Natural and Technological Hazards

Disasters, which are an important concern in building urban resilience, encompass a wide variety of events resulting from natural *(floods, droughts, famine, earthquakes, hurricanes, fires, etc.)* and technological/human-made *(chemical leakage, radioactive explosions, wars, terrorism, etc.)* factors *(Fleischhauer 2008; Godschalk 2003; Jha et al. 2013)*.

In the contemporary world, the impact of a natural disaster is often not limited to a local community, but rather it is experienced on a regional or even global scale, depending on the degree of the interaction of the originating event with other components of the natural system. Therefore, the kinds of hazards encountering the humanity today are not only those whose causes and consequences are well-defined and determined, but also those with a high level of uncertainty and ambiguity. Within the context of resilience research, the most important natural disaster is taken to be climate change. Natural disasters increasingly linked to climate change such as droughts, floods, storms, and endangered biological diversity pose a very serious risk to human settlements, which might give rise to enormous social and economic loss *(see Table 2)*.

Technological disasters too occur both on local and regional/global scales. They refer to catastrophic events caused by a malfunctioning of a technological/scientific system and/or some human error in

Resilience Against Natural and Technological Threats		
Subjects of Risk	• Windstorm • Flood • Forest fires • Drought • Earthquake	• Wars • Epidemic disease • Famines • Terrorism
Vulnerability	• Being unprepared for future uncertainties in social–economic-physically developed areas • Loosing regulative and supportive services of ecosystems • The high ability of feedback, experience, learning and watching of society • Incompatible buildings to geographical and environment	
Threats	• Complexity and uncertainty • Climate change • Unpredictable natural movements • Conflict of local and global scaled, economic, • Social and physical structure	
Tools	• Take precaution, harm reduction and be prepared for long term (Jha et al. 2013) • Reducing social and ecological vulnerabilities (Berkes and Ross 2013) • Defining social relation networks (Maclean et. al. 2013) • Developing self-organizing capacity (Berkes and Ross 2013; Maclean et. al. 2013; Jha et al. 2013) • Education and control of local data flow (Jha et al. 2013; Godschalk 2003)	

Table: 2
Defining resilience against natural and technological disasters (derived from Özyetgin Altun, 2011)

managing the technology or the related political and economic systems. Technological hazards include industrial pollution, nuclear radiation, toxic wastes, and chemical spills. These hazards are often examined with reference to theories of uncertainty, ambiguity, and complexity *(Fleischhauer 2008; Bosher et al. 2007; Jha et al. 2013)*.

Disruptions or deterioration of regulatory or supporting services of urban ecosystems are amongst the factors triggering natural disasters. Moreover, the impact of disasters upon urban areas varies in accordance with the levels of social and economic vulnerability of cities. The weaker the socio-economic, political or ecological system of an urban area, the greater the impact of a disaster might be there. The same holds true for the level of flexibility or adaptability of a city *(Godschalk 2003)*. The risks posed to a city increases in direct relation to the vulnerabilities it has. Enormous social and economic vulnerabilities of a city imply that it has highly insufficient levels of collaboration, adaptability, and efficiency. Thus, disaster resilient cities can be created by reducing socio-economic and ecological vulnerabilities and developing efficient methods of loss and risk management *(see Table 2) (Fleischhauer 2007)*.

2.3. Social Resilience

In resilience research, social resilience approach focuses upon the capability of an socio-ecological structure to sustain and adapt itself in face of the changes in the ecosystem. It is often pointed out that communities whose main source of income relies on the resources in an ecosystem are particularly impacted by ecological changes *(Adger 2000)*. Furthermore, social resilience research covering the resilience of the smallest unit of the social structure, i.e. the family, deals with issues such as poverty, disasters, cultural loss, economic instability and safety systems *(Mullin and Arce 2008; Walsh 2007; Wallace and Wallace 2008)*.

Various aspects of weak social resilience are related to the dynamics of urbanization, which cause the disintegration of rural culture, the reduction of social and economic benefits obtained from natural resources, and the increasing dependency on consumer culture *(Walsh 2007)*. This process often involves poverty and the loss of cultural heritage. Indeed, it might be argued that poverty represents Achilles' heel of modern cities. The poor *(and deprived)* constitute the most vulnerable social groups since they are often unable to access proper health, education and security services—indeed, clean drinking water and food. As many people suffer from

Social Resilience		
Subjects of Risk	• Poverty • Social segregation • Social conflict	• Natural Hazards • Drought • Famine • Epidemic disease • Unhealthy living conditions • Wars
Vulnerabilities	• Loss of social, economic and ecological sources • Loss of cultural memory • Difficulty in accessing health, education and security services • Weakness of trust, solidarity, and knowledge flow networks in social structure.	
Threats	• Complexity, uncertainty • Social, economic and politic relations on local and global scale • Loss of provisioning, regulating and cultural services of ecosystems.	
Tools	• Improving the capacity of self-organization (Maclean et al. 2013; Berkes et al. 2004; Berkes and Ross 2013) • Improving and strengthening trust, solidarity and knowledge flow networks (Maclean et al. 2013; Wallace and Wallace 2008) • Strengthening the community against economic and ecologic vulnerabilities (Maclean et al. 2013)	

Table: 3
Defining social resilience (derived from Özyetgin Altun, 2011)

the decreasing opportunities of accessing natural resources for food and water, urban populations are becoming less self-sustainable, and more dependent on consumer culture. Hence, they have less capability in creating flexible and speedy solutions in times of crisis such as disasters such as wars, earthquakes, and floods or economic downturn *(see Table 3)*.

One of the most dramatic impacts of urbanization is the loss of some fundamental social and cultural values. These values rest upon social solidarity networks as well as a way of life with the capability of meeting basic needs by utilizing natural resources *(Wallace and Wallace 2008)*. The disintegration of solidarity networks means that the community will suffer more from a crisis because they have become unable to take collective action.

Poverty and cultural disintegration create vulnerabilities in the social structure. Natural disasters, wars, conflicts, economic and political uncertainty arising under these conditions mean that multidimensional challenges facing urban society *(Godschalk 2003)*. For vulnerable urban communities, each kind of hazard represents a greater social risk. Therefore, coping with social vulnerabilities is essential for building urban resilience.

The social structure of resilient cities requires stronger self-organizing and learning capacity, which can be subsumed under the concept of social capacity *(Berkes et al. 2004)*. The latter concept refers to a wide variety of areas such as cultural values, geographical and social knowledge and experience, communication and solidarity networks. Moreover, self-organizing capacity involves the flow of knowledge and experience, learning, governing and governance issues *(Berkes et al. 2004; Folke et al. 2005)*.

2.4. Planning Targets for Urban Resilience

The level of urban resilience is identified with reference to three issues. Within the frame of this extent, using of the topics that are determined by tools of resilience concept should be targeted by urban planning. These topics are combined under two fundamental targets for planning the development of resilient urban systems with economic, ecological, social, spatial, institutional, administrative and legal insights. These two targets are, activating social-ecological networks and activating structuring ecologically.

The context of the target of activating social-ecological networks;

1. Collecting ecological knowledge and experiences
2. Mitigation of poverty and deprivation
3. Sustainability of social, cultural knowledge and learning networks
4. Achieving flow of knowledge be-

tween institutional structure and local people
5. Organizing risk management
6. Enhancing self-organization

The context of the target of activating structuring ecologically;

1. Resilience of urban ecosystem units
2. Resilience of ecological units
3. Efficient usage of economic resources
4. Activation of land usage and structuring against to natural and technological threats
5. Land development by debating local's knowledge and experience

3. Informal Residential Areas in Istanbul: The Case of Sultanbeyli

Istanbul, the largest city in Turkey, faces an incredible number of economic, political, social, ecological, and spatial problems. Due to the opportunities it offers, immigration into the city gained momentum in the 1950s and has continued unabated until today *(Keleş 1978)*. Informal housing areas constitute one of the main characteristics of the city's unplanned development. Informal settlements came into being in the 1950s, when the dynamics of rapid urbanization led many migrants to solve their housing problems on their own by creating shantytowns. These informal areas have been expanding in an uncontrollable and unstoppable fashion ever since due to the policies adopted by populist politicians and the legal loopholes seized by both state officials and citizens *(Keleş 1978; Çavuşoğlu 2004)*. Whereas gecekondus *(squatter's houses)* were single-story dwellings made of simple materials, they changed significantly over time, often turning into multi-story buildings in the 1980s *(Işık and Pınarcıoğlu 2001)*. Thus, a new vocabulary concerning informal housing came into being including some terms referring to such buildings as informal hotels, hospitals, and schools. By 2000, many quarters, neighborhoods, even entire districts of the city were mainly composed of informal buildings, accessing every kind of urban facilities and services *(Erkan 2002)*. Informal housing areas constitute 47% of the city *(İBB 2009)*.

Figure 4 shows that how widespread informal housing areas have become in Istanbul, particularly having an impact on water basins. This study deals with the district of Sultanbeyli, which is situated within the Ömerli Basin.

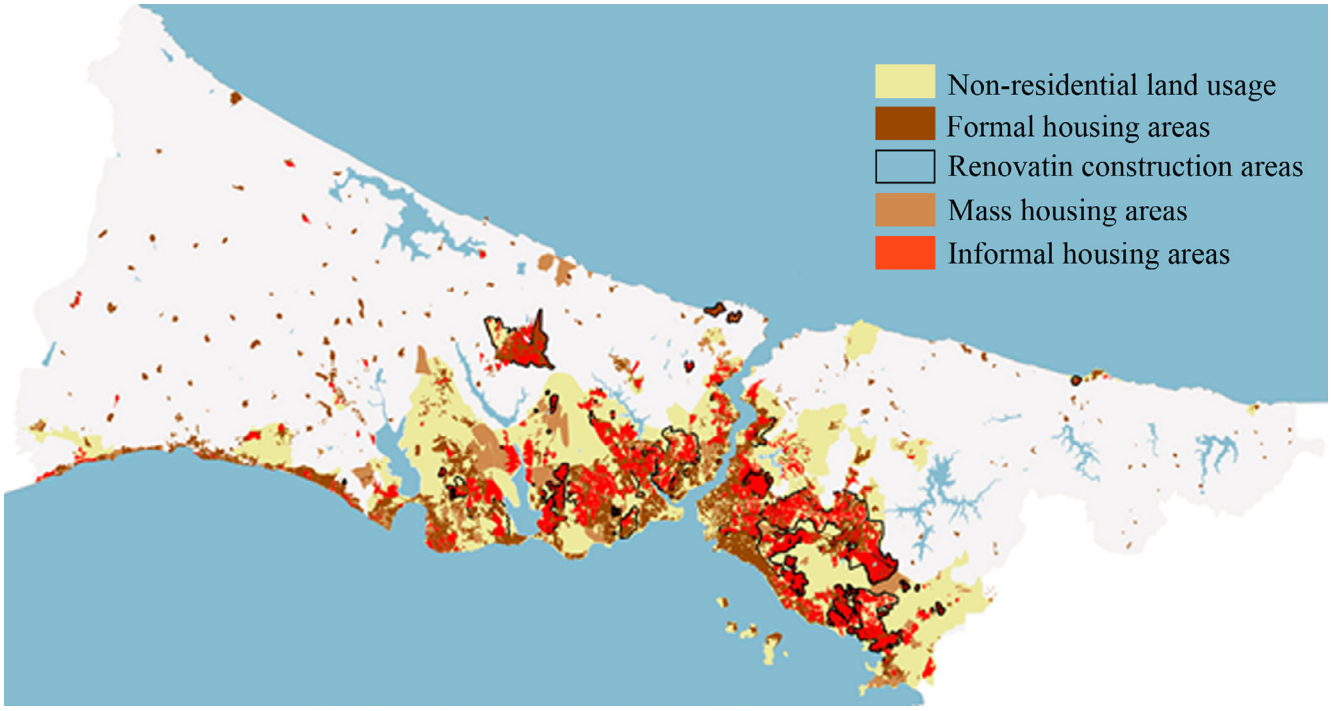

Figure: 4
Housing types and distrubution in Istanbul (Ozyetgin Altun 2011, 54).

Regarding the issues crucial for building urban resilience, the characteristic vulnerabilities of informal housing areas can be enumerated as follows *(Tezer et al. 2010)*

- Ecological:

a) Exposure of ecological structural components to the pressure of unplanned development.

b) Sustainability risk concerning ecosystem services under the pressure of unplanned development.

- Constructional:

c) Construction of the buildings without any technical/engineering services or any compatibility to planning or construction norms.

d) Vulnerability to natural hazards since most of them are low-cost and low-quality buildings.

e) Insufficient or low-quality infrastructure

f) Turning single-story buildings into four- or five-story ones over time.

- Social:

g) Low participation in formal education.

h) Low-quality and insufficient cultural services.

i) Lack or insufficient level of social security due to high rates of unemployment and informal employment.

j) Immigrants constituting the bulk of the population.

- Economic:

k) Underutilization by informal housing communities of the surplus value of urban land.

l) Limited economic productivity due to unqualified labor.

- Ecological and Socio-economic:

m) Unpredictability of long-run social and economic consequences of the loss of efficiency in ecosystem services.

- Planning:

n) Uncertainty in land and house property.

o) Uncontrollability regarding the direction of urban development.

p) Unchecked expansion of urban population.

q) Inability of providing the population with equal access to urban equipment.

r) The pressure on planning policies due to populist approaches.

s) Loss of faith in planning.

Sultanbeyli is a district which has developed in a completely unplanned way within the Ömerli Basin. It was only a small village in the 1950s, when rural-urban migration began to change Istanbul rapidly. Today, it is a considerably large district with a population of nearly 30.000. The most important dynamics affecting the settlement patterns of Sultanbeyli are its ecological environment, population density, unplanned development, and socio-cultural diversity.

One major socio-economic problem for the residents of Sultanbeyli is the construction of dwelling units or workplaces by destroying woods, bushes, and shrubs or filling stream beds, thereby giving rise to important risks for a regulated, healthy, and sustainable community development. The problems identified on the basis of the population data in Sultanbeyli can be classified in the following way (*Işık and Pınarcıoğlu 2001; Tezer et al. 2010; Özyetgin Altun, 2011, 68)*.

- Problems related to the social structure:

a) Difficulty in estimating population size,

b) Cultural fragmentation due to the low level of the integration of migrant communities with diverse backgrounds,

c) Socio-economic differentiation of the population due to the period of migration,

d) Low level of education.

- Problems related to the economic structure:

e) Insufficient qualification for professional work,

f) Unemployment,
g) Lack of social security,
h) Undeveloped state of various industries,
i) Low income level.

- Problems related to the physical urban structure.

j) Informal housing,
k) Lack or insufficiency of infrastructure.

With reference to all these problems, the urban vulnerabilities facing Sultanbeyli will be discussed in terms of ecological and socio-economic aspects. These vulnerabilities stem from insufficient value of the district's assets and its chaotic character and tend to grow due to unplanned and non-regulated development. Undoubtedly, social, economic, and ecological vulnerabilities can be classified and examined under separate headings for specific purposes. It is impossible, however, to neglect the interaction between them while assessing the resilience of an urban system.

The most important vulnerabilities of Sultanbeyli can be listed under the following two headings:

- Socio-economic vulnerabilities *(Özyetgin Altun, 2011, 75-76)*

l) Loss of cultural values,
m) Undeveloped state of the sense of belonging to the district amongst its residents,
n) Low level of education,
o) Unemployment,
p) Insufficient access to social security,
q) Insufficient knowledge of and insensitivity to the natural environment.

- Ecological vulnerabilities *(Özyetgin Altun, 2011, 68-74)*

r) Ongoing informal construction,
s) Use of water wells,
t) Insufficient accumulation of surface water and its pollution because of informal construction within or around surface water drainage areas,
u) Informal construction within the strict preservation zone,
v) Waste accumulation in ecologically vulnerable areas,
w) Unhealthy and insufficient sewage system,
x) Informal, non-regulated industrial units.

The river Uzundere, which constitutes a natural corridor within the ecosystem, is one of the ecological most vulnerable resources of the area. The researcher observed that the parts of the rivers running through Mediciye and Turgut Reis neighborhood were particularly polluted with waste *(Figure 5)*. Since the river feeds into Lake Ömerli, the pollution directly affects the basin, posing a risk for Istanbul in accessing clean water.

4. *Field Research: Socio-Ecological Network Analysis of Sultanbeyli*

4.1. *The Method of the Field Research*

The field research was conducted by employing the method of social-ecological network analysis. In addition, the survey of the scholarly literature and field observations are employed as supporting tools in gaining insight into the general demographic conditions of the neighborhoods and the district and identifying their

Figure: 5
Uzundere river (Özyetgin Altun 2011, 72).

socio-economic and ecological strengths and weaknesses.

Social network analysis seeks to understand and explain networks and their numerous participants in a specific social setting, laying the ground for managing their relationships on the basis of its findings. This type of analysis aims to discover the units of social networks and the structural features of their relationships. It rests upon the relevant mapping and assessment methods and concepts.

The components of social networks are nodes, ties and attributes. Nodes *(actors)* refer to the basic units of the social structure. They can be taken as individuals, families, age groups, companies, organizations, or communities. Ties refer to the relationships between the nodes. Network scholars distinguish between strong ties and weak ties. The distinction can be identified with reference to a large number of factors including affect, reciprocity, and intensity. For example, individuals within a close circle of family and friends are viewed as strong ties, while acquaintances are considered weak ties. Attributes are the properties of nodes. If nodes are taken to be individuals, they may be income, gender, and age *(Granovetter 1997; Wasserman and Faust 1994; Hanneman and Riddle 2005)*. The system comprising nodes and their ties is designated as a network system or structure. The term "structure" corresponds to patterns of relationships in this context. Discovering structural patterns may contribute to adaptive forms of governance and co-management *(Ernstson et al. 2008)*.

Social network analysis employs two sampling methods: snowballing and ego-centric network sampling methods *(Granovetter 1977; Wasserman and Faust 1994; Hanneman and Riddle 2005)*. Snowball sampling starts with a focal set of actors *(individuals or organizations)*. Then, each of these subjects is asked to recruit other actors amongst their acquaintances so that the sample grows like a snowball. This type of sampling enables the researcher to identify social networks within the relevant system. The other sampling method begins with a set of focal individuals *(egos)* so as to identify the social networks ties within the research setting.

In the field study in Sultanbeyli, the ego-centric network sampling method was opted. The researcher conducted a face-to-face questionnaire survey, covering the entire district with the total number of 178 questionnaires. They were applied with at least 11 respondents in each one of the 15 neighborhoods in Sultanbeyli. The respondents were randomly selected and the researcher tried to make observations in the entire area of each neighborhood. The respondents were the decision-making individuals of families. The data collected were analyzed by using EgoNet and the visual materials were generated by the same program. The analysis aimed to discover the behavior patterns and contact preferences of the families.

The questionnaire comprises three parts. The first part of the questionnaire is made up of the household information questions aiming to obtain a general profile of the Sultanbeyli residents, while the second part contains questions about the built environment. Finally, the third part focuses on the social networks employed by the households. The questions in the first two parts serve two purposes: to find out about the socio-economic conditions and spatial properties of Sultanbeyli by contacting people living there, and to discover how the respondents use physical space and how they position themselves in terms of socio-economic variables. The third part of the questionnaire aims to lay bare their patterns of relationships with social and the natural environment, thus acquiring the data necessary to conduct a socio-ecological network analysis.

In this study, the nodes are taken to be families. The visual materials present the clusters of families categorized according to their forms of action, i.e. participation in solidarity networks, association membership, and use of garden plots

4.2. What Types of Social Networks Do the Residents of Sultanbeyli Have?

The first question of the social network analysis is about the association member-

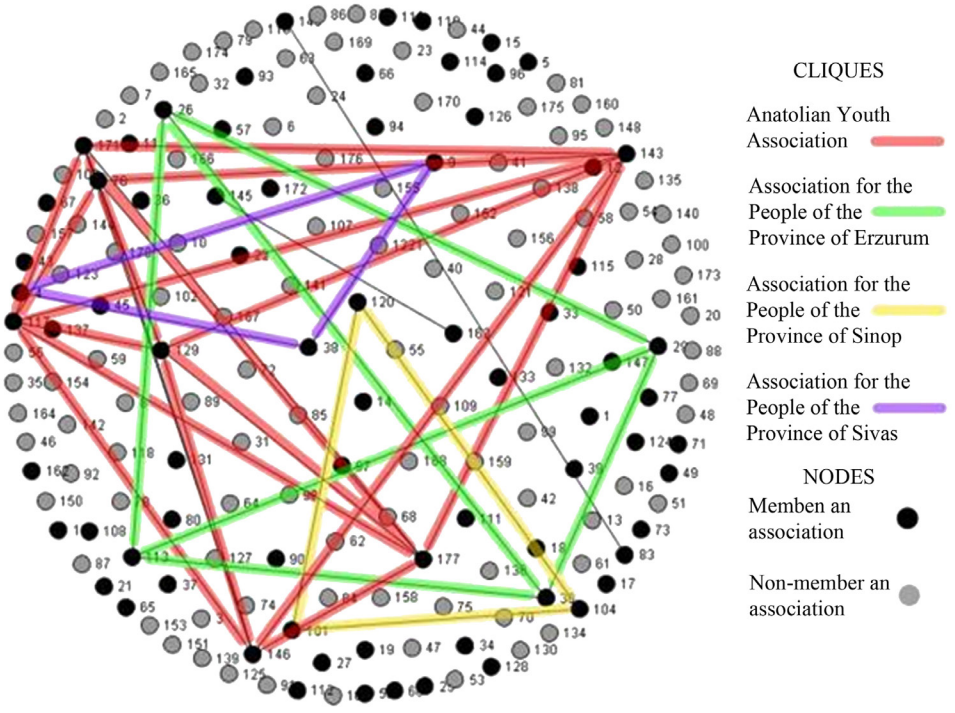

Figure: 6
Association membership and cliques (Özyetgin Altun 2011, 84).

ship of the household head. 74 of the 178 respondents are members of some association. Most of them *(64)* are members of hometown associations *(hemşehri dernekleri)*, while the other associations are represented with far fewer members. In fact, leaving aside the "Anatolian Youth Association" *("Anadolu Gençlik Derneği")*, which is in fact a political organization represented with 7 members, each one of the other organizations *(the Atatürkist Thought Association/"Atatürkçü Düşünce Derneği", the Red Crescent Society/"Kızılay Yardımlaşma Derneği", and Beşiktaş Football Club Association/"Beşiktaş Futbol Takımı Derneği")* has only one member amongst the respondents *(Figure 6)*.

Hometown associations appear to have been organized on the basis of the province, district, village, or even village neighborhood where the residents migrated from. Therefore, they display a great diversity. Amongst the respondents, for example, the Association for the People of the Province of Sivas *(Sivaslılar Derneği)* is represented with 3 members, while the Association for the People of the Province of Erzurum *(Erzurumlular Derneği)* has 4 and the Association for the People of the Province of Sinop *(Sinoplular Derneği)* has 3 members. Similarly, the Mutual Aid Society of the People of the District of Sürmene *(Sürmene Yardımlaşma Derneği)* has 2 members, while Çarşamba Village Association *(Çarşamba Köy Derneği)* is represented with the same number.

Assuming that membership of the residents living in different quarters to the same association implies a relationship, we can analyze the networks accordingly. Thus, we find four cliques with at least three nodes *(Figure 7)*. Since these cliques define the common nodes within the social networks, they might be representing the basic units facilitating the flow of knowledge and experience in Sultanbeyli.

If the number of the questionnaires conducted had been higher, we might have accessed a higher number of cliques. The four cliques thus obtained represent the sufficient number to understand the significance of association membership for the social networks in Sultanbeyli. Therefore, we can argue that every member of these associations assumes a role in the relevant network. What turns this role into that of a key figure is to be found in the exam-

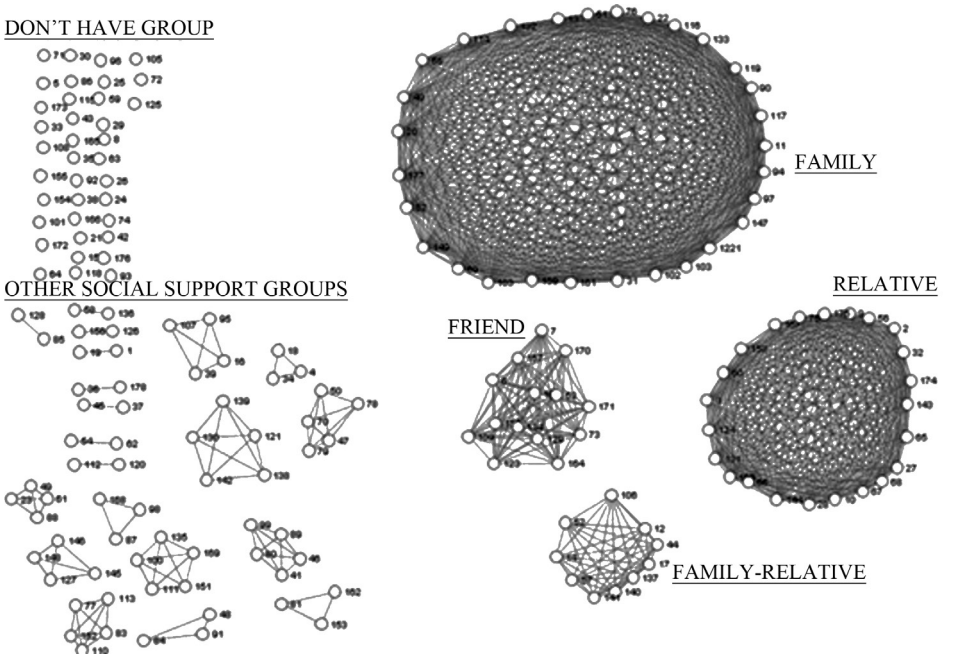

Figure: 7
41 Behavior groups of social structure (derived from Ozyetgin Altun 2011).

ination of the relative factors in the other subgroups of the networks.

In order to understand the forms of behavior displayed by the district residents when they encounter a problem, a question is put to the respondents about their social support relationships. Thus, the second layer of relationships was found by examining the following question: "when you face a problem, from whom do you seek support first?" *(see Table 4 and Figure 7)*.

The second question posed in this context is about the first person or organization the household heads appeal to when they need help. The question aims to discover the sources of financial and psychological support they receive. It was an open-ended question, and the respondents were asked to state whomever came to their minds first.

In this network relations analysis, the respondents who seek no support and/or who are not members of any association

Table: 4
Significance level of relations (derived from Ozyetgin Altun 2011)

Who	First	Second	Third	Total
Family	84	0	0	84
Relative	40	23	0	63
Friend	16	12	1	29
Neighbor	0	5	1	6
Association	4	5	0	9
Religious community (cemaat)	1	0	0	1
Village headmen (muhtar)	3	7	6	16
Municipality	5	7	4	16
District governor (kaymakam)	3	11	8	22
Party (AKP)	1	3	0	4
Grocer	0	1	0	1
Emine Abla	0	2	0	2
Mushin Beseci	0	1	0	1
Mustafa Amca	0	0	2	2

are viewed as the "lost people" within the network. 21 people stated that they seek support from no one, and nine of them had no membership in any association. Therefore, these nine respondents were put into the category of "lost people". 84 respondents answered the second question with "family" *(see Table 4)*. In this context, the term "family" seems to include the members of their household and their very close relatives. Thus, it might be argued that half of the Sultanbeyli residents tend to solve their problems within their family circle, and they are closed to the outer world; the replies to the third question, however, shows that this is hardly the case: most of them appear to have been receiving aid and help from organizations and individuals other than their own family members.

The analysis of the answers to the second question shows that 56 people seek support from their relatives and friends. It might be argued that they are more extrovert and make more contacts than those who provided the answer "family." The table below shows the categories generated with the answers given to the second question *(see Table 4)*. Even though one can see muhtar *(headman)*, municipality, or the district governor *(kaymakam)* in the table, the number of people applying to them is very low. This means that when a problem arises in the district, the residents tend to deploy informal relationships.

4.3. Who Are the Key Persons in the Networks On Different Scales of Social Structure?

Key individuals are the ones who facilitate the knowledge flow between the subgroups of a social structure. These individuals are part of a large number of subgroups, and they can be instrumental in enabling these subgroups maintain their close ties. Therefore, we take the individuals who are members of a large association as key persons *(Figure 8)*.

In Figure 8, black points indicate alters who are in an association and the colored ties show key persons of this analysis.

Figure: 8
Membership in the same association (derived from Özyetgin Altun 2011).

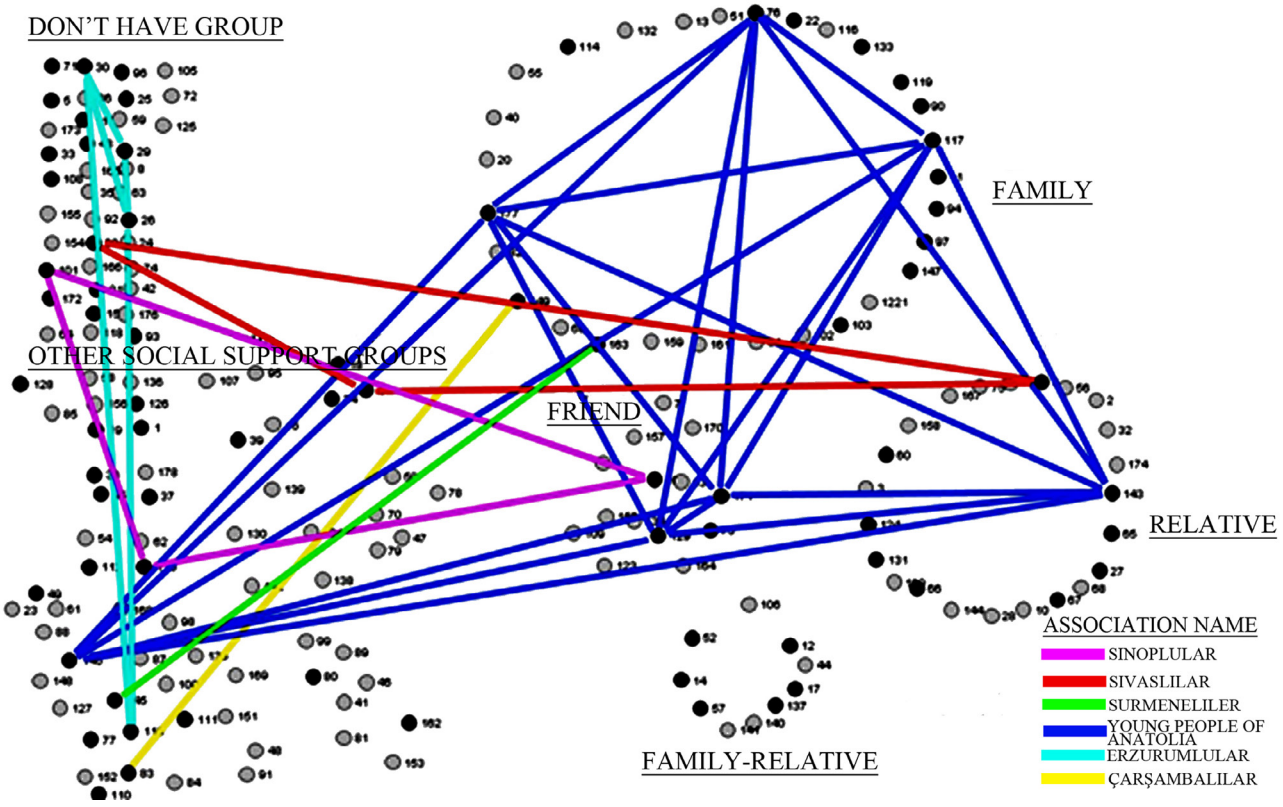

Figure: 9
Use of small plots near dwellings in Sultanbeyli (Özyetgin Altun 2011, 74).

4.4 *Are the District Desidents Able to Maintain Their Rural Culture? What Kind of Networks Do They Have with the Surrounding Ecosystem?*

More than half *(55%)* of the participants of the survey used the garden plots in some form. 46% of these gardens were used as recreational facilities, planting fruit trees there, while vegetables were cultivated in 9% of them. While 8% of the plots remained vacant, both vegetables and fruit trees were cultivated in 7% of them. These figures show that plot use is common in the district, with even a potential of further development. That is to say, rural migrants in Sultanbeyli tended to carry on their agricultural activities—albeit in a modified form under the new conditions in which

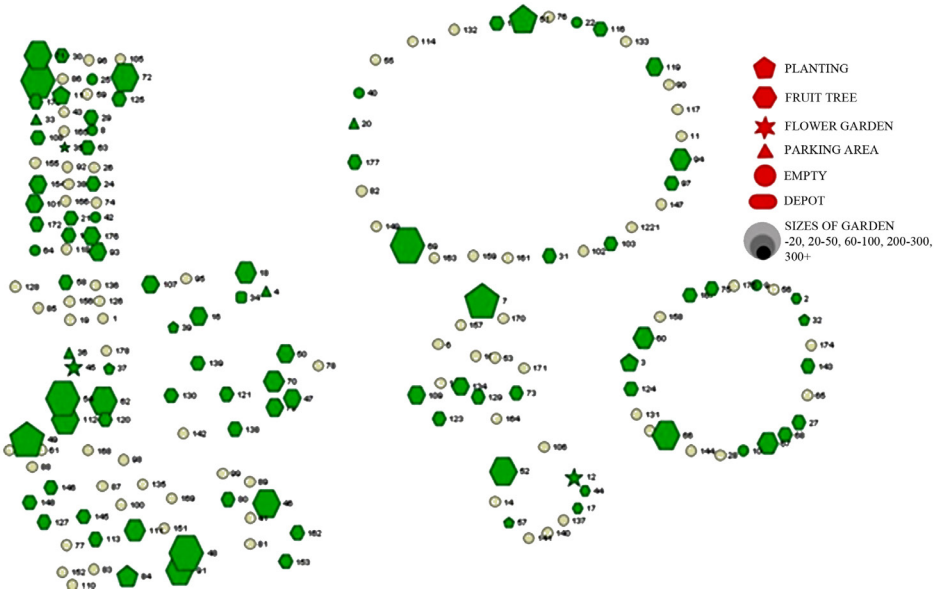

Figure: 10
Respondents with gardens and their different uses (derived from Özyetgin Altun, 2011).

they lived *(see Figure 10)*. Moreover, 2% of the gardens were used for planting flowers, and 4% as parking lots. It is also noteworthy that 12 percent of the respondents did not lose their ties with the rural way of life they had been used to. All these indicate that agricultural way of life was sustained through different activities and these activities had a potential for development.

4.5 Results: How Can the District Residents Are Organized for More Resilient Urban Life Through Urban Planning?

Figure 11 shows all the findings of the survey in a combined form: association membership; the first persons applied to when a problem arises; garden ownership and use. Thus, we can see how knowledge might flow through a social network—association members and family members/relatives/friends. In this network, there are a few people with no connections at all *(9 people out of the total 171)*. The existence of a social network suggests a potential for knowledge flows, hence the possibility that Sultanbeyli might represent a resilient community. Thanks to the social network, the community might reach the objectives of learning, self-organization, and monitoring the system. Moreover, urban planning may make use of knowledge flows to facilitate participatory processes.

Within the resilience thinking approach, the capacity of self-organization is associated with the community's capability of producing and implementing common norms and values—a process which certainly necessitates collective thinking. In order to be able to implement their plans, urban planners seek that the community embraces them, hence the necessity for participatory processes. For this reason, it is maintained that the method of social network analysis may be helpful for the strategic planning stakeholder analysis. Furthermore, thanks to this method, researchers are able to collect considerable amount of data about local people and ecological environment.

In the context of Sultanbeyli, we can list the following strategies for improving gardening/cultivation activities:

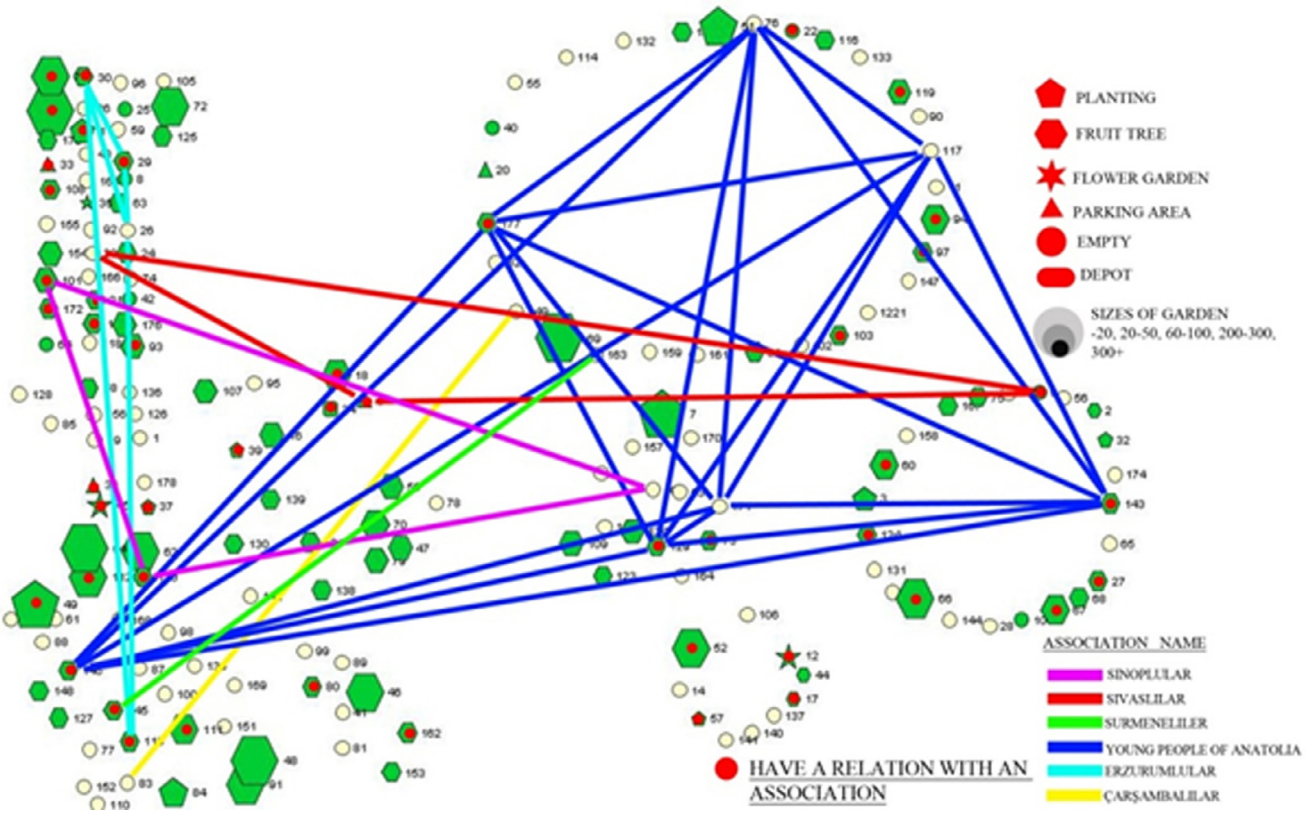

Figure: 11
Overlap of relation and attributes of alters (derived from Özyetgin Altun 2011).

1. The possible damages of the urban settlement might be reduced by the controlled use of gardens.
2. The proper use of gardens allows for the opportunities of creating recreational spaces which may be employed for educational and socialization purposes.
3. A stronger tie between the local community and the natural environment can be generated.
4. Alternative income and food resources can be created for local people.
5. Women's level of employment may increase in this way.

Thus, if the proper use of gardens is to be stimulated, it will be helpful to design better garden plots, to provide gardening training, and to monitor the system. Undoubtedly, monitoring is one of the key components of strategic planning. The planning process does not with making a plan and implementing it, rather it involves monitoring the system.

Resilience thinking also holds that monitoring is essential for good governance. In our context, the following questions may be amongst the relevant ones for monitoring the system:

1. What impact do gardening areas have upon the surrounding ecosystem?
2. What impact do gardening areas have upon social life?
3. Does gardening provide an extra source of income for the local community?
4. How may gardening contribute to the process of the reduction of spatial vulnerabilities?

5. Conclusion

This study provides an overview of some theoretical developments concerning resilience thinking and explores the potentialities of urban resilience in terms of scope, methodology, aims, and policies. In order to create resilient cities and achieve sustainable development, urban ecosystems and socio-ecological systemic structures are of utmost importance. Resilience thinking offers a fresh perspective for urban planning and sustainable development. This approach rests upon a method aiming to identify the relations between the structural units of a system, thresholds, breaking points which signal the onset of change *(where, when, how, with whom, and why)*.

This theoretical framework has been applied to the case of Sultanbeyli, Istanbul. As an informal, non-regulated settlement area, the district is highly vulnerable in the social, economic, and ecological realms. In the resilience assessment, the pressure exerted by the settlement on the ecological environment is taken to be a major hazard, and a strategy is sought to counter it so that the district may expand its socio-ecological resilience. In accordance with this strategy, two objectives are defined: the development of socio-ecological relation networks and ecologically efficient construction. This study focuses on an analysis which may be helpful for the first objective.

The socio-ecological network analysis has provided important data about the relationships of the people of Sultanbeyli amongst themselves and with their natural environment. This data has been grouped under the headings of solidarity and garden use. The potential of garden use appears to be important for the improvement of socio-ecological relationships, creating income, and meeting the need for healthy food of the local community. Moreover, it has been demonstrated that solidarity and relationship networks are of considerable significance for knowledge flows and monitoring processes. The network analysis conducted has shed light on some patterns of collective action amongst the local residents. It is claimed that all of this might be helpful for urban planners in their efforts in taking common action with the local community.

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