'URBAN RESILIENCE' AS A NEW POLICY PARADIGM FOR ACHIEVING SUSTAINABILITY IN ISTANBUL[1]

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Abstract

Because of the complexity of components and dynamics in settlements, planning practices and processes focus on diverse urban problems such as global environmental challenges, land and water degradation, biodiversity, habitat loss and fragmentation, natural hazards, climate change, inequitable distribution of resources and services, urban sprawl and fragmentation, traffic congestion, unsustainable way of urban form, social injustice, spatial segregation based on socio-economic differences of population and unemployment (Abukhater, 2009; Miller et.al. 2010). Consequently, it will be inevitable to have vulnerable and unsecure community and spatial form in urban areas. A city without resilient community will be extremely vulnerable (Godschalk, 2003). Based on this realization, throughout the past half century, there has been a growing and continuing demand towards developing more integrated approaches to spatial planning in a way to combat the disreputably complex and chronic urban problems (Abukhater, 2009). Therefore, the necessity to provide resilience in order to achieve sustainability for community development becomes more crucial. Since planning for a community may seem like a significant challenge, spatial planning should involve rational choices to get prepared for the future (Kelly and Becker, 2000). In this context, Wilkinson (2011) mentions a fundamental issue in planning theory that is "think planning again" in ways of admitting the emergency, unpredictability and inescapability of ecological processes.

This paper aims to discuss the integration of urban resilience theory into sustainable spatial planning process and to assess how urban resilience concept can be related with urban sustainability. Istanbul is chosen as a case study since having the largest metropolitan population and being the economic, cultural and international focal area of Turkey.

In the second half of the 20th Century, during fast industrialization and urbanization, Istanbul has been the destination of rural migrants in large scales that influenced illegal developments on public lands with low quality housing pattern lacking basic

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infrastructure and technical guidance. Additionally, the majority of these illegal developments emerged on major water basins (Tezer, 2005; Tezer, et.al. 2011a; Tezer, et.al. 2011b). Consequently, the pattern of growth couldn't be sustained ecologically and socially. Due to the problems affected by social, economic and administrative characteristics, the community as well as the spatial form of the city became vulnerable. On this account, this paper will focus on the integration of social and ecological systems to develop better tools and policies for enhancing urban resilience in Istanbul. In this task, the key questions will be how spatial planning can be apprehended to provide urban resilience and how urban resilience can address vulnerabilities to achieve sustainable urban development in Istanbul.

Key Words: Sustainability, urban resilience, urban sustainability, spatial planning, Istanbul.

I. Introduction: Resilience Theory

The future can't be predicted, but it can be envisioned and brought lovingly into being… We can't surge forward with certainty into a world of no surprises, but we can expect surprises and learn from them and even profit from them. We can't impose our will upon a system. We can listen to what the system tells us and discover how its properties and our values can work together to bring forth something better than could be produced by our will alone. We can't control systems or figure them out. But we can dance with them! (Meadows, 2001)

The increasing complexity and rapid changes in world dynamics, brought to a growing interest in "resilience" as a concept for understanding, managing and governing complex social-ecological systems and managing the capacity to cope with, adapt to, and shape change (Figure 1) (Lang, 2011; Schultz, 2009). The attention this term receives is the response to a widespread sense of uncertainty and insecurity and a strain to find formulas for adaptation and survival (Müler, 2011). Resilience as a concept firstly appeared in the work of the ecologist C.S. Holling. According to Holling (1973), resilience is "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." In 1986, Holling (1986) refines this definition as "the ability of a system to maintain its structure and patterns of behavior in the face of disturbance." In the late 1980s, the ecological vision of resilience involved the interactions between people and the environment in order to measure the complexity of community-environment interactions, and the changes they bring (Maguire and Cartwright, 2008), then in the 1990s several scholars adopted this approach as an important tool to measure sustainability.

Now the general approach of resilience for urban development related sectors is quickly expanding and including the following: mitigation and adaptation to climate change (Satterthwaite et al. 2007; Dodman, Ayers and Huq, 2009; Deppisch and Hasibovic, 2011), disaster planning, management and recovery (Goldstein, 2009; Vale and Campanella, 2005; Godschalk, 2003; Berke and Smith, 2009; Normandin,

Therrien and Tanguay, 2009), energy and environmental security (Coaffee, 2008), urban design (Colding, 2007; Pickett et al. 2004), resilience as socio-ecological systems (Berkes, Folke and Colding, 1998; Adger, 2000; Folke, Colding and Berkes, 2003; Adger et al. 2005; Walker, Holling, Carpenter and Kinzing, 2004; Folke, 2006; Walker and Salt, 2006; Ernstson, 2008), urban resilience (Folke et. al. 2002; Alberti et al. 2003; Pickett, Cadenasso and Grove, 2004; Campanella, 2006; Gleeson, 2008; Maguire and Cartwright, 2008; Ernstson et al. 2009; Newman, Beatley, and Boyer, 2009; Deppisch and Schaerffer, 2010; Lin, 2006) and urban planning (Fleischhauer, 2008; Wilkinson, Porter and Colding, 2010; Scotti-Petrillo and Prosperi, 2011; Schrenk, Neuschmid and Patti, 2011; Wilkinson, 2011). The extended use of resilience allows the treatment of the issues raised by Holling (1986) about renewal, innovation and reorganization in system development and how they interact across scales (Gunderson and Holling, 2002; Folke et al. 2010).

Resilience means in the last two decades what sustainability meant in the 1980s and 1990s. Among the many authors discussing the relationship between resilience and sustainability (Table 1) the most remarkable are; Levin et al. (1998) claim that resilience is the preferred way to think about sustainability in social as well as natural systems, thus he suggests basically an equivalence of resilience and sustainable development. Holling and Walker (2003) showed how a resilient socio-ecological system is synonymous with a region that is ecologically, economically, and socially sustainable, while Gross (2008) quoted Holling promoting resilience as a better tool than sustainability.

Since sustainability policy has been adopted globally in the late 20th century, theorists are increasingly appreciating the interesting role that change, dynamics, and uncertainty play in sustainability, so that the Brundtland Report (1987) sets as the goal of sustainability, all the processes and abilities to deal with change in constructive ways. The Millennium Ecosystem Assessment (2003) also depicts sustainability as a process and suggests paying more attention to issues such as robustness, vulnerability, resilience, risk and uncertainty, which will determine the ability of a system to adapt to and take advantage from change. Put in these terms, resilience gives a new look to the perception of sustainability. Long-term sustainability will result in the ability of continuously adapting to changing conditions which growth and transformation are inevitable in urban systems. Paradoxically sustainability is grounded on the basic need for stability and security while facing and accepting the necessity of change (Novotny, Ahern and Brown, 2010; Schrenk, Neuschmid and Patti 2011).

However, the necessity of resilience in system's sustainability is still under criticism (Table 1), like Derissen, Quaas and Baumgärtner, (2009) explained these options such as: "*resilience of the system is both necessary and sufficient for sustainable development; resilience of the system is sufficient, but not necessary; resilience of the system is necessary, but not sufficient; and resilience of the system is neither necessary nor sufficient for sustainable development*".

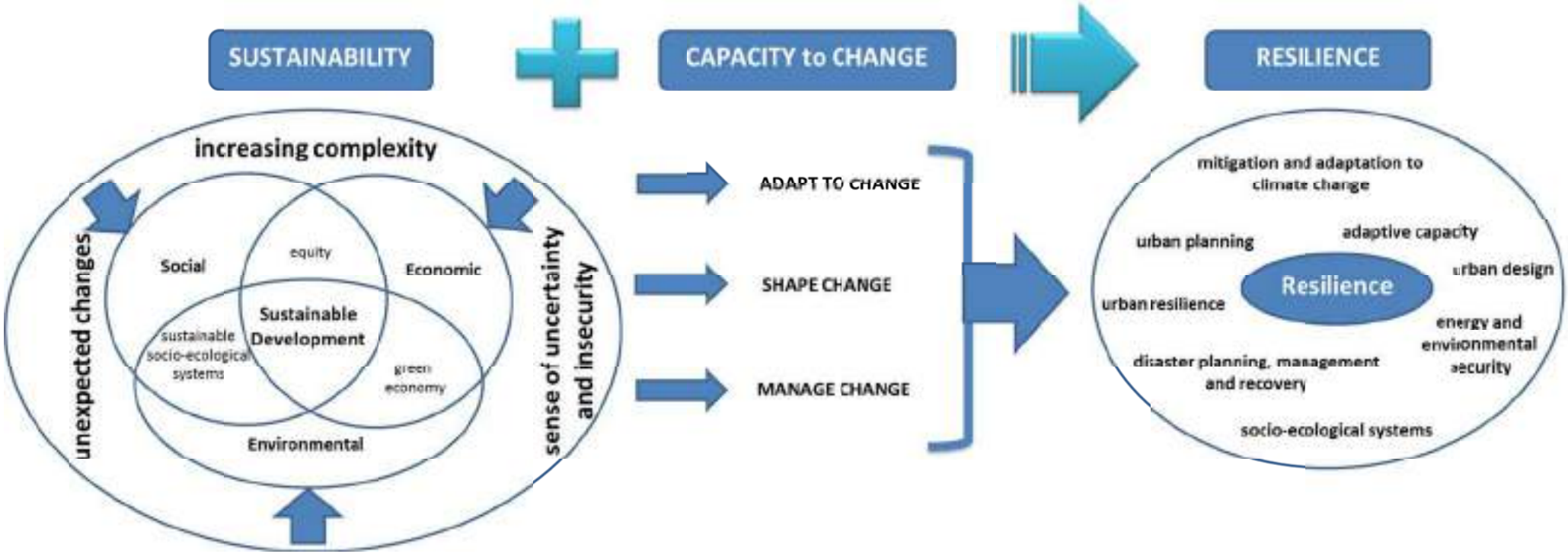

Figure 1. Resilience Theory

Clearly resilience proved to be effective, under its both social and ecological perspectives, as a crucial tool for the sustainability of urban development and resource utilization, not the least as a comprehensive strategy for urban sustainability, in sight of increasing working hypotheses about urban and regional systems, widening the interest to the whole aspects of human life.

II. Resiliency As A New Theory In Urban Scale and Sustainable Spatial Planning

Morphing in cities will always take place, carrying growth, change or the death of the city itself (Kowalik and Guaralda, 2011). Resilience in the urban systems risks to be lost (Folke et al. 2002), due to the growing complexity (Ernstson et al. 2010) and global integration of economic, social and physical processes putting in evidence the fragility of urban areas. Switching the perception of the city from economical to environmental, will guarantee better results allowing the city to prosper, grow and survive as long as these changes are not seen as negative but understood as yet another transformation being a natural part of the evolution of the metropolis. Recently there has been interest to apply the resilience concept to cities as complex adaptive systems (Newton and Bai, 2008; Alberti et al. 2003; Pickett et al. 2004; Newman, Beatley and Boyer 2009; Campanella, 2006; Gleeson, 2008; Maguire and Cartwright, 2008; Ernstson et al. 2009; Lin, 2006, Colding, 2007).

In order to be sustainable over significant periods of time, cities can't avoid being also resilient since, as it is natural, they will be affected by unexpected influences and disturbances (Novotny, Ahern and Brown, 2010). Newman, Beatley, and Boyer (2009) show cities' strain to endurance, to react to crises and adapt, and how they are compelled to re-shape and grow toward other directions; cities don't need only strong physical infrastructure and built environment, but also require their own inner strength and resolve. The novelty of this approach is a multi-level understanding of resilience of urban systems, recognizing the role of *metabolic flows* in sustaining urban functions, human well-being and quality of life; *governance networks* and the ability of society to learn, adapt and reorganize to meet urban challenges; and the *social dynamics* of people as citizens, members of communities, users of services, consumers of products, etc., and their relationship with the *built environment* which defines the physical patterns of urban form and their spatial relations and interconnections (Resilience Alliance, 2007). Urban resilience is created by the intersection of these areas.

Moreover, Gleeson (2008) suggests the ‘resilient urbanism’ via three principal branches: firstly, the acceptance of the inevitability of evolution and the necessity of adaptation. Urban planning's aim is to defeat disorder while navigating change flows, in search of urban resilience. The resilient city is the goal. Secondly, planning is an orchestration of activities (zoning, infrastructure, services, design, etc.), all of which converge in the best set of major improvements for urban well-being and efficiency. A good planning is a pre-condition for urban sustainability and resilience. The third branch of resilient urbanism is equity, meaning fairness not simple equality.

Table 1. Relationship between "Sustainability" and "Resilience"

Author	Relationship between "Sustainability" and "Resilience"	Which is more broader: "Sustainability" or "Resilience"
Hollings, 1973	A more laudable goal should be resilience rather than sustainability.	Resilience
Wildavsky, 1988	Resilience is the key to achieving long-term urban sustainability.	Resilience
Arrow et al. 1995	Economic activities are sustainable only if the life-support ecosystems upon which they depend are resilient.	Resilience
Lélé, 1998	Resilience is one of the contributing concepts of 'sustainability'.	Sustainability
Haris, 2000	For the ecologist, sustainability should be defined in terms of the maintenance of ecosystem resilience.	Resilience
Ahern, 2011	Resilience theory offers a new perspective, or possibly a solution to this paradox of sustainability.	Resilience
Carpenter et al. 2001	Resilience is often used to describe the characteristic features of a system that are related to sustainability.	Sustainability
Folke, et al. 2002	Management that builds resilience can sustain social-ecological systems in the face of surprise, unpredictability, and complexity therefore is closely related to concepts of sustainability and sustainability transition.	Resilience
López -Ridaura, Masera, and Astier, 2002	Resilience is one of the attributes of sustainable systems.	Sustainability
Bastianoni, Pulselli and Tiezzi, 2004	The role of resilience to achieve the goal of sustainable development is essential.	Resilience
Neuman, 2005	Sustainability draws from at least five intellectual traditions: capacity, fitness, resilience, diversity, and balance.	Sustainability
Fiksel, 2006	The sustainability of living systems-including humans-within the changing Earth system will depend on their resilience.	Resilience
Lebel et al. 2006	Strengthening the capacity of societies to manage resilience is critical to effectively pursuing sustainable development.	Resilience
Tainter, 2006	It is important to distinguish sustainability from resiliency. Sustainability is the capacity to continue a	Sustainability

	desired condition or process, social or ecological. Resiliency is the ability of a system to adjust its configuration and function under disturbance. The goal of human groups is more often sustainability or continuity than resilience. Most of us prefer the comfort of an accustomed life (sustainability) to the adventure of dramatic change (resiliency).	
Walker and Salt, 2006	Resilience is the key to the sustainability.	Resilience
Perrings, 2006	A development strategy is not sustainable if it is not resilient.	Resilience
Brand and Jax, 2007	Resilience is one of the most used concepts in sustainability.	Sustainability
Stirling, 2007	Stability, durability, resilience and robustness are each individually necessary and collectively sufficient for the quality of sustainability in social-ecological systems.	Sustainability
Callaghan and Colton, 2008	By shifting focus away from an ultimate end goal of sustainability, to an ongoing process of enhancing resilience it moves a community toward sustainability.	Resilience
Newman and Jennings, 2008	Sustainability cannot ensure survival, especially if disturbances are completely outside the realm of s system's experience.	Resilience
Stirling, 2008	Resilience as just one dynamic sub-property of sustainability	Sustainability
Derissen, Quaas, Baumgärtner, 2009	Resilience is the preferred way to think about sustainability.	Resilience
Du Plessis, 2009	Resilience, vulnerability and adaptability are seen as the conditions for sustainability of the city.	Sustainability
Hvid, 2010	A new systems approach is developing. It understands systems as incalculable complex entities in which change is discontinous, in which chaos and order exist at the same time. Sustainable systems are adaptive and have the capacity to change themselves in a world dominated by uncertainty.	Resilience
Novotny, Ahern and Brown, 2010	Understanding resilience is central to understanding sustainability. Resilience is a new way of thinking about sustainability, rather than a specific set of guidelines, instructions, or checklists.	Resilience
Thapa, Marshall and Stagl, 2010	Resilience is about adaptation, uncertainty and flexibility, which allow for continuous development for long-term sustainability.	Resilience
Pierce, Budd and Lovrich, 2011	Resilience is a major theoretical contribution to the understanding the likely sources of sustainability.	Resilience
Saporiti, 2011	The concept of resilience is not tied exclusively to the maintenance (for present and future) of natural resources, such as sustainability, but also to the transmission of these resources.	Resilience

Ernston et al (2009) defines ‘resilience in cities’, operating within the city and dealing with local-to-regional ecosystem services; while ‘resilience of cities’, operating at the scale of a ‘system of cities’ which is a concept borrowed from geography meaning a set of cities linked with each other through relations of exchange, trade, migration or other that sustain the flow of energy, matter and information between the cities. Resilient cities are constructed on solidity and flexibility criteria. According to sustainability, development is based on the creation and conservation of a prosperous social, economic, and ecological system, therefore the role of resilience becomes essential for a prosperous development of society (Folke et al. 2002). In order to become more resilient, cities and regions are supposed to adapt planning and design strategies versatile and able to foresee the economic, social, and physical stresses they will face (Müler, 2011). 'Adaptation' is surely the new keyword for planning: ‘ordering the use of land’ in a time of increasing urban disorder. Resilience wants to be the ordering logic and the potential of planning (Gleeson, 2011).

Planning theory conceptualizes change in many different ways, according to the philosophical starting point. Complexity theory and its conceptualization of the dynamics of change are concepts not new to planners. As Wilkinson (2011) expresses, the attempt to ‘defeat disorder’ inherent in traditional planning approaches is challenged and the ‘science of surprise’ is prioritized. Land-use disorders and the reduction of land-use conflicts (Fleischhauer, 2008) are becoming the core tasks of spatial planning, that contribute to all those principles of urban resilience dealing with the physical/environmental urban structure. Spatial planning is one of the fields which embed at its best the infrastructures that are necessary for resilient cities. Hence, one of the purposes of planning is to strengthen resilience of cities to be able to adapt to new trends, changes and impacts (Schrenk, Neuschmid and Patti 2011).

In recent literature, disaster management allowed resilience theory in urban planning to show up (e.g. see Godschalk, 2003) since recently natural disasters with distressing effects on human settlements have multiplied. Uncertainty of natural risks, gives resilience the possibility to provide a better guidance to produce effective hazard mitigation approaches in urban settlements. The disaster resilience concept, in terms of the adaptation capacity, provides not only built up infrastructures, but also non-built up environment such as community of life potentially exposed to natural hazards with a view to maintaining or restoring an acceptable level of functioning and structure (Alarslan, 2009).

According to Godschalk (2003; p.139) researchers who have studied the response of resilient systems to natural hazards find that they tend to be;

Redundant; with a number of functionally similar components so that the entire system does not fail when one component fails,
Diverse; with a number of functionally different components in order to protect the system against various threats,

Efficient; with a positive ratio of energy supplied to energy delivered by a dynamic system,
Autonomous; with the capability to operate independently of outside control,
Strong; with the power to resist attack or other outside force,
Interdependent; with system components connected so that they support each other,
Adaptable; with the capacity to learn from experience and the flexibility to change,
Collaborative; with multiple opportunities and incentives for broad stakeholder participation.

Both hazard mitigation and land use planning are noteworthy tools for reducing vulnerability and creating more disaster resilient communities that can front or absorb an impact, shape in order to overcome or recover from the backlash of a disastrous event and consequently adapt or learn from the experience. Disaster resilient communities are intrinsically more sustainable than those who do not undertake any action to reduce their exposure to natural hazards. A resilient community can actually return to prior conditions quickly, mainly because it has embodied hazard mitigation infrastructure and counter-measures into their community that reduce the spreading and the duration of the disorders due to disaster (Berke and Smith, 2009).

As Lebel et al. (2006) indicates a society's ability to manage resilience resides in actors, social networks, and institutions (Figure 2). The kinds of attributes such as participation, representation, deliberation, accountability, empowerment and social justice are considered to be part of good governance. Furthermore, to obtain urban resilience, governments should be self-organized and they should have the capacity to learn and adapt (Lebel et al. 2006) which means it is essential to provide hazard mitigation and urban planning indicators as well as the analysis of the risks (see Fleischhauer, 2008) and their possible impacts that cities may be exposed to.

Certainly, resilience theory can't be an approach only for disaster mitigation but also it has the tools in a larger scale in the sustainable urban planning. The goal is to pursue community resiliency striking an appropriate balance among economic, environmental, and equity values (Berke and Smith, 2009). As Wilkinson (2011) determines 'think planning again' in ways that acknowledge the emergency, unpredictability and inevitability of ecological processes, it is sure to define social-ecological resilience as of interest to the field of planning in several dimensions. In this sense, resilient urban planning approach should be accepted as a more comprehensive strategy for urban sustainability aiming to have low risk, low vulnerability, appropriate scale of planning, interdependent and independence of social networks (Tobin, 1999), a concrete, unified strategy for the overall urban development of a city which provides an overall vision for the future direction of urban maturity and which developments meet and enforce and the necessity to address current urban concerns – transportation, density requirements, urban facilities as well as having a clear direction in terms of sustainability goals and agenda (Kowalik and Guaralda, 2011). Therefore, resilient urban planning comprehends all the development plan elements and sustainability policies (Table 2).

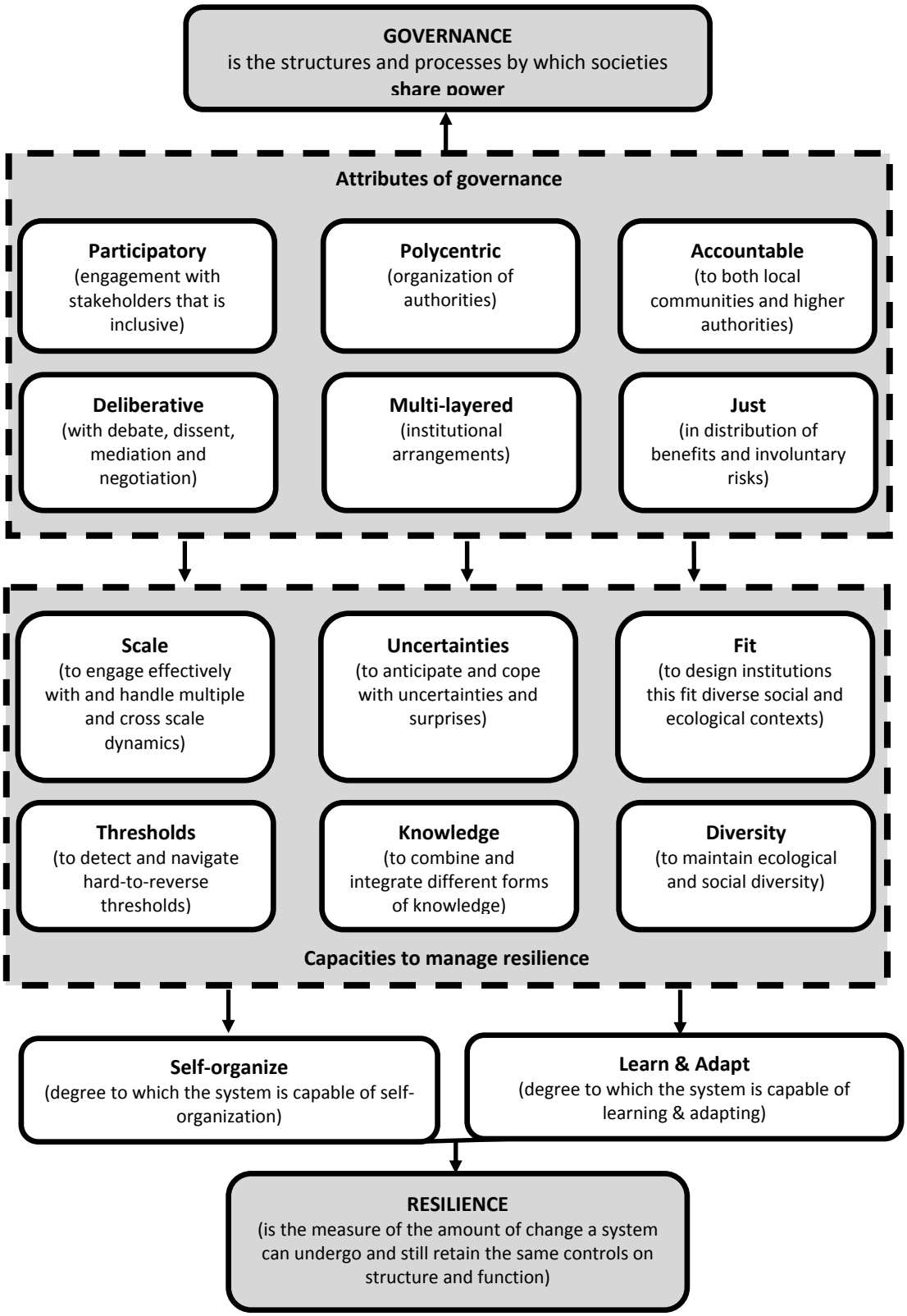

Figure 2. The Capacity to Manage Resilience (Lebel et al. 2006)

Table 2. Development/Master Plan Elements and Sustainability Policy (reproduced and adapted from Alshuwaikhat, 2006)

Urban Plan/Policy Development Components	Sustainability Policy
Physical Issues	**Land Use** Controlling urban area footprint Supporting mix land use and compact development Redevelopment of land and prevention of uncontrolled urban sprawl Balancing jobs and residential areas Managing sustainable housing policies Supporting smart growth **Transportation** Balancing travel density Balancing transit mode density Reducing car dependence Supporting pedestrianization and bicycle use **Infrastructure** Preventing ozone depletion Preventing excessive water consumption Providing available park space Managing wastes **Urban Design** Preservation of historic and archaeological sites and buildings Protecting open space
Environment and Energy Issues	**Environment** Protecting natural areas Protecting species and biodiversity Supporting agricultural land conversion Controlling Imperviousness Controlling water quantity Maintaining water quality Maintaining air quality Adapting climate change **Energy** Reducing excessive energy use
Economic Issues	Developing economic performance Increasing level of investment Increasing the ratio of employment
Social Issues	Enhancing human health Eradicating poverty Providing access to basic education Providing security Providing social inclusiveness

Resilience theory is at the frontier of contemporary urban planning and design, serving as a robust platform to shape and articulate the re-forming urban

development. Resilience is a new way of thinking about sustainability (Pickett et al. 2004), rather than a specific set of guidelines, instructions, or checklists. Resilience is strategic because, in order to be effective, resilience must be obviously based on, and informed by ecological, social, and economic drivers and dynamics of any particular place-called site specific, and it must be integrated across variety of linked scales.

III. Evaluation: Resilient and Sustainable Urban Planning in Istanbul

There is a commonsense that developing/less developed countries are exposed to more frequent and more severe natural hazard risks as a consequence of an increase in human settlements in vulnerable areas, rather than a rise in the number of geophysical events. The two main reasons for the exacerbation of the effects of natural hazards in developing/ less developed countries were rapid uncontrolled urbanization and unstable economic conditions (El-Masri and Tipple, 2002).

Cities are planned to last for long periods of time, therefore, continuation of functions ensures resilience in cities even in times of crises, unexpected changes or stressed spatial configurations (Surjan et al. 2011). The challenges for human dimensions research include those of measuring and addressing vulnerability, adaptation and resilience (Adger, 2006). Surely, resilience and vulnerability assessment is a necessary component of effective planning. Figure 3. shows vulnerable physical elements of urban settlements which are categorized in three scales in accordance with the scales in spatial planning.

Alarslan (2009) points out since urban settlements develop dynamics parallel with living organisms, the vulnerability of an urban settlement changes over time. Therefore, those elements in spatial plans at macro, meso, and micro scales should be updated to provide resilient urban policies. In this sense urban resilience theory is a relevant and noteworthy focus for contemporary urban development and enhancing urban resilience necessitates finding out how urban resilience can address vulnerabilities to achieve sustainable urban development. Table 4 is presenting a framework to explain how urban resilience relates with the key vulnerabilities and urban policy components. First of all, it is crucial to define the key vulnerabilities of different scales. Then, for realizing these vulnerabilities, it is necessary to emphasize what kind of urban development policies address them. Considering the role of resilience in providing and strengthening sustainability, third step is to define how to develop the resilience capacity. Enhancing resilience capacity is the overall concept of sustainable urban development with the scope of an increasing adaptability and manageability of the changing conditions.

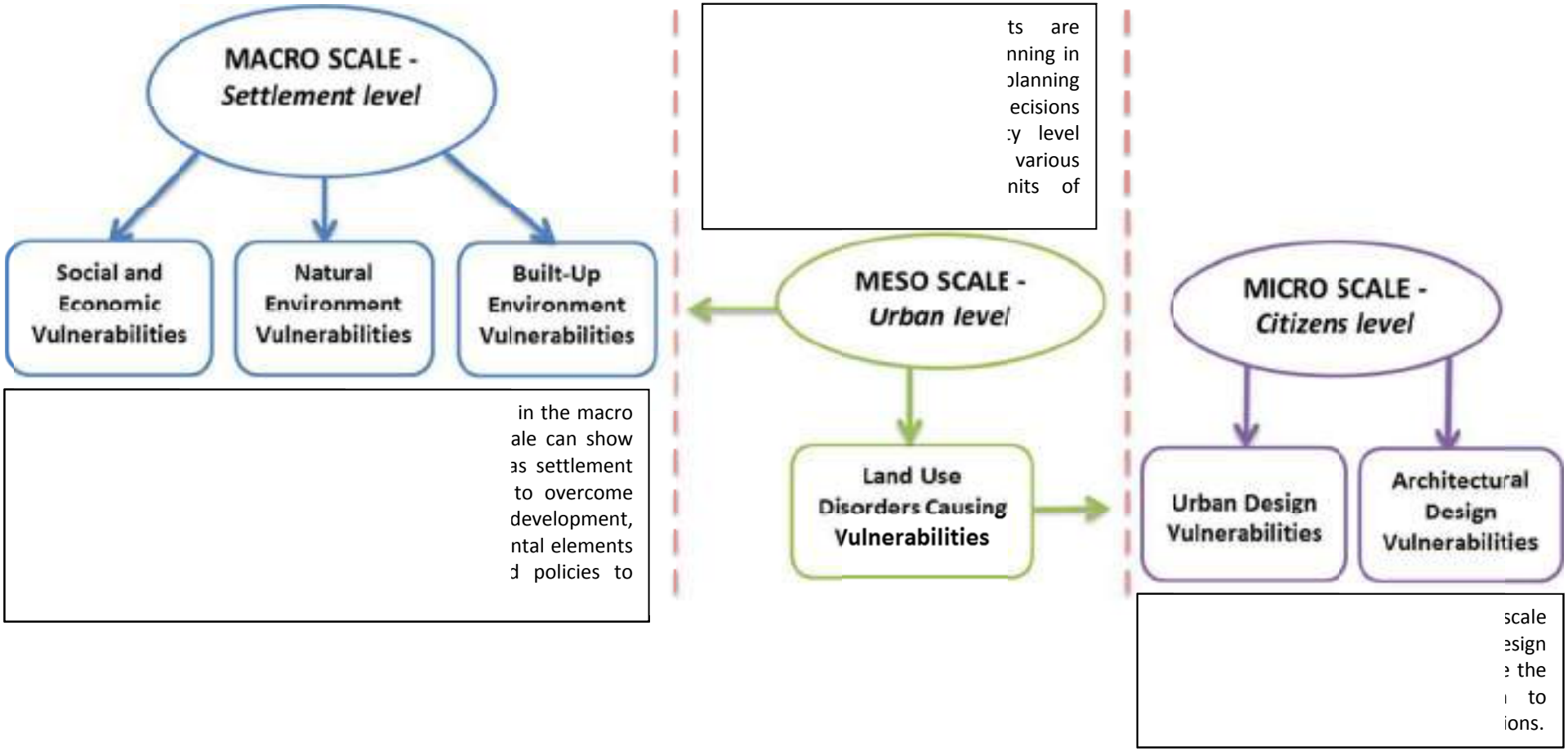

Figure 3. Vulnerable Elements of Urban Settlements (reproduced from Alarslan, 2009)

Turkey, like other developing countries, suffers from extensive pressures on natural resources due to rapid population increase and urbanization dynamics around metropolitan attraction nodes. The case of Istanbul sets a unique example with a population growth around 600% and a growth in built up areas 700% approximately since the 1950s. Today, Istanbul, with more than 12 million people, is still one of the most attractive internal migration nodes in Turkey. Diverse service facilities of governmental and private institutions, employment opportunities, cultural and historical background have been stimulating thousands of people from different rural parts of the country. As a result of the rapid growth in population and urban dispersion, there has been significant pressure on the ecological life support systems of the region (Tezer, 2005). The conditions, which are the origins of change processes creating vulnerability in megacities include high population density, high resource consumption, intensive land use (Deppisch and Schaerffer, 2010), a combination of economic and non-economic urban poverty, uncontrolled and unsustainable urbanization, unsustainable planning and development practices, and substandard urban management systems (Gencer, 2007), like in Istanbul. Istanbul shows high degree of complexity of dynamic ecological, social, economic, cultural and political interrelationships. Moreover, it is particularly vulnerable to changes and disorders.

In Istanbul, there has not been a plan covering the metropolitan area since 1995. There were many of local plans, which were not integrated to each other (Eyuboglu, 2004). While urban planning in Istanbul has been experiencing a rapid restructuring process intending to have an integrated and decentralized system, issues such as “environmental protection, risk management, transportation, urban renewal and regeneration” have increasingly been included into its urban planning discourse (Turan, 2011). In order to provide urban resilience through sustainable spatial planning process, first of all it is essential to address key vulnerabilities and define a framework to address those vulnerabilities with the resilient urban planning tools (Figure 4).

Although it is not the complete list of the assessments about the resilient urban planning in Istanbul, it may open up a discussion for further researches. Some of the indicators in the Figure 4 may be relevant for other crosschecks too. The aim of this evaluation is to represent the possible criteria of the resilient urban planning concept for policy development and spatial organization.

V. Conclusions

This paper examined the necessity to provide urban resilience in order to achieve sustainability for community development and emphasized the importance to consider planning in ways of admitting the emergency, unpredictability and inescapability of ecological processes. In order to face this new challenge, cities should cope with, adapt to and manage change and remains sustainable not only in terms of ecological perspective but also from the social and economic perspectives. It is important to note that, developing sustainable urban planning tools and creating

resilient and sustainable cities is fundamental for contemporary society. Planning is an ever-changing combination of activities such as zoning, infrastructure, services, design, etc., which meet the major improvements to urban welfare and competence. Effectiveness of the planning process is the first step for urban sustainability and urban resilience. Then, cities will be sustained over time depending on the ability to anticipate and adapt to new circumstances.

Surely, urban resilience will be the next objective of Istanbul to overcome the worsening social, economic and environmental problems. The evaluation in this paper shows that, there is still a long way to generate a concrete concept to clarify and explain urban resilience and resilient urban planning policies for Istanbul. Each scale (macro, meso, micro) in urban planning has its specific vulnerabilities and the resilience indicators addressing them. A macro perspective is instructive and might be the relevant starting one to evaluate both key vulnerabilities and urban resilience policies for urban sustainability.

Table 4. Evaluating Resilient Urban Planning[2]

	Key Urban Vulnerabilities	**Urban Plan/Policy Development Components**	**Attributes of Resilience Capacity**	**Attributes of Urban Resilience**
Macro Scale	Natural Environment	Protecting natural areas Protecting species and biodiversity Controlling imperviousness Controlling water quantity Adapting climate change Preventing ozone depletions	Scale Uncertainties Knowledge Thresholds	**Built Environment** Quality of Environment Quality of Housing Reduction of zones at risk Safety standards and codes Quality of transportation Urban planning **Metabolic Flows** Agriculture Business Economic development Education Energy Finance Health Insurance Sewers Telecommunication Water **Social Dynamics** Age
	Built-up Environment	Supporting agricultural land conversion Maintaining water quality Maintaining air quality Reducing excessive energy use Managing wastes Controlling urban area footprint		
	Social and Economic Vulnerabilities	Enhancing human health Eradicating poverty Providing access to basic education Providing security Providing social inclusiveness Developing economic performance Increasing level of investment Increasing the ratio of employment		

[2] Adapted from Normandin, Therrien and Tanguay, 2009; Alarslan, 2009; Resilience Alliance, 2007; Alshuwaikhat, 2006; Lebel et al. 2006

Meso Scale	**<u>Land Use Disorders</u>** Housing Areas Health Services Education Services Social Services Administrative and Security Areas Commercial Areas Industrial Areas Infrastructure and Technical Service Areas Transportation Routes and Terminals Open and Green Areas Protection Zones (cultural, historical, natural assets)	Supporting mix land use and compact development Redevelopment of land and prevention of uncontrolled urban sprawl Balancing jobs and residential areas Managing sustainable housing policies Supporting smart growth Balancing travel density Balancing transit mode density Reducing car dependence Supporting pedestrianization and bicycle use Preventing excessive water consumption Providing available park space Preservation of historic and archaeological sites and buildings Protecting open space	Thresholds Fit Diversity Knowledge	Population Education Gender Health conditions Housing conditions (TL/per) Awareness about probable hazards Labor force Ownership Poverty/income Social conflicts Community participation **Governance Networks** Budget/funds Community involvement about hazards Coordination Emergency services Law for prevention Emergency planning Mitigation plan Training for emergency Other types of preparation Public information/education about hazards and risk Risk assessment
Micro Scale	**Urban Design Vulnerabilities:** Indoors and Outdoors Psychological Issues	Providing social inclusiveness Providing accessibility Preservation of sense of place Protecting open spaces	Knowledge Self-organize Learn and Adapt	

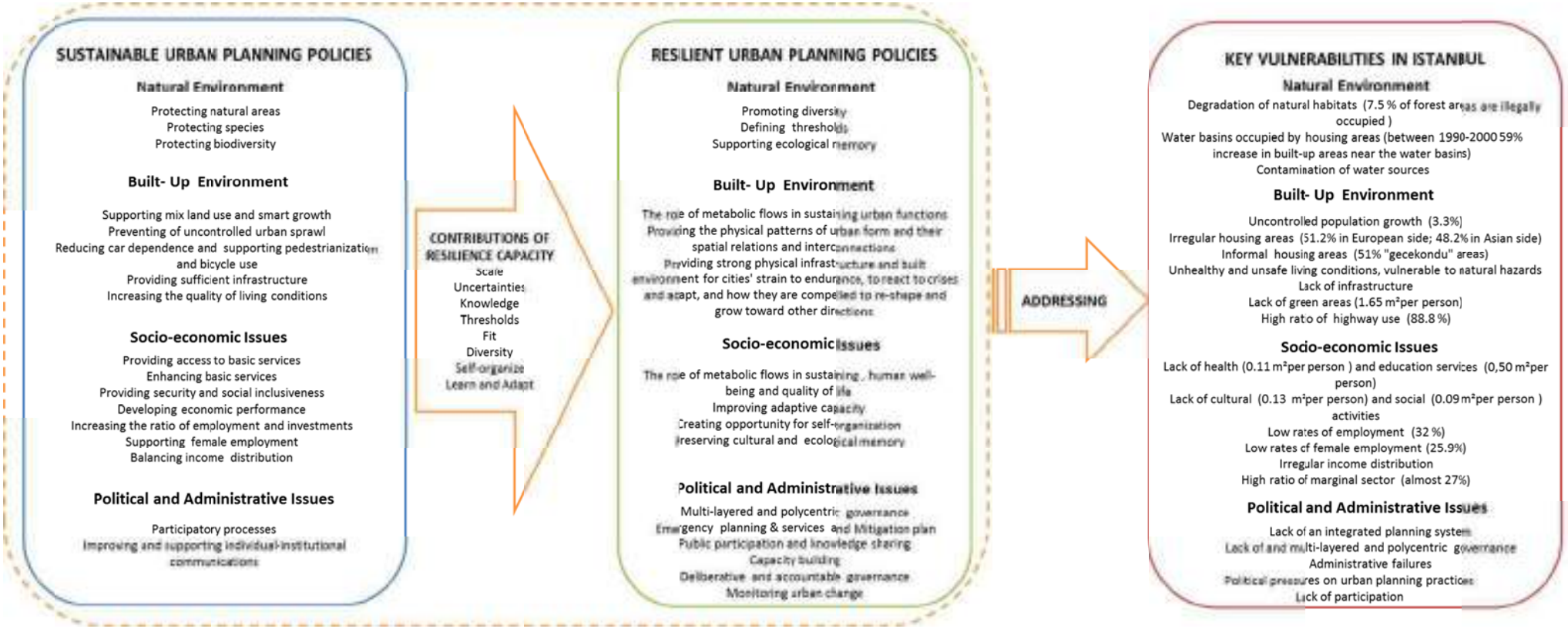

Figure 4. A Proposal for Evaluating Resilient Urban Planning in Istanbul[3]

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