Iğdır Üniversitesi Fen Bilimleri Enstitüsü Dergisi
Iğdır University Journal of the Institute of Science and Technology

The Concept of Resilience: A Critical Evaluation of Erzurum*

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ABSTRACT: This study aims to evaluate existing urbanization practices of Erzurum in terms of the concept of resilience. In this context, consistency of existing urbanization dynamics and ecological system is questioned through resilience perspective in order to determine the future economic, social and ecological risks for Erzurum. Thus, to cover all these three areas, indicators such as the changes in employment rate, income and main economic activities; changing population, education and migration status, dependency ratios and welfare; changing land use characteristics in historical process are used. The findings show that urbanization policy and practices, economic situation and social structure in Erzurum are not resilient against the changes in the system and sometimes they are the reasons of ecologic, economic and social vulnerabilities. A new planning approach should immediately be developed with the resilience perspective. Otherwise, the city will be faced with immense risks in the near future, especially in terms of livability.

Keywords: Resilient City, Adaptation, Planning, Erzurum

Dirençlilik Kavramı: Erzurum Kentinin Eleştirel Değerlendirmesi

ÖZET: Bu çalışmanın temel amacı dirençlilik kavramı ile Erzurum'un kentleşme sürecini değerlendirmektir. Bu kapsamda mevcut kentleşme süreçleri ile ekolojik sistemin uyumu dirençlilik perspektifinden sorgulanmıştır. Ayrıca, Erzurum kentinin ekonomik, sosyal ve ekolojik riskleri çeşitli göstergeler (işgücü sayıları, gelir, temel ekonomik aktiviteler, eğitim, göç, bağımlılık oranı, refah, değişen arazi kullanımları) kullanılarak belirlenmiştir. Bulgular Erzurum kentindeki kentleşme politika ve pratiklerinin, ekonomik yapının ve sosyal durumun dirençli olmadığını ve ekolojik, sosyal ve ekonomik riskleri ortaya çıkaran faktörlerden olduğunu göstermiştir. Dirençlilik kavramı ve gereklilikleri üzerinden yeni bir planlama yaklaşımı geliştirilmesi önem kazanmaktadır. Bu şekilde bir gelişme olmadığında, yaşanabilirlik açısından gelecekte büyük tehditlerle karşı karşıya kalacak bir Erzurum ortaya çıkacaktır.

Anahtar Kelimeler: Dirençli Kent, Adapte Olma, Planlama, Erzurum

Cilt/*Volume*: 8, Sayı/*Issue*: 3, Sayfa/*pp*: 295-304, 2018
ISSN: 2146-0574, e-ISSN: 2536-4618 DOI: 10.21597/jist.426175

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* Bu çalışmanın taslak hali 3-4 Aralık 2015 tarihinde Karadeniz Teknik Üniversitesinde düzenlenen 15.Ulusal Bölge Bilimi ve Planlama Kongresi ve 19-20 Ağustos 2017 tarihinde (Seul) Güney Kore de düzenlenen International Conference on Spatial Planning and Sustainable Development sempozyumunda sözlü olarak sunulmuştur.

Geliş tarihi / *Received:* 22.05.2018
Kabul tarihi / *Accepted:* 31.05.2018

INTRODUCTION

The concept of resilience rises in importance as it refers to sustainable urban development and ways how to deal with the factors threatening the urban life. Resilience concept is predicated on increasing the capacities to struggle and survive at sudden shocks and stress conditions, and involves diminishing the vulnerabilities. There are threats and risks for cities to preserve and develop their existing economic, social and ecological positions. Cities should be dynamic and creative as they may face a new challenge in today's global competitive economy. The awareness of their decisions on environmental issues should provide sensitiveness of any spatial development to ecological changes, such as global warming. Thus, cities should develop strategies to increase their resilience capacities in such an environment where the attitude of social structures; that is both innovator and open to diversities; determines their other resilience capacities.

The main feature of a resilient system is its capacity to deal with change and degeneration (Eraydın, 2010; Walker and Salt, 2006). Providing the preservation and continuity of a system as it is with its basic functions and structures is important with regards to resilience. Thus, resilience is the *defence capacity* that can be described as being prepared to future shocks (Eraydın, 2010; Adger, 2000). Resilience as *foreseeing capacity* comprises the process of planning and minimizing the effects of crisis through system changes by predicting them in advance (Aguirre, 2006). Thus, this concept does not only involve answering and adaptation but also pretentive arrangements (Baud ve Hordijk, 2009). In this context, resilience concept becomes an approach that can be involved in urban planning, design and participation processes. Thus, resilience concept, its approach and policies change their directions from controlling the changes in order to provide the system to maintain its condition, to multiple meanings such as struggling, adaptation, managing the change, creating new opportunities and innovation. (Eraydın, 2010). All these meanings come forward as the facilitator elements for the use of resilience concept in urban planning field.

Determination of the fragility and adaptation capacities of cities comprises the first step for the resilience based urban planning. Putting forward the identicators and techniques of detecting the existing situation; determining the principles and opportunities has been the key actions for *resilience planning*. The guide made for understanding the resilience of urban systems (Urban Resilience Research Prospectus, 2007) states that understanding the quality of life, governance networks, learning capability of societies, social dynamics, flows between urban activities, economic activities, built structure and the relations with it has an important role in this process. The works emphasizing the versatile structure of resilience (Eraydın, 2010; Adger, 2000; Berkes and Folke, 1998; Folke and Carpenter, 2000; Abel, Cummings, Anderies, 2006) also states that all three fields -economic, social and ecological- are interconnected with each other. That is, there is a need for an analysis involving ecologic, economic ad social indicators and an urban plan developed by means of the findings of this analysis to increase the resilience capacity of an urban system.

In this context, after the explanation of the concept and scope of resilience, this article continues with the determination of the indicators for the analysis regarding ecological, economical and sociological resilience. Thirdly, all variables are tested through Erzurum case. The last section of the paper includes the discussions on the ecologic, spatial, economic and social resilience levels of Erzurum city within the scope of these variables.

MATERIALS AND METHODS

This research was carried out for Erzurum within interpretative approach over economic, ecologic and social data especially for the last fifteen years. First, spatial development process of the Erzurum was analyzed with the aim of evaluating its ecological resilience. In this process, the development of urban area of Erzurum since 13th century was evaluated and projected to 2035 by using previous plans, reports together with the new plan suggesting development areas for the next twenty years.

Secondly, economic performance of the city was analysed to measure the economic resilience of Erzurum. This perspective leads us to analyse the existing condition of Erzurum through the change of selected economic indicators (Table 1). Some of the

economic data is analysed in comparison with Turkey and TRA[1] Region (NUTS[2] Region of Erzurum) to understand the general context, as in the analysis of change in general income states (Table 2). Moreover, the change of the shares for population and income per capita data of Turkish NUTS2 Regions, are analysed to put forward the change in the spatial redistribution of population and capital between 2000-2007 and 2007-2011 periods (Figure 2). These analyses are followed by a location quotient (LQ) analysis made for the local production facilities, in order to understand the existing situation in industrial production capacity of Erzurum and the leading sub-sectors in the city.

Then, the social resilience of Erzurum was evaluated by using the properties and the changes in its demographic structure especially in 2000s (Table 3). Here, some variables related to the quality of life and change of human capital in the city are also used to test the reciprocal affects of economic and social realities. The education level is one of them which is the determinant of supply for skilled labor; and helps to increase both social and economic resilience (Table 4). In addition, the age structure of a society demonstrates not only its social resilience but also the fragility points against contingencies (Figure 3). This indicator is important especially for the settlements trying to develop through intense industrial facilities; as it indicates the possible future labor supply; and thus possible fragilities. Age dependency ratio, migration movements and the level of education for the working population were evaluated to see the social resilience of Erzurum (Figure 4).

RESULTS AND DISCUSSION

The concept of *ecological resilience* is related to ecosystems; which directly influences the future senarios. Developments caused by humanbeings' damages to the ecosystem together with the natural developments (such as disasters) often affect the ecological resilience. The natural values that are lost and the urban ecosystems that were incorrectly built downscale the resilience of the related city/region against any disasters. First two of the indicators used to determine the ecological resilience is urban sprawl and unplanned developments (Eraydın et al., 2011). These two developments also minimize the cities' adaptation capacities. Except for consuming the natural resources, wrong land use desicions also trigger some negativities. Unplanned development increases the problems and diminishes the resilience. Moreover, the adaptation capacity of cities also weakens as the urban sprawl process ends up with the consumption of agricultural areas. As travels increase in both number and time, traffic problems arise and energy waste rises. Inadequacy of public transportation systems encourages the usage of personal vehicles, and then the increasing traffic and pollution causes negative effects on the ecological resilience. The effects of urban development models on ecosystems are highly discussed in literature. Sprawled and compact urban models have different affects to the environment. However, compact urban models are preferred from the perspective of the ecological resilience.

Erzurum is a city located at 1850m height. The center of the city is placed at the arc of Erzincan-Erzurum-Kars Highway. Until the foundation of Dadaşkent on Erzincan Highway as a satellite city, Erzurum had a tendency to develop on the northeast-southwest line. Erzurum Plain which is in the north part of the city comprises of agricultural areas with high groundwater. Additionally, the area the city settled on has serious earthquake risks. Geographical properties of the city and structure of its land support the development of compact urban macroform. However, Erzurum had showed a compact development model until 1940s, but then started to develop and sprawl to all directions. And the newly designed urban development would negatively affect the ecological resilience. The proposed development areas of the development plan signed at 2015 puts forward that these ecological factors and risks were not considered.

[1] The name of the NUTS2 level region including the city of Erzurum

[2] Nomenclature of territorial units for statistics

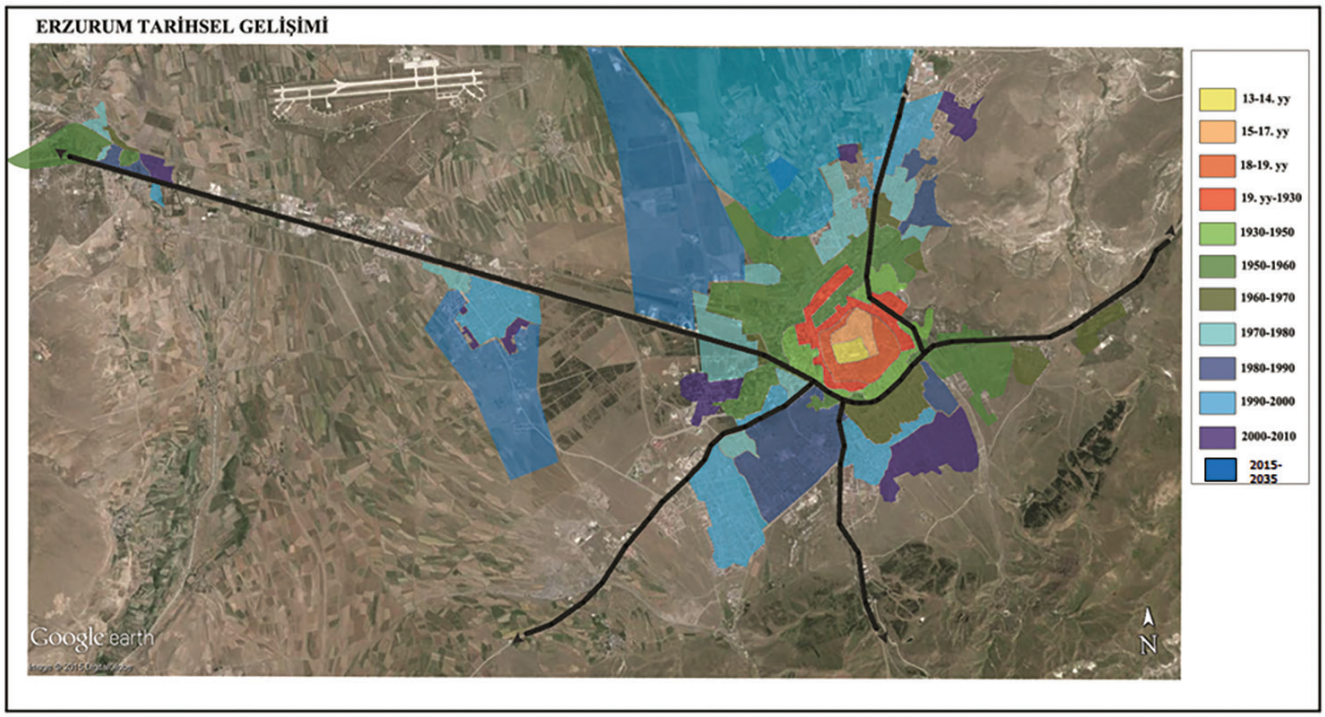

Figure 1. Historical development of the city of Erzurum

This plan has projected a population of 700.000 (at 2035) for the urban area of Erzurum. The development area for the additional 300.000 people is generally located to the north, towards the Erzurum plain, and to the agricultural areas in the south of Dadaşkent. Besides, the plan suggests the transfer of existing industrial area towards the recommended north orbital road. Some urban service areas are also suggested around this axis, while big recreational areas are planned on the northwest border of the city as a buffer zone. All these suggestions of the plan would alter the urban macroform which would not only increase the traffic density but also threat the whole ecosystem of the region. Thus, these interventions on the ecosystem would decrease the adaptation capacity of the city.

The sensitivity of the plan to the ecosystem is very low, as it suggests development on and around the plain and other ecologically sensitive regions. As the future development of Erzurum city is projected to be on the Erzurum Plain, the plan come forward as a threat for ecological resilience. It has lots of negativities regarding the future senarios with its development methos and suggested macroform; and thus minimizes the adaptation capacity of the city.

The planning history of Erzurum between 1939 and 2015 reveals that spatial and ecological risks increase rapidly, the plain and underground water resources are threatening and no attentions were paid to the big earthquake risks (Figure 1). We cannot talk about a healthy planning approach to the Erzurum city, but ad-hoc spatial interventions which were triggered by land speculations and increasing demand for rent. This is one of the indicators that show the fragility is high and resilience is low.

Economic resilience is one of the concepts which become prominent as the production and consumption chains get more complicated owing to the increasing global network relations. The world economy had been reorganized according to increasing flows of goods, capital, ideologies and technology. Both people and the cities controlling them are open to perpetual change; which makes it harder to sustain the economic success. Thus, cities/regions should develop their capacities in order to adapt the changing conditions, i.e. changing flows, rivalry conditions, crisis and alterations of global economy.

There are three different types of results of these economic crises and shocks for cities and regions (Eraydın et al., 2011). Some of the cities; i.e. *economically resilient cities;* can go back to their previous development levels and even sometimes pass it being more successful. Some other cities; ***resilient***

cities; are not affected by crises or any shocks and continue to sustain their existing development levels. However, third type of cities/regions, the ones that are *not resilient;* cannot compete with those crises and cannot catch up with their previous development levels (Hill et al., 2008).

According to the analysis on the sectoral division of Turkey, the share of agriculture decreases (from 35% to 26%) while that of services increases (from 38% to 48% between 2000 and 2011 (that of industry remain nearly the same, around %26). This tendency seems to be same for Erzurum (from 62% to 46%), and TRA1 region (from 63% to 45%), with the difference of increase in the share of industry (from 3% to 13%, for Erzurum). This seems to be associated with the reduction of the total number of employment in the region as a result of increasing disengagement from rural areas and tendency to migrate from Erzurum. However, the analysis indicates that the increase in the share of industry depends on the construction sector, which reveals the fragility of the urban economy; especially as the accumulated capital in this sector cannot be transferred to other economic sectors in the city (Dursun, 2015).

Table 1. Annual percentage change in financial and employment indicators

	Name of the Data	Erzurum		Change		Ann.Aver. % Change
FINANCIAL	Ratio of Bank Credits to that of Turkey (%)	**2003**	**2013**	**0.2**		**11.1**
		0.18	0.38			
	Ratio of Saving Deposits to that of Turkey (%)	**2003**	**2013**	-0.04		**-1.8**
		0.22	0.18			
	Average Saving Deposits per capita (TL)	**2008**	**2013**	1220.3		**22.7**
		1073.2	2293.5			
	Share of Total Tax Revenues in Turkey (%)	**2003**	**2012**	0.1		**10.1**
		0.11	0.21			
EMPLOYMENT	Unemployment Ratio (%)	**2000**	**2012**	**-2.6**		**-2.38**
		9.1	6.5			
	Employment Participation Rate (%)	**2000**	**2012**	-4.4		**-0.70**
		52.4	48			
	Employment Ratio (%)	**2000**	**2012**	-2.7		**-0.47**
		47.6	44.9			
	Ratio of Economically Active Population (15-64) (%)	**2000**	**2012**	3.59		**0.50**
		60.04	63.63			
	Ratio of Employment for Manufactural Industry (%)	**2000**	**2012**	8.38		**24.08**
		2.9	11.28			
	Ratio of Employment for Construction Sector (%)	**2000**	**2012**	18		**39.47**
		3.8	21.8			

Source: Dursun, 2015

Indicators in Table 1 show that the problem of intense flow of people (employment) and capital from Erzurum is diminishing. Bank credits, saving deposits and total tax revenues are the indicators giving ideas about the investment climate in the city. Also they provide clues about capital movements in the case study area. On the other hand, ratio of unemployment can provide an information about the economic situation of cities. If that ratio is higher than the national average, it shows bigger fragility for the cities. Moreover, the increase in both total tax revenues and saving deposits per capita plays a positive role in the downtrend of the economic fragility of the city. The tendency of downsizing in unemployment, employment

participation and employment ratios reveal that the increase in the share of industry has not yet affected the urban economy in terms of general employment conditions. This negative change in employment data corresponds to that of population data; which may become a threat for economy of Erzurum in near future. Despite there seems to be a slowing down in this tendency as a result of the pickup in construction sector, the problem cannot be solved to increase the economic resilience of Erzurum.

Table 2. The Change in the General Income State of Turkey and TRA1; GVA[3] / percapita

	Gross Value-Added ($/percapita)			Difference with Turkiye
	Turkiye	TRA1		TRA1
2004	5103	2975		2128
2011	9244	5901		3343
2004-2011	4141	2926		1215
Change (%)	81,15	98,35		57,10

Source: www.tuik.com.tr, Regional Statistics, Notes:TRA1: Erzurum(leading city), Erzincan, Bayburt

According to Table 2, which puts forward the relative change of economic situation, the level of income has increased for both Turkey and TRA1 region. However, the increase in TRA1 goes beyond that of Turkey reaching 98.35% of change.

But the real change can be monitored via the difference between regional and the national data; which has increased between 2004 and 2011 despite the GVA per capita of TRA1 had doubled.

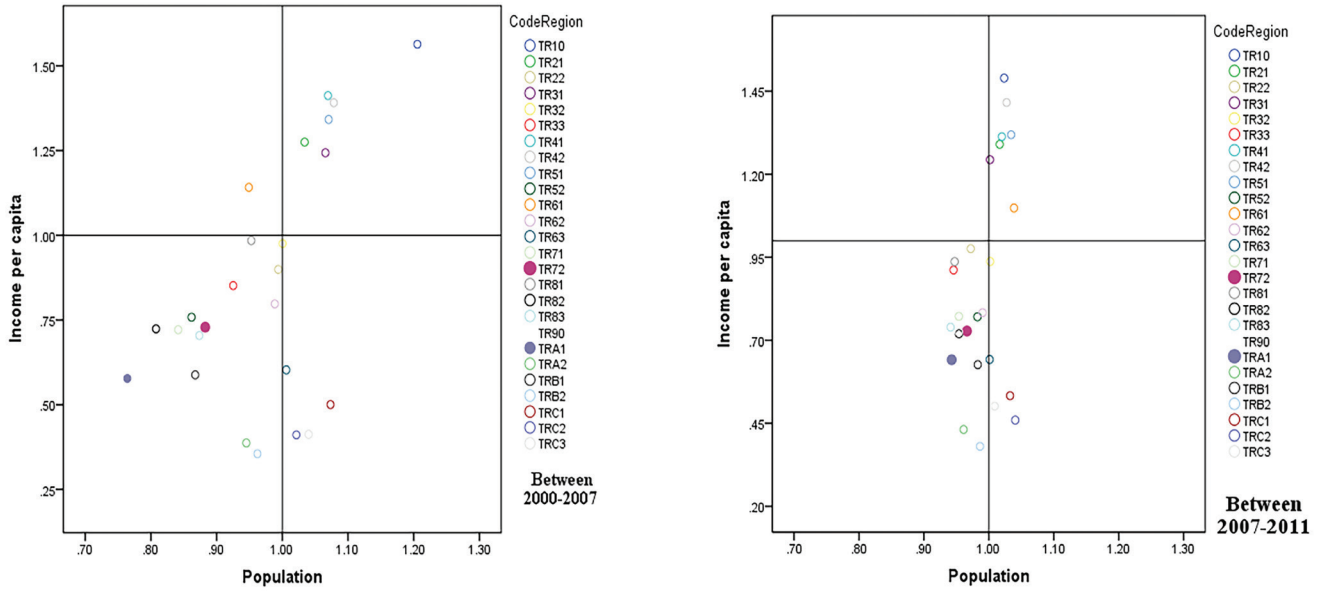

Figure 2. Re-distribution of Population and Capital in Space for NUTS2 Regions; between 2000 and 2011; (Source: Dursun, 2015)

[3] Gross Value Added

According to the graphic presenting the redistribution process of capital and population (Figure 2), the regions at the bottom-left of the diagram are the ones that lose in this process. This figure reveals that although TRA1 Region is one of those losers, it started to gain within the redistribution of population and capital after 2007. The change in the relative position of TRA1 after 2007 is owed to the increase in constructrion sector (Table 2). The capital accumulated through construction sector did not transferred to investments producing more value-added goods; i.e to manufacture sector. So, especially in a downsizing city like Erzurum, even this relatively positive development in the redistribution of population and capital is not enough to overcome the fragility of its economy. Size of the urban macroform is increasing and creating ecological risks for Erzurum but population is decreasing. Urban development process and population growth dynamics shows a contradiction as physically growing cities but decreasing population. It can be understood with the investments concentrated on construction sector.

According to the location quotient (LQ) analysis; that shows which facility of the city provides its production identity; there is concentration for forestry (LQ: 3.91), mining (LQ:1.32) and food production sectors (LQ:1.17) in Erzurum together with activities on service sectors. This analysis reveals that manufactural facilities are very limited in the city. Specialization in the city is realized at the facilities in service sector; which move the economy forward with education, health and commercial facilities –especially when the capital accumulated in these sectors can be transferred to the manufactural sectors. In addition, the tendency of the capital holders to migrate to the metropolitan cities (Dursun, 2015) in the country may continue in the near future; which in turn increase the vulnerability of the local urban economy. Thus, it is important to increase the numbers and diversity of investments in the productive fields to provide economic resilience for Erzurum.

The social structure of a city or a region is the determinant of its adaptation capacity against new situations. The character of the people is their distinctive property providing to survive after crisis, shocks or threats. Maguire ve Hagan (2007) defines *social resilience* concept as the capability of societies to overcome negative situations and transform them to positive. According to them social resilience concept has three components; i.e. resistance, recovery/overcoming, and creativity. The societies with these properties are accepted to have very high degree of resilience. In order to evaluate the social resilience of a city, demographic properties and the changes in demographic structure of a settlement given in the methodology section were used. In terms of those variables, high levels of education, high ratios of young population, increased labour force participation of women, and higher levels of education of the ones migrated to the city indicate higher levels of social resilience for the case city/ region.

Any change in the population determines the future employment potentials of the city and directly affects its economic resilience. The population data of Erzurum indicates the decrease in its population, especially due to the ongoing migration from the city. Even though it is not happened yet, this may create a serious problem for labour supply in near future. The data on Table 3 proves that Erzurum is a shrinking city. However, it also shows that migration from Erzurum has been decreased within the last decade; which is a positive development regarding the social resilience of the city. Moreover, the urbanization ratio and and average household size indicates that Erzurum has changed its social structure from rural to urban, especially after 2000s. According to the variables, Erzurum seems very fragile with its social structure but the changes indicate a possible positive development in the future.

Table 3. The annual percentage change in population indicators

	Name of the Data	Erzurum		Change		Ann.Aver. % Change
POPULATION	Population Density (km2/per capita)	**2000**	**2012**	**-6.3**		**-1.4**
		37.3	31			
	Urbanization Ratio (%)	**2000**	**2012**	5.68		**0.79**
		59.79	65.47			
	Rate of net migration (%)	**1995-2000**	**2011-2012**	41.17		**25.2**
		-54.8	-13.6			
	Average Household Size	**2000**	**2012**	-1.13		**-1.6**
		5.73	4.6			
	Age Specific Fertility Rate (15-49) (#/1000people)	**2001**	**2012**	-3.66		**-0.4**
		90.86	87.2			
	Dependency Ratio for 0-14 age (%)	**2000**	**2012**	-6.1		**-1.4**
		35.1	29			

Source: Dursun, 2015

The increase in the number of graduates from higher education and above (Table 4), puts forward the positive change in human capital of Erzurum. If this growth tendency can be maintained, Erzurum may become resilient, as its social residence increase.

Table 4. Education Level in Erzurum; for 15+ Aged Ones

	1	2	3	4	5	6	7	8	9
2012	47827	46948	134172	112448	23248	112465	48213	3536	1735
2013	45386	46031	130505	113462	22735	108412	54376	3948	1841
2014	44281	43588	130251	100395	42869	108719	58881	4456	1973

Source: TUIK, 2014, Regional Statistics-Education, 1.Illiterate; 2. Not completed school 3. Primary school; 4. Primary education; 5. Junior High School or Equal; 6. High School or Equal; 7. Higher Education / Undergraduate; 8. Masters; 9. Doctorate

The age structure of a society was evaluated to see social resilience and fragility points. Figure 3 shows an accumulation of the population aged between 10 and 35 as young populations. However, it also indicates that the population of Erzurum started to be aged between 2007 and 2014. Even though being lower than that of Turkey, the ratio of the population aged more than 65 increased more rapidly between 2007 and 2014 in Erzurum (from 6.6% to 7.9%) than Turkey (from 7.1% to 8%). Thus, even it has not yet created fragility for Erzurum; it may in the future if it maintains this rate of increase.

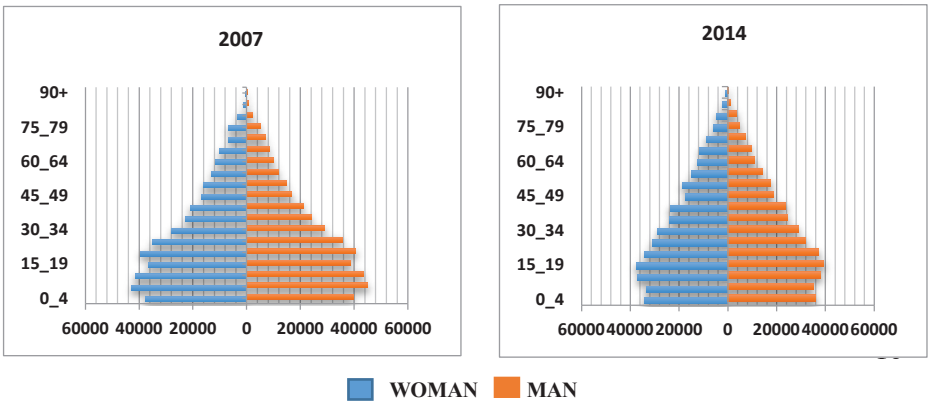

Figure 3. Age Pyramids of Erzurum; 2007-2014 (TUIK, 2014, Regional Statistics)

Age dependency ratio[4] is another variable regarding the aging of any settlement. There is a decrease in the dependency ratio of young people between 2007 and 2014 (from 51.8% to 43.8%); while the dependency ratio of elderlies has increased within the same period. Thus, the ratio of elderly people who do not attend the workforce in Erzurum is increasing as the society is aging (from 10.8% to 12.5%); which by time increases the fragility of the city.

Population data indicates that this is not only created by natural population increase; but migration moves. A detailed analysis on migration movements indicates that migration from Erzurum increases in parallel with the increase in the level of education. Additionally, the ones migrated to Erzurum also have higher educational status; and their educational level is increasing through the years. Erzurum is one of the important centers in its region regarding educational, health and administrative services. All these institutions attract educated and skilled people in the city. However, this seems to be not enough to increase the social resilience of the city as these newcomers generally do not integrate the city life as the local community.

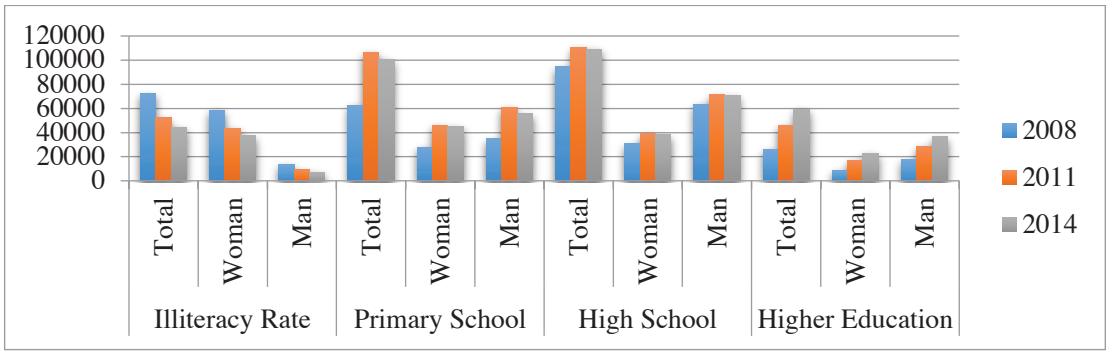

Figure 4. Education Status of Working Population (15+ Age Group) (*TUIK, 2014, Regional Statistics; Education)*

However, the average level of education for the working population is generally in Erzurum primary education or high school; which states that labour intensive productive facilities based on unskilled labourers are common in Erzurum. Even so, the increase in the number of women labourers, especially the educated women, is increasing the social resilience of the city. They generally work in agricultural sectors in Erzurum and most of them are graduated from primary school. However, especially between 2008 and 2014, the number of more educated women in Erzurum labour market has started to increase (Figure 4). The continuity of this tendency may increase the social resilience of the city in near future.

CONCLUSION

Resilience analyses offer a new approach for the future of the cities regarding the possible shocks the cities may face and their capacities to adapt them. Planning discipline should adopt this approach and try to find new ways to intervene cities through a resilient planning perspective. Thus, this study aims to analyse the urbanization experience of Erzurum through the resilience perspective using economic and social indicators; questioning its capability to adapt.

Plans and efforts to provide a planned development reveal that urbanization policies and practices of Erzurum create fragilities which generate ecological risks and make the city unprovided for possible shocks, risks and threats. The analysis indicates that the economy of the city has the tendency to grow, based on service sector. Thus, the capital accumulation is provided through service sector in Erzurum. However, this accumulated capital cannot be transferred to productive facilities in the city; which makes it vulnerable to any crises.

[4] Age dependency ratio indicates the ratio of young people (aged between 0 and 14) and elderlies (aged above 65) to the others (the ones aged between 15 and 64).

Actually, the migration of investors to bigger cities from Erzurum after accumulating a significant capital is the explicit signal of such a crisis. Social resilience analysis states that Erzurum is a shrinking city. Erzurum loses its population; expecially the educated ones. In addition, the aging in the population increases the dependency ratio of the elderly. All of these characteristics of the city reduce its capacity to resist a possible crisis and recover afterwards.

In fact, resilience analyses are made using more indicators comprising more issues within a long time period. However, we confronted to the general problem of Turkey on deficiency of data and their inconsistencies. This study should be thought as a starter for the analysis on economic, social and ecological resilience putting forward the fragilities of the city and should be supported with additional analysis.

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