Capacity for Urban Adaptation to Climate Change: Case Study of Erzurum and Kayseri

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Abstract

Climate change is a growing problem for urban areas, which should be held by the governance institutions with growing significance. In this process, there is a great need for greater capacity for adapting climate change in urban areas through effective urban policies. However, the research has shown that even if the related bodies had shown some eagerness on urban adaptation, the required steps to reduce the vulnerability of urban areas and urban populations could not be taken. Thus, it is obvious that there is a great need for adapting climate change and thus built a capacity for this both through political institutions and civil society.

Turkey started to experience an important construction boom after 2004. It was aimed to trigger the economic development owing to the backward and forward linkages of construction sector. Urban transformation is used as a tool to ease and control the building processes of the cities. Through these urban transformation processes, most of the urban areas had been re-built. This paper aims to question whether this rapid and intense change experienced on the urban built environments could have been used as an opportunity for the climate change adaptation of the related cities. The recent urban policies and implementations of local governments of Kayseri and Erzurum will be analysed in this regard. Thus, analysing the climate adaptation capacities of two cities (Kayseri and Erzurum); that are differing through their sizes and economic structures; it is aimed to put forward the capacity of Turkish urban policy to adapt climate change.

1. Introduction

When the urban policy literature is analysed for the last three decades, it is seen that climate change and adaptation strategies become important especially for developed countries. While, in the first stage, need for climate change adaptation strategies are discussed, strategic steps for the adaptation are evaluated in later. As it is mostly emphasized in scientific studies related to the future scenarios, Turkey has high sensitivity for climate change. All related maps showing the future scenarios demonstrate that Turkey is in the group of countries have serious risks and become red in the following years. Cities are the most important factor negatively contributing the climate change in this process. In developed country examples, cities have started to promote climate sensitive strategies for urbanization and other policies in their city scale scenarios. Stuttgart, Gothenburg, Stockholm, Hong-Kong and Freiburg are the cities can be given as well-known examples having this type of strategies. When the list of cities in the world concentrated on climate change and adaptation strategies are analysed, it is observed that design based factors such as urban form, geometry, density and settlement pattern are evaluated on the one hand, and on the other hand future scenarios, predictions, sustainability and quality of life become the issue for discussions.

2. Climate adaptation strategies and urban policies

Climate change has become important policy issue for developed countries and in parallel with these studies, adaptation strategies has come to the agenda of urban policy makers. For Turkey, we can observe limited studies about measuring climate change. As it is known, the Earth's climate is becoming warmer, which is a big risk for Turkey. Since the beginning of the twentieth century the global mean surface temperature has increased by about 0.89^{o}C. In the last fifty years, especially for summer time, temperature has increased 1.5 ^{o}C in Turkey. Based on different scenarios, climate scientists estimate increases between 1.5 and 4.5^{o}C by the end of the present century for the world (IPCC, 2013). Turkey is in the list of countries, which will be profoundly affected by this change. In this process, temperature increase will have important effects on the environment, society, and the economy. Several factors such as distributions of population, urbanization, industry, agricultural areas and water resources may influence the impacts of climate change.

As it is illustrated in Figure 1, temperatures are rising almost everywhere in Turkey through last 50 years. While summer temperatures have seen the most increase, precipitation has not changed significantly except for the north-eastern parts. The changes in mountain glacial retreat (about 10m/year) and streamflow timing also reflects a response to increasing temperatures. Meanwhile, the statistics reveal an increase in the number of natural

hazards experienced in Turkey in this period. Already, Şen (2013) states that a higher number of natural hazards is expected when the temperature is higher than average.

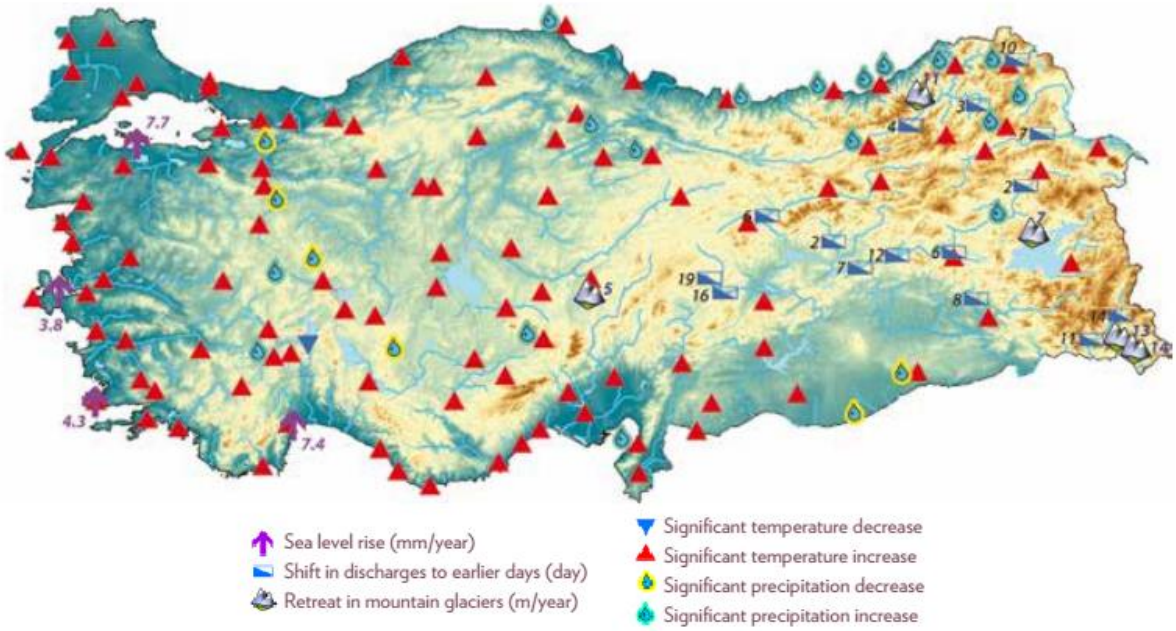

Figure 1. Past changes in hydro-climatic variables of Turkey (Source:Şen, 2013 p.12)

Above summarized changes in the last 50 years, emphasize the importance of climate change for Turkey. The policies on climate change have started to gain a seat in national policies. However, the consideration of cities' adaptation to the climate change is still a question for Turkish urban policies. Before investigating the so-called policies on case cities, it is important to put forward the urban design-based factors for reflecting the existing situations of the cities within a wide range from physical structure to policy orientations; which also reflects their capacities on adaptation to climate change.

In this study, design based factors summarized by the Milosovicova (2010) will be used by combining and excluding some of the elements. Size of the city is excluded due to the discussions about its reliability on the explanation of the correlation between city size and urban heat island. Water is the other factor excluded because of the inexistence of the natural water surfaces in urban areas of both Kayseri and Erzurum. Other design-based factors used in this study have a decisive role in determining the situation of urban climate.

- Urban geometry: Building height to street width (H/W) ratio and orientation of the streets
- Density and Compactness
- Settlement patterns and the particular land use (Dursun & Yavaş, 2015)

These factors demonstrating the existing situation of cities is meaningful only when they used cumulatively through various strategies and actions regarding land-use and transportation policies, massing and building controls, open space/outdoor living areas and public amenities.

3. Case Study Areas: Erzurum and Kayseri

Planning histories of settlements demonstrates two important issues: the power of localities on implementing the policies and the development path of physical development of the urban built area (a predictable development through long-range plans/decisions or fragmented developments catalyzed with ad-hoc decisions). Erzurum and Kayseri cases indicates different results of urban development regarding the capacity of localities to create powerful rules for the development game and the power of them to implement these rules throughout years.

Development tradition of Turkey does not involves sensibility on the climate or climate related issues. However, these issues started to became a part of the planning processes. So, despite having no examples of climate sensitive planning, the willpower of localities are thought to be important for the implementation of future adaptation policies. Kayseri uses two important tools for implementing urban plans. "Land Deals" is used since the first plan of the city, 1945 onwards; and "Free Work" is used since the second half of 1980s. Owing to these tools, development of Kayseri follows the main structure created by the second plan made at 1975. On the contrary, Erzurum failed to develop an appropriate tool that will give power to the decision makers. The only tool to

implement the urban plans and other decisions regarding built environment is the "18th item" on Development Law (#3194) which has no local issues. The history of planning of Erzurum is full of debates on development and interruptions at implementation of plans. Since 1939, Erzurum is subject to four or five different plans and developed without a plan for several years between each new plan.

The historical analysis of Erzurum's urban form indicates a compact development. However, urban development transforms to a linear form in the direction of north-east to south west through the main arterial roads. The fragmented development of built environment and the increase in the building tendency creates a development pressure on the meadow that was once limiting the development of the city from the north. Because of the above-mentioned reasons regarding planning history, nearly each settlement region of Erzurum displays different characteristics regarding their densities, street orientations, height and width ratios, positioning of buildings and streets regarding the prevailing wind direction (from southwest to north east), etc.

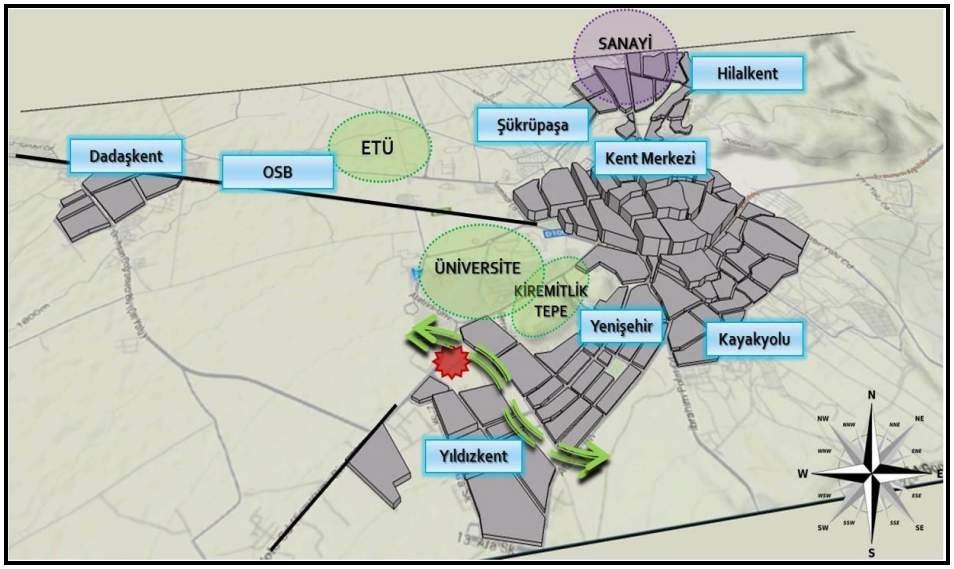

Figure 2. Urban macroform and settlement areas of Erzurum (Dursun&Çodur, 2015)

The city center of Erzurum displays a compact form with buildings having five to seven storeys and one or two old housing areas. The density of historical places at the city center characterizes the city. Streets are oriented from south to north in this high-density region (nearly 800person/ha). The hard winter conditions at the city resulted with narrow streets and very few outdoor areas, historically. However, the continuity of this tendency even after the elevation of the building storeys lead the blocking of the wind and resulted with an important air pollution problem. The lack of open space areas together with the city center's surfaces' being hundred percent sealed increases the risk for climate change. The new development plan of Erzurum, dated 2015, proposes nearly 500ha urban transformation areas, an important part of which located within the city center. This transformation may be an opportunity for getting rid of the existing air pollution problem and for the adaptation of the city to the climate change.

Dağ district, which had created by the gecekondus built especially after the dense migration problems experienced by 1950s. The orientation of the streets cannot be understood due to the organic form of the region. This district located over the hill is comprised of one or two storey buildings have many social and technical infrastructure problems together with air pollution problem.

Only two districts of Erzurum have designed considering the wind information: industrial area of the city and Yenişehir settlement area. Industrial area is located at the northeast part of the city with one or two storey buildings in a linear form. Despite the streets' south-north orientation, this area is faced with pollution problem. It has so many technical infrastructural problems, which lead its existing transformation. Yenişehir region is designed and implemented as a precaution to the gecekondu problem of the city and created through cooperatives. The planned development of this region provided a balance for the open and closed space. Being a mid-density area with buildings having five storeys, and relatively large streets oriented parallel to the wind, Yenişehir region has no air pollution problem and also plays an important role in the ventilation of the city center.

The relatively newer settlement regions; i.e. Yıldızkent (western edge of the city), Şükrüpaşa (north part of the city) and Kayakyolu (south of the city) have no sensitivity regarding the wind direction. They all include five to seven storey buildings creating high densities. Open and closed space balance in these regions are distorted as

they have limited or no green areas. The streets at Şükrüpaşa are oriented with south-north direction, but as this region is developing towards the plain, it creates a development pressure on it. The street orientations at Kayakyolu are very complex as it did not developed through a setup determined in advance. The settlement structure of Yıldızkent does not only forms a problem for itself but also for the whole city as the built environment of this region blocks the wind because of the density of the buildings, distorted open and closed space balance and the direction of the streets.

Dadaşkent, the satellite town of Erzurum, is located on the plain with one-two and five storey buildings. This housing area, which is located on the plain and creates transportation demand, is forming an ecological risk and a pressure on the climate change.

As the details about the settlements of Erzurum clearly indicates, the development of the city is not based on a setup created in advance. However, the situation is different for Kayseri. The main structure of Kayseri's urban built area is formed mainly after 1950s through Land Deals. As a result of the implementations at those years, a tradition on wide streets had settled to the urbanization culture of the city. With the migration movements increased after '60s, Kayseri had been subject to dense gecekondu areas. However, the second development plan of Kayseri made by the Ministry at 1975 had followed the main structure formed by the previous plan, and designed development areas appropriate to this structure. Owing to the Land Deals System, which provides the implementation of development plans annihilating the problems that cannot be solved by 18th item implementations, Kayseri developed with wide streets and a relatively balanced open and closed space.

Kayseri's historical city center has a compact form which is distorted by the development movements after 1950s. The main structure of the city is developed in a linear form through east and west at the same time, parallel to the main arterial road of the city. The built environment of the city is formed around the streets vertical to the main artery, which allowed the wind into the city. The development of the city still materialized through west and east parallel to the main artery. However, the new developments to north through the airport; to south through Talas district (the settlement where upper-class tend to locate), and to south-west where the Eskişehir İllegal Housing Prevention Zone locates changed the macroform of the city to a form which looks like a star.

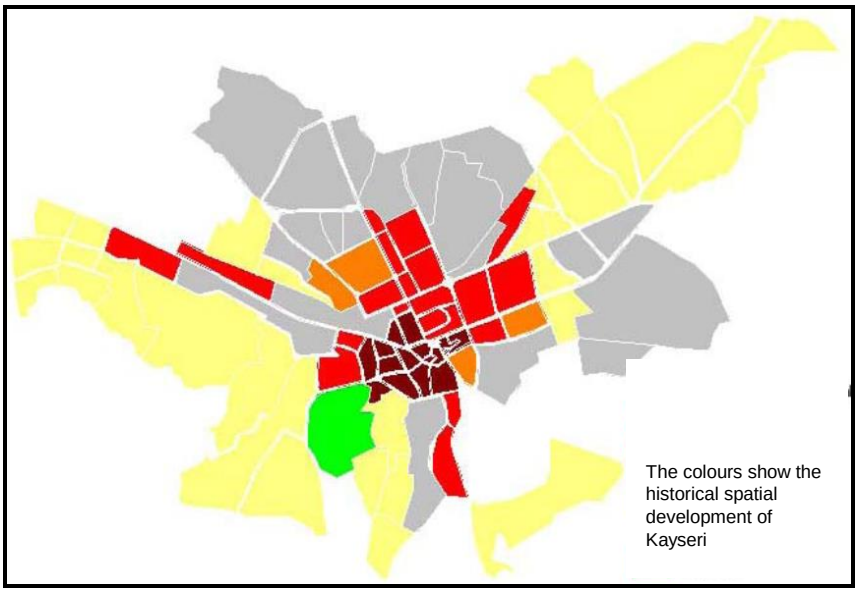

Figure 3. Urban macroform development of Kayseri (Kocatürk&Yücel, 2012)

The prevailing wind direction is south in Kayseri, and the main structure proposed by the development plans offer appropriate street orientations regarding the wind direction. Owing to the implementation tools of local governments, the main structure of the city is formed according to the development plans even since the first planning efforts. However, as a result of the development pressure at the city, the local government made up a new implementation tool, which is called as "Free Work" after '90s. This provides the developer to build freely up to 14 storeys, using the determined floor space ratio at the related parcel. Such kind of a development does not ruin the basic structure of the city; the road system and the relations between different functions in the city. However, the increase in the heights of the buildings have important effects on the urban climate through both the increase in the built structure and the densities of the settlement fragments which then increases the demands on social and technical infrastructures like transportation, etc. Thus, by time, the implementation tool of local government produced for its facilitator affect, started to work against the favor of the future of the city.

By 2014, the Ministry of Environment and Urbanization made “Clean Air Action Plan”s for most of the cities in Turkey in relation with their governors. This development heralds that the sensibility on environmental and climate issues exceeded the national scale and started to be active in localities, too.

4. Conclusion

Existing environmental problems such as climate change necessitates different approaches to policymaking and implementation to increase the capacities of cities adaptation to these changes. The differences not only comes from the complexities of the problem but also the changing peculiarities of the localities. All these different peculiarities create different pathways for cities regarding the priorities, policy making processes, tools of implementation and the relations between the actors, etc.

Turkey is in the list of countries, which will be affected from the climate change. The temperatures are rising almost everywhere in Turkey through the last fifty years. The analysis show that there exists a growing awareness at the national level regarding these environmental and climate change issues. However, both case study areas demonstrate inconsistencies between urbanization practices or policies and climate conditions. The cities have formed without such an awareness. However, the cases provide an important clue on the capacities of localities to adapt their policies to climate change and provide a long-lasting implementation.

The relation between the planning histories and settlement characteristics of Kayseri and Erzurum puts forward the importance of willpower of the local governments to implement their decisions. The awareness at the national level should become current at the localities, too.

This study is just a beginning for the search of the capacities of localities to implement their decisions and power of them to affect the destiny of them. More and detailed empirical studies are needed not just only to understand the capacities of them but also to find out the appropriate policy implementations for localities to increase their capacities and provide an increase in their willpower to implement.

If the local governments do not have future scenarios and predictions for climate change in their region, they will be more vulnerable to external shocks. In addition to the strategy and scenarios, they should have climatology section and this section should cooperate with planning bureau. Also, growing awareness at the national level concerned with the climate conditions should be transferred to local level. Otherwise, existing capacity problem will create a risk for sustainability of cities and will negatively affect the future of those cities.

Our comparison of the existing situation and adaptation approaches of Kayseri and Erzurum reveals that different planning pathways based on a city’s or governors’ prior and existing priorities, programs, and policy-making processes are important elements for cities’ existing level of quality of life and the sustainability of it. In order to increase this level of quality, strong political leadership, departmental engagement, municipality-wide institutionalization, and continued stakeholder involvement are needed. This will help the adaptation of cities in the long run.

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