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# Sustainable Urban Planning and Disaster Risk Management: Experiences from Kayseri

**Abstract**

Recently, the rising incidence of disasters has increased the need for more proactive urban planning and adaptation policies to reduce possible risks. This study aims to understand the disaster risk, urban planning-disaster preparedness obstacles in Kayseri, and to identify potential solutions. Within the scope of the research, an inventory of natural disasters identified as landslides, rockfalls, floods/water inundations, avalanches, and earthquakes were prepared for the city. Disaster-prone areas were identified, and point data related to the disasters were obtained from the service map and plotted on maps using ArcGIS. The prepared disaster inventory shows that there is a total of 98 disaster-prone areas in the province. Although no detailed disaster-related provisions were identified in the planning process until the Fifth Plan period, a total of 2,072 disaster housing units were constructed following disasters between 1967 and 2017. It was concluded that planning processes should include limiting urban expansion in risky areas, evaluating temporary housing programs, developing hazard-focused planning policies, creating a risk assessment database, improving coordination within and between institutions, and including communities in disaster planning.

**Keywords:** Urban Planning, Natural Disasters, Mapping, Kayseri

## Afetler ve Kent Planlama İlişkisi, Kayseri Kenti Afet Deneyimleri Üzerinden Çözümleme

**Öz**

Son yıllarda sayısı ve etkisi giderek artan afetler karşısında afet risklerini azaltmak için daha proaktif kent planlaması ve uyum politikalarına duyulan ihtiyacı ortaya çıkmıştır. Bu çalışmanın amacı Kayseri kenti özelinde afet riskini, kentsel planlama- afet ilişkisi kurgusu üzerindeki engelleri anlamayı ve olası çözümleri belirlemektir. Araştırma kapsamında Kayseri kenti için Heyelan, Kaya Düşmesi, Sel/Su Baskını, Çığ ve Deprem olarak belirlenen doğal afetlere yönelik envanter hazırlanmış, afete maruz bölgeler(alanlar) tespit edilmiş, yaşanan afetlere ilişkin hizmet haritasından noktasal veriler elde edilerek ArcGIS programı aracılığı ile haritalara işlenmiştir. Planlama sürecinde ise V. Plan dönemine kadar detaylı bir afete yönelik bir hükme rastlanmamış ancak planlama dönemlerinde ilgili kurum ve kuruluşlarca afetten etkilenen hak sahibi kişilere yapılan 1967-2017 yılları arasında yapılan afet konutu sayısına ulaşılmıştır. Planlama süreçleri bağlamında riskli alanlara kentsel genişlemenin

sınırlandırılması, geçici konut programlarının değerlendirilmesi, tehlike odaklı planlama politikalarının geliştirilmesi, risk değerlendirme veri tabanının oluşturulması, kurumlar içinde ve arasında koordinasyonun iyileştirilmesi, afet planlamasına toplulukların dahil edilmesini içerecek biçimde geliştirilmesi sonucuna ulaşılmıştır.

**Anahtar kelimeler:** Kent Planlama , Doğal Afetler, Haritalama, Kayseri

## 1. Introduction

In recent years, the frequency and impact of natural disasters and the magnitude of their destructive effects on humanity have increased [1,2]. This reality has made it necessary to identify complex risks in the urban area and to analyze them using scientific methods, especially by considering the systemic interplay of the physical, economic, and social characteristics of the city. Disaster risk management is a relatively new topic on the agenda of efficient urban planning and land use procedures in the creation of the built environment; however, it remains unaddressed in other contexts. Examining the literature on risk reduction and urban planning reveals that disaster risk and urban planning are typically discussed independently. The topic of disaster and urban resilience has gained attention during this time, encompassing a wide range of categories, including engineering, physical, and socioeconomic aspects [3,4,5,6,7]. As Xie et al. (2016) stated, these studies have not presented an integrated practical methodology from an urban planning perspective. In addition, the results of these studies typically provide land use configurations and engineering solutions for construction levels according to the risk profiles of cities [8]. The field of study on the relationship between urban planning and disasters, which has been neglected for years, is now being discussed in many places with new policies and necessities. In this system, efforts to develop implementation methods for risk reduction define a rich type of special planning with its content and tools. The term "Mitigation Planning" is used to highlight the uniqueness of this new planning area and to guarantee that the decision-making environment resulting from physical-economic-social integrity is understood [9,10]. The use of these regions in planning studies spanning from the national to the local scale, as well as the interpretation of data generated by engineering units related to disasters, such as geodesy, seismology, geology, geophysics, and earthquake engineering, in accordance with planning objectives, is directly related to the execution of an urban and regional planning study that adopts the goals of mitigation planning [11].

According to international research on this topic, the US led the way in developing comprehensive laws in 2000 with the Disaster Mitigation Act. The 1971 amendment to California's State Planning Act highlighted the importance of including seismic mitigation components in a thorough land-use plan. Nelson and French (2002) provide evidence for this claim by analyzing the connections between seismic damage from the 1994 Northridge earthquake and seismic safety components in comprehensive plans created for the Los Angeles region [11]. Regulatory policy development initiatives often focus on either lowering urban vulnerability or boosting urban resilience in response to the uncertainty of seismic consequences. Resilience can be defined as a city's capacity to withstand, absorb, adapt, recover, and, more recently, promptly respond to the consequences of a calamity [12,13,14].

Apart from Japan allocating 5% of its budget to risk reduction measures since the 1960s, it appears that countries are moving towards risk reduction efforts in line with new policies, albeit through different methods. Countries such as New Zealand, South Africa, Australia, Armenia, Greece, Canada, and the United Kingdom have undertaken new legal regulations and institutional structuring efforts to coordinate risk reduction activities with large-scale implementation projects. Currently, the International Disaster Reduction Strategy (ISDR) seeks to develop risk reduction efforts through an international 'Global Platform,' encouraging the establishment of National Platforms in each country, involving central and local governments, as well as NGOs, universities, and scientific institutions. Among the countries that are establishing their National Platforms are France, Italy, Germany, China, Japan, Iran, Norway, Nigeria, Uganda, Senegal, Peru, and Panama, which have high disaster risks and supported the Global Platform (2007) meeting [15]. The United Nations launched the 2010-2011 World Year of Disaster Reduction - Resilient Cities Campaign with the slogan" make cities resilient". In our country, the Disaster and Emergency Management Presidency (AFAD) has been working on the National Earthquake Strategy and Action Plan-2023 (UDSEP), the Türkiye Disaster Response Plan-7 (TAMP), the Türkiye Disaster Risk Reduction Plan-2019 (TARAP) strategic document, and the Provincial Disaster Risk Reduction Plan (İRAP) in the new period to reduce the effects of disaster risks and to create resilient urban systems. While the National Earthquake Strategy and Action Plan propose earthquake-resistant construction, the Turkish and Provincial Disaster Risk Reduction Plans prioritize the identification of risks and the implementation of prevention, mitigation, and damage reduction measures for these risks.

A disaster is a situation that arises when one or more hazards, combined with exposure and vulnerability, raise disaster risk above critical thresholds and exceed the coping capacity of the community [16,17]. Risk has been defined as 'a unique, intermediate state between safety and destruction'. It is a condition that 'indicates something future-oriented and imaginary, and therefore implies uncertainty' [18], and is linked to 'the desire to control, and especially the idea of controlling the future' [19]. Risk has been understood as a combination of hazard, vulnerability, and exposure. By controlling and altering the layout, operations, and continuous expansion or contraction of cities and regions, urban planning can reduce risk factors such as hazards and location-specific vulnerabilities and raise public awareness of dangers [20,15]. From a planning standpoint, it is critical to identify and reduce a city's susceptibility to hazards through land-use planning, thereby fostering urban resilience by strengthening the city's resilience capacities. In academic and policy circles, this has grown in importance as a research priority [21]. Only through urban planning can risk mitigation theory be put into practice by limiting future activities to seismically dangerous areas [22, 23]. Numerous land-use planning strategies aimed at reducing potential risks have been proposed in the literature. The long-standing claim that land use allocation can assist in attenuating potential harm by lowering exposure to hazards is supported by previous studies [24]. It is stated that urban planning is increasingly accepted as a key mechanism in reducing disaster risk [21, 25]. Urban planning faces the challenges of working in all phases of disaster management (mitigation, preparedness, response, and recovery). The fundamental element of urban planning is to prepare for and make decisions regarding future land use. Spatial planning involves the process of allocating, shaping, sizing, and adapting the area (land) for multifunctional uses [26]. The main purpose of urban planning is to decide on the future use of the area [27]. Development plans and programs prepared by municipalities and institutions at various scales take care to create a livable physical environment by meeting the basic needs of people, such as housing, workplaces, transportation, and infrastructure that make up our living spaces, while also protecting natural and cultural resources [28].

In this context, it is of great importance that decisions and practices regarding the urban environment are formulated with the concern of being prepared before such disasters occur, to reduce potential disaster damage, and that planning studies are carried out by considering disaster risks. The urban planning system is seen as an important tool in enabling the creation of healthier and safer spaces for disaster-sensitive cities. Therefore, for disaster-sensitive planning, the hierarchical order consisting of development plans, regional plans, master plans, zoning plans, and implementation plans needs to be addressed with a harmonious and holistic approach. This study aims to understand the obstacles in the urban planning-disaster relationship framework and to identify possible solutions regarding disaster risk in the city of Kayseri. The selection of Kayseri province as the study area is based on its strategic location in the Central Anatolia Region, its proximity to active fault systems, and the contradiction between its well-established planned urban identity and the limited scholarly attention given to its vulnerability to disasters. Although Kayseri is often characterized as a relatively orderly and planned city, the implications of this urban structure for disaster risk reduction have not been comprehensively examined. In recent years, the city has experienced rapid population growth, extensive urban development, and increasing spatial sprawl, processes that have significantly transformed land-use patterns and the built environment. These dynamics provide a critical research context for analyzing how disaster risks are produced, intensified, or mitigated through urban planning decisions. Moreover, as a medium-sized Anatolian city, Kayseri represents a typical urban form beyond metropolitan centers, enabling the findings of this study to support comparative analyses of cities with similar socio-spatial characteristics and to inform evidence-based policy and planning recommendations aimed at enhancing urban resilience. The study will first provide an overview of the disaster history of Kayseri, the study area, and examine the city's approaches to disaster issues in the planning process. The results will support planners and decision-makers at the theoretical and practical levels to contribute more effectively to creating resilient cities.

## 2. Material and Method

The research began with a detailed literature review on the national-international wide. To examine the disaster history of Kayseri, the designated study area, a disaster inventory was created. This inventory identified the types of disasters that have occurred in rural and urban areas from the past to the present, as well as the affected areas. A dataset was compiled based on this inventory. Landslides, rockfalls, floods/water inundations, avalanches, and earthquakes that were deemed disaster-prone areas in Kayseri Province between 1960 and 2017 were listed. To access this information, the archives of the Ministry of Interior's Disaster and Emergency Management Presidency, the Kayseri Provincial Disaster and Emergency Management Directorate, and the municipality were thoroughly searched. The dataset developed from this disaster inventory was then mapped using Density Estimation (DE) of disaster data across Kayseri province using a Geographic Information System (ArcGIS). This method allows visualization of spatial clustering trends in point-based data (disaster events) as a continuous surface. In addition, point-specific data from the disaster service map, broken down by district across the city, were plotted on maps, and a density analysis was conducted. The numerical values obtained from the analysis and indicated in the legend represent the estimated disaster intensity per unit area. The color scale on the map ranges from low-density areas (light gray/white) to the highest-risk 'hot spots' (black). The same process was repeated based on the number of houses built during the post-disaster recovery process.

In parallel, the relationship between the city's disaster history and planning has been examined in detail, and a comprehensive literature review has been conducted. The study investigates the relationship between disasters and urban planning in Kayseri province across planning periods, examining the approaches adopted, studies conducted, and policies implemented regarding disasters during these periods. Simultaneously, problems encountered in the disaster management process have been identified, and solutions proposed. This examination was conducted in the following periods: Pre-planning period, First Plan Period (1944-1975), Second Plan Period (1975-1986), Third Plan Period (1986-2006), and Fourth Plan Period (2006-present). As a result, a disaster inventory of the province has been compiled through the study area, and these areas have been identified. This explains the factors to consider when preparing urban plans for a city in the context of disasters.

## 3. Results

Kayseri is located in the Central Kızılırmak region, where the southern part of Central Anatolia and the Taurus Mountains converge. The province covers an area of 16,913.8203 km$^2$, with 36.1% covered by mountains, 14.8% by plains, and a large portion (49.1%) by plateaus. Within the borders of Kayseri province, formations from the Paleozoic, Mesozoic, and Cenozoic eras are observed. When evaluating the disasters experienced by the city, rockfalls, landslides, floods, earthquakes, groundwater flooding (GWF), and, although less frequent, avalanches are observed (Table 1). The area where 95 of these disasters occurred has been declared a disaster-prone region by the Council of Ministers, in accordance with the provisions of Law No. 7269 on Measures to be Taken and Assistance to be Provided Due to Disasters Affecting Public Life [31].

**Table 1.** Kayseri -Disaster Inventory [29]

| DISTRICT | NEIGHBOURHOOD | TYPE OF DISASTER | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Landslide | Rockfall | Flood | GWF | Avalanche | Earthquake | Disaster-Affected Area Decision |
| **Akkışla** | Uğurlu | | * | | | | | 6.06.1979 |
| **Akkışla** | Gömürgen | | * | | | | | 22.06.2021 |
| **Bünyan** | Akmescit | | | * | | | | 16.11.1968 |
| **Bünyan** | Doğanlar (Gergeme) | | | * | | | | 3.03.1990 |
| **Bünyan** | Karakaya | * | * | | | | | 14.01.2019 |
| **Bünyan** | Kardeşler | | | | | | * | - |
| **Bünyan** | Burhaniye | | | | | | * | - |
| **Bünyan** | Yenice | | * | | | | | 08.12.2022 |
| **Develi** | Büyük Künye | * | | | | | | 09.06.2022 |
| **Develi** | Ayvazhacı | * | | | | | | 16.05.1980 |
| **Develi** | Çadıryeri | | | * | | | | 12.10.2009 |
| **Develi** | Derebaşı | * | | | | | | 2.06.1998 |
| **Develi** | Gaziköy | | * | | | | | 09.06.2022 |
| **Develi** | Kabaklı | | * | | | | | 09.06.2022 |
| **Develi** | Kılıçkaya | | | * | | | | 11.02.1991 |
| **Develi** | Kızık | | * | | | | | 17.01.2018 |
| **Develi** | Küçükkünye | * | | | | | | 22.06.2021 |
| **Develi** | Merkez | | * | | | | | 17.01.2018 |
| **Develi** | Öksüt | | | * | | | | 27.03.1965 |
| **Develi** | Sarıca | * | | | | | | 21.02.1964 |
| **Develi** | Sarıkaya | * | | | | | | 09.06.2022 |
| **Develi** | Tombak | | * | | | | | 22.06.2021 |
| **Develi** | Yeniköy | * | * | | | | | 22.06.2021 |
| **Felahiye** | Silahtar | * | * | | | | | 14.01.2019 |
| **Felahiye** | Kaya Pınar | | | * | | | | 02.09.1967 |
| **İncesu** | Kızılören | | * | | | | | 14.01.2019 |
| **İncesu** | Süksün Kas. | | * | | | | | 28.05.1996 |
| **İncesu** | Küllü | | * | | | | | 09.06.2022 |
| **İncesu** | Kızılören | | * | | | | | 14.01.2019 |
| **İncesu** | Saraycık | | * | | | | | 18.08.2008 |
| **Kocasinan** | Höbek | * | | | | | | 09.11.2015 |
| **Kocasinan** | Güneşli | | | | | | * | - |
| **Kocasinan** | Hasancı | * | | | | | | 04.10.2019 |
| **Kocasinan** | Hırka | | * | | | | | 04.10.2019 |
| **Kocasinan** | Bayramhacı | | * | | | | | 17.07.1962 |
| **Kocasinan** | Kuşcu | | * | | | | | 04.10.2019 |
| **Kocasinan** | Obruk | * | | | | | | 04.10.2019 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Kocasinan** | Oymaağaç | | * | | | 04.10.2019 |
| **Kocasinan** | Taşhan | * | | | | 04.10.2019 |
| **Melikgazi** | Bağpınar/ Kuzey | * | * | | | 18.06.2003 |
| **Melikgazi** | Mimarsinan | | * | | | 12.03.1997 |
| **Melikgazi** | Aydınlar (Tavlusun) | | * | | | 18.01.1980 |
| **Melikgazi** | Gesi | | * | | | 13.03.1981 |
| **Melikgazi** | Hisarcık | | * | | | 8.04.1968 |
| **Melikgazi** | Turan | | * | | | 14.01.2019 |
| **Melikgazi** | Yeşilyurt | | * | | | 15.03.2019 |
| **Özvatan** | Kermelik | | | * | | 9.10.1964 |
| **Özvatan** | Merkez | * | * | | | 09.06.2022 |
| **Pınarbaşı** | Kayaönü | | | | * | 3.03.1990 |
| **Pınarbaşı** | Dilciler | | * | | | 04.10.2019 |
| **Pınarbaşı** | Artmak | | | * | | 17.07.1962 |
| **Pınarbaşı** | Ayvacık | | * | | | 04.10.2019 |
| **Pınarbaşı** | Aşağıbeyçayır | | | * | | 3.03.1969 |
| **Pınarbaşı** | Yukarıbey Çayır | * | | * | | 20.12.1993 |
| **Pınarbaşı** | Saçlı | | * | | | 10.11.2008 |
| **Pınarbaşı** | Kayaönü | | | | | 3.03.1990 |
| **Pınarbaşı** | Kavlaklar | | * | | | 29.06.2009 |
| **Pınarbaşı** | Han | | * | | | 21.11.2016 |
| **Sarıoğlan** | Ebülhayır | | | * | | 30.03.1964 |
| **Sarıoğlan** | Karpınar | * | | | | 09.06.2022 |
| **Sarız** | Ördekli | * | * | | | 04.10.2019 |
| **Sarız** | Kırkısrak | * | | | | 09.06.2022 |
| **Sarız** | Dallıkavak | * | * | * | | 08.12.2022 |
| **Sarız** | Darıdere | * | | | | 04.10.2019 |
| **Sarız** | Değirmentaş | | | * | | 19.02.1982 |
| **Sarız** | Karakoyunlu | | | * | | 17.09.1992 |
| **Sarız** | Fettahdere | | | * | | 29.01.1969 |
| **Sarız** | Kıskaçlı | * | | | | 09.06.2022 |
| **Talas** | Merkez | | * | | | 11.02.1991 |
| **Talas** | Süleymanlı | | * | | | 09.06.2022 |
| **Talas** | Cebir | | | * | | 03.03.1990 |
| **Talas** | Başakpınar | | * | | | 08.03.1994 |
| **Talas** | Kepez | | | * | | 10.04.1981 |
| **Tomarza** | Çukurağaç | | * | | | 14.01.2019 |
| **Tomarza** | Şeyhbarak | | | * | | 14.01.2019 |
| **Tomarza** | Emiruşağı | | * | | | 30.06.1998 |
| **Tomarza** | Alakuşak /Akdere | | * | | | 24.05.2006 |
| **Tomarza** | Avşarsöğütlü | | * | | | 21.02.1964 |
| **Tomarza** | Kömür | | * | | | 14.01.2019 |

| | | | | | |
|---|---|---|---|---|---|
| **Yahyalı** | Çubukharmanı | | | * | 16.01.2019 |
| **Yahyalı** | Merkez | | * | | 5.01.1989 |
| **Yahyalı** | Balcıçakırı | * | * | | 16.12.2013 |
| **Yahyalı** | Büyükçakır | | * | | 19.07.2010 |
| **Yeşilhisar** | Başköy | | * | | 16.12.2013 |
| **Yeşilhisar** | Soğanlı | | * | | 04.10.2019 |
| **Yeşilhisar** | Doğanlı | | * | | 17.01.2018 |
| **Yeşilhisar** | Kavak | | * | | 04.10.2019 |
| **Yeşilhisar** | Güzelöz | | * | | 03.10.2016 |
| **Yeşilhisar** | Araplı | | * | | 17.01.2018 |

### 3.1. Rockfall

Kayseri is evaluated within the scope of rockfall disasters; it ranks first in the country in terms of frequency and number of affected disaster victims—settlements [30]. Due to the temperature differences between night and day in rural climates, rocks are subjected to physical erosion. In addition, the water content accumulated in the discontinuity lines of the rocks causes both physical disintegration as a result of freeze-thaw cycles and also affects the initiation of rock mass movement. Rockfall events occur throughout the province, and they are particularly widespread in Melikgazi, Kocasinan, Develi, İncesu, Yeşilhisar, Tomarza, and Talas districts. In total, 82 settlements have been definitively declared disaster-affected areas based on events that occurred after 2008, and 55 settlements have been affected by rockfall disasters. When we examine the areas where rockfalls occur on a district basis, the Melikgazi district has the highest number of rockfall disasters (Figure 1).

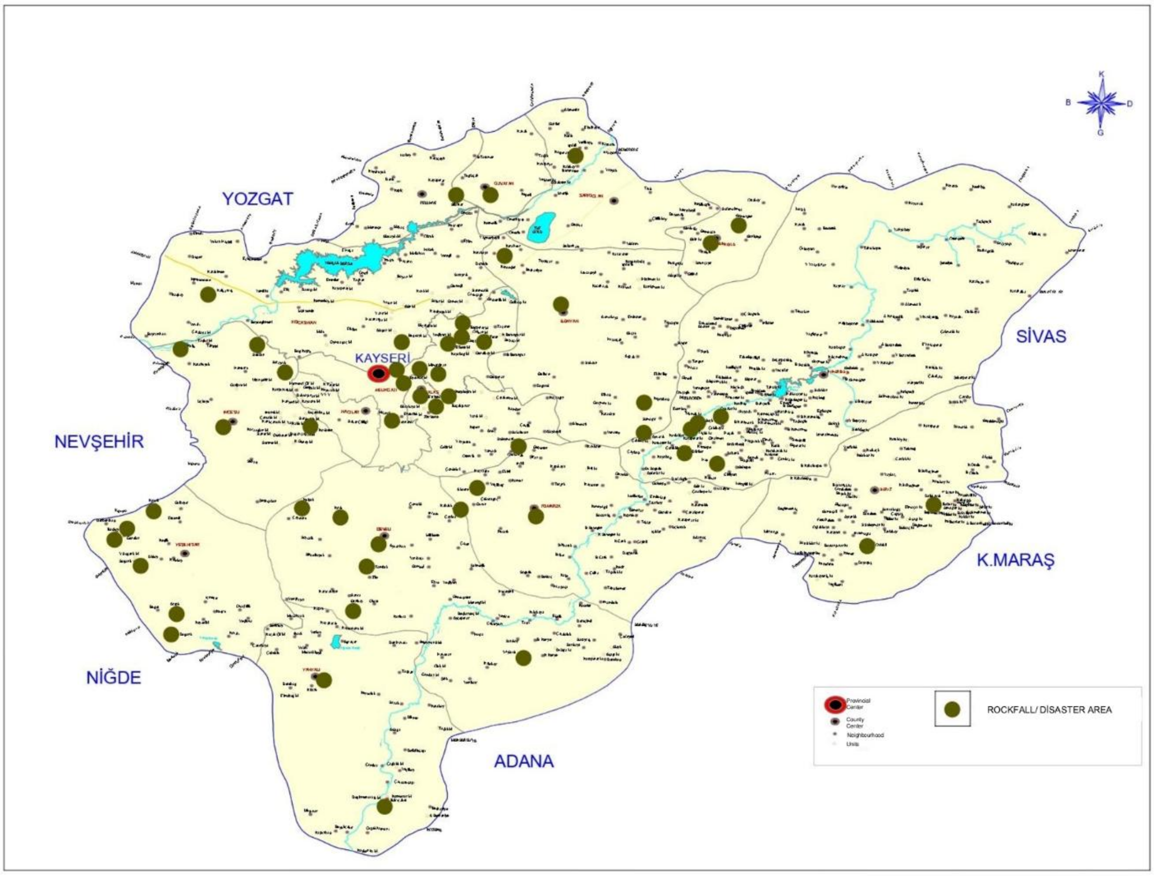
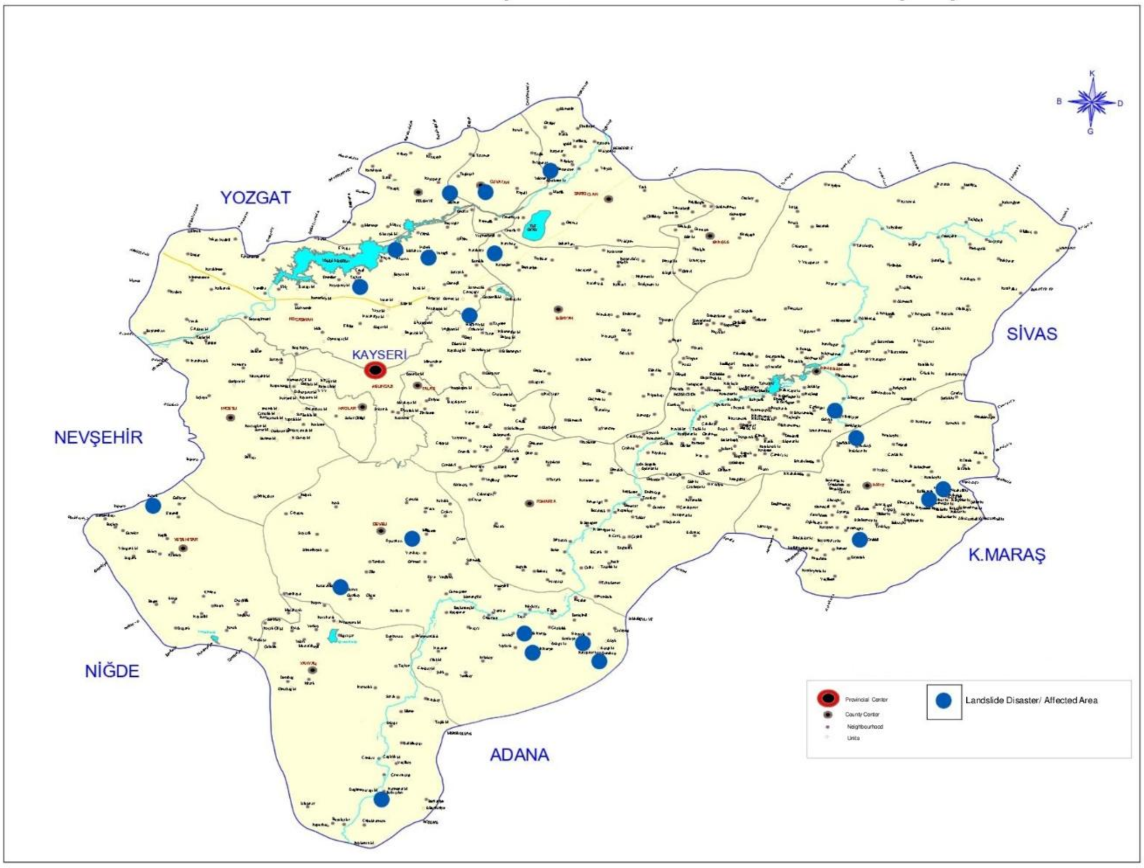



**Figure 1.** Kayseri-Rockfall [29]

### 3.2. Landslide

Landslides in Türkiye generally occur in the Black Sea and Central Anatolia regions. In Kayseri province, landslide disasters have been observed in 35 settlements. Furthermore, 22 settlements have been identified as confirmed disaster-prone areas (Figure 2). Landslides usually occur on sloping hillsides near the center of the Kızılırmak and Seyhan river basin boundaries. Kayseri province is not particularly prone to landslides.




### 3.3 Earthquake

Earthquakes are the type of disaster that causes the most material and moral losses in Türkiye, in terms of loss of life and property. Earthquakes account for a significant portion, about 60 percent, of the loss of life [31]. Kayseri province and its surroundings are in the 3rd degree earthquake zone according to the Turkish Earthquake Map. In the earthquake hazard map, Kayseri is located on the Central Anatolian Fault Segment. The earthquake that is thought to affect Kayseri and its surroundings is the movement that may occur on the Ecemiş Fault, which is a strike-slip fault. Located 80 km south of the province, the fault is in the Ecemiş depression that cuts across the Taurus Mountains between Niğde and Adana. It starts between Yahyalı and Çamardı and extends to the Mediterranean Sea through a corridor passing through Kamışlı, Pozantı, and Ortaköy. In addition, there are many small faultings around Mount Erciyes in the south of the province and around Erkilet in the north. The formation of the Pliocene-Quaternary Erciyes depression basin, in which the Kayseri region is located, and the morphology of the region are controlled by oblique-slip faults, strike-slip faults, and normal-slip faults. The Erciyes depression basin and the surrounding areas are under the influence of small- and medium-magnitude earthquakes [32].

There are a total of 24 faults and 16 fault segments that could affect the city center and districts of Kayseri. When considered together, there are 40 individual active structures. Kayseri province has historical records of earthquakes causing moderate damage in 240 AD (I=IX), 1205 AD (I=VIII), 1717

AD (I=VIII), and 1835 AD (I=VIII). Historical earthquake records in Türkiye cover observational earthquake records prior to 1900 AD. Historical earthquake records are evaluated according to the Mercalli intensity scale. They are based on observational information as they consider the degree of damage to structures. According to instrumental records, earthquakes that occurred between 1900 and 2014 had magnitudes greater than 4 and less than 6. The two major earthquakes in 1835 caused significant damage to numerous buildings, resulting in loss of life and property. In particular, the earthquake that occurred in the evening of 1835 reduced many houses with stone and earthen roofs to ruins. The minarets of the Camii Kebir, Hatıroğlu, and Kazancılar mosques were destroyed. According to Ahmet Nazif Efendi, official authorities announced that 1064 people died in the last earthquake. Local earthquakes of magnitude 4.5–5 occur intermittently throughout the province, but the 5.2 magnitude earthquake that occurred in Develi district in 1940 caused the death of 37 people and severe damage to many buildings in the villages located between Kayseri and the Ecemiş-Kayseri depression. Rockfalls were observed on Mount Erciyes during this earthquake. Among the damaged villages are Soysalı, Sendermeke, Develi, Kulpak, Kızık, Zile, and Hacılar. However, in the 1998 earthquake of magnitude 4.8, some villages along the fault line between Bünyan and Sarıoğlan districts suffered damage to houses built with dry stone. Furthermore, the earthquake of magnitude 4.9 in Güneşli, Kayseri, on November 12, 2008, caused minor cracks and collapses in dry stone walls, although it did not result in any loss of life or property. Finally, on November 22, 2011, an earthquake of magnitude 4.4 occurred in the Sarıoğlan district; there was no loss of life or property, and 5 settlements in the province were affected by the earthquake disaster (Figure 3). In instrumental earthquake records, the strongest earthquake with an epicenter in the three districts forming the city center was recorded in Kocasinan with a magnitude of 4.8. [33]. In addition, due to its proximity to the February 6 earthquakes, the tremors experienced in the earthquake centers were also experienced in the city center of Kayseri, resulting in 2515 minor damage, 42 moderate damage, 43 severe damage, and a total of 2600 buildings being damaged [34]. The consequences of the February 6 earthquakes on the main fault lines and the new risks that they will create on other faults in and around Kayseri need to be addressed comprehensively.

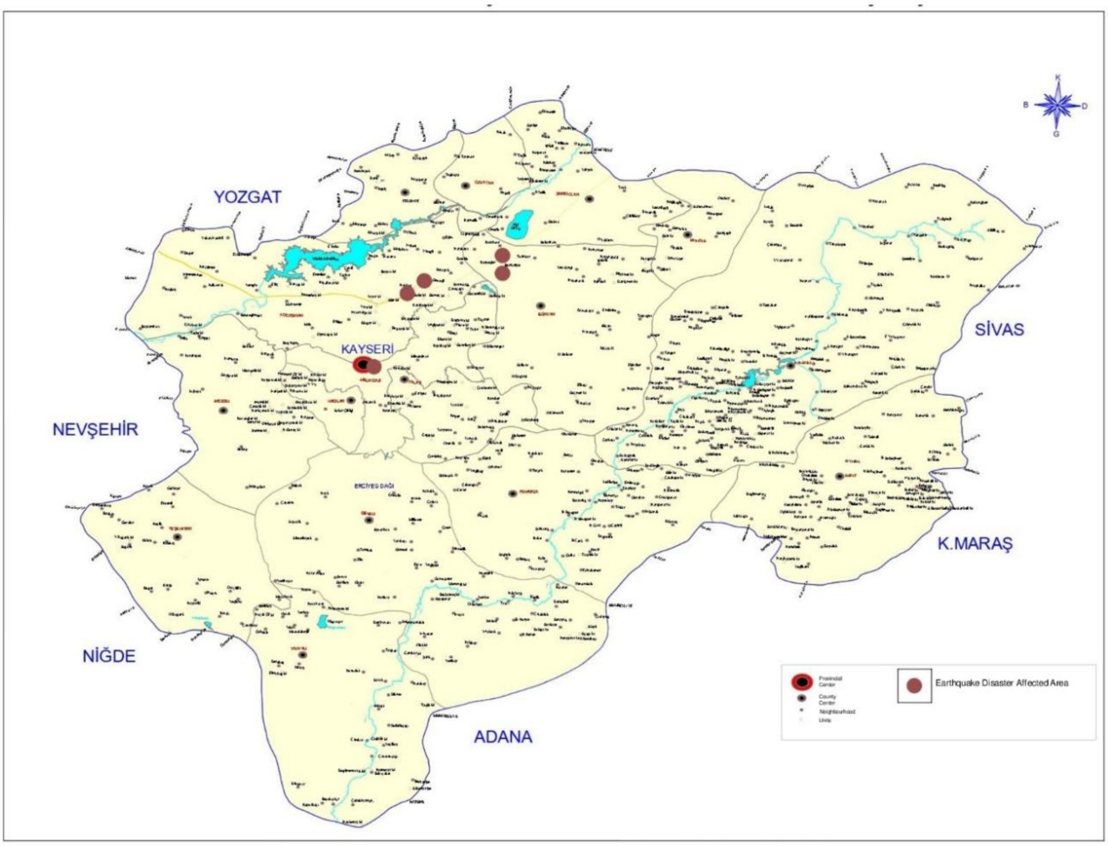



**Figure 3.** Kayseri -Earthquake [29]

### 3.4. Flood

Kayseri ranks 4th in the world in terms of the number of flood and water inundation events and 10th in terms of the number of victims. The fact that Kayseri ranks 4th in event frequency and 10th in the number of victims among these provinces indicates that it is one of the provinces with the highest risk of flooding. In total, 81 settlements in Kayseri province have been affected by floods, water inundation, and potential disasters, highlighting the considerable risk in the region. 22 settlements have been definitively designated as disaster-stricken areas. Looking at the settlements affected by floods/water inundation disasters by district, İncesu district experiences the most flood disasters (Figure 4).

### 3.5. The Interplay between Urban Planning and Disasters in Kayseri

Kayseri has been one of the important settlements in Anatolia, located at a significant crossroads since ancient times. The organic urban fabric that constitutes the characteristic feature of the city continued to exist until the Republican period. Until approximately the 1930s, there was no significant change in the city center of Kayseri. The first urban development plan of Kayseri was carried out in 1944 by Gustav Oelsner and Kemal Ahmet Aru [44]. During this period, housing production in the context of disasters came to the agenda, and 140 houses were built in rural areas such as the Felahiye, İncesu, and Sarız districts (Table 2).

**Table 2.** Disaster housing in Kayseri (1945-1975 planning period) [37,29]

| Districts | Neighbourhood | Disaster Type | Construction Year | Number of Houses |
|---|---|---|---|---|
| **Felahıye** | Merkez | Flood | 1967 | 35 |
| **Incesu** | Vıranşehır | Flood | 1968 | 32 |
| **Incesu** | Tahırını | Flood | 1968 | 16 |
| **Sarız** | Fetthadere | Flood | 1975 | 57 |
| **Total** | | | | **140** |

With the master plan prepared by Yavuz Taşçı in 1975, the city's appearance with high-rise blocks and wide streets began to take shape. With this plan, the Kayseri metropolitan area was designed as a service-intensive city center. The city developed in a linear form and with a single center. In the plan report, it is stated that, based on the development of the new center and industrial zones next to the covered bazaar in Kayseri, the central settlement and form were taken as a guide in the physical shaping of the city, and that a single-centered macroform would be created with an efficient transportation system [35]. In this period, the rockfall disaster that occurred in 1980 in the Mimar Sinan neighborhood of Melikgazi district, which was the central district, caused damage to many houses and resulted in many deaths and losses of property. As a result of the disaster, 227 disaster houses were built for the affected families, and 83 disaster houses were built in Turan village due to the rockfall disaster. Subsequently, houses were built for disaster victims in the districts of Develi, Kocasinan, Tomarza, and Bünyan, respectively, due to various disasters. In Ayvaz Hacı village of Develi, many lives were lost due to the landslide disaster, and 74 houses were built (Table 3).

**Table.3.** Disaster housing in Kayseri (1975-1986 planning period) [37,29]

| Districts | Neighbourhood | Disaster Type | Construction Year | Number of Houses |
|---|---|---|---|---|
| **Kocasinan** | Obruk | Landslide | 1977 | 75 |
| **Tomarza-** | Alakuşak-1 | Rockfall | 1980 | 44 |
| **Bünyan** | İğnecik | Landslide/Rockfall | 1980 | 49 |
| **Tomarza** | Merkez | Landslide | 1980 | 57 |
| **Melikgazi** | Mimarınsan | Rockfall | 1980 | 227 |
| **Develi I** | Ayvaz hacı | Landslide | 1982 | 74 |
| **Melikgazi** | Turan | Rockfall | 1982 | 83 |

| | | | | |
|---|---|---|---|---|
| **Pınarbaşı** | Aşağı Bey çayır | Flood | 1984 | 17 |
| **İncesu** | Küllü | Rockfall | 1984 | 20 |
| **Develi** | Merkez (Yukarı Develi) | Rockfall | 1985 | 109 |
| **Felâhiye** | Kaya Pınar | Flood | 1986 | 18 |
| **TOTAL** | | | | **773** |

In the plan prepared by Melahat Toplağlu-Bülent Berksan in 1986, the general principles of the Taşçı plan were preserved. It is stated that the plan was considered together with its surroundings in order to guide this development, since there is an exchange of services in all urban functions, such as recreation and tourism-summer houses, commerce, work, transportation, etc., between the surrounding settlements and Kayseri [36]. Kayseri city center develops on two axes that intersect in the shape of a cross. The main axis is in the east-west direction along the Ankara-Sivas highway, and the other axis is in the north-south direction from Erkilet to Talas. In the plan report, it is stated that artificial and physical limitations, agricultural areas, and the city image are effective in the formation of the city's macro form. These include the hills around the Sugar Factory in the north, Ali Mountain in the southeast, water storage units, areas used as vineyard houses in the south, military areas, Erciyes University, the railway axis, and the ring road. The spatial spread of the city of Kayseri is influenced by the location of large facilities, transit road crossings, and surrounding settlements, as well as organized housing development. Public housing areas are concentrated in the east and west of the city. The city structure is shifting from its old compact form to linear development [35]. A total of 901 disaster relief houses were built during this period. The highest number of disaster relief houses was seen in the districts of Kocasinan, İncesu, Yeşilhisar, and Develi. During this period, the city was affected by rockfall disasters. The disaster, which occurred especially in the İncesu district, caused damage to commercial areas and residential areas in the district center (Table 4).

**Table 4.** Disaster housing in Kayseri (1986-2006 planning period) [37,29]

| Districts | Neighbourhood | Disaster Type | Construction Year | Number of Houses |
|---|---|---|---|---|
| **Develi** | Sarıca | Flood | 1987 | 49 |
| **Develi** | Kızık | Rockfall/Flood | 1987 | 16 |
| **Kocasinan** | Erk ilet | | 1989 | 133 |
| **Melikgazi** | Tavlusun | Rockfall | 1991 | 22 |
| **Yeşilhisar** | Doğanlı | Rockfall | 1991 | 14 |
| **İncesu** | Şeyhşaban | Flood | 1991 | 162 |
| **Özvatan** | Merkez | | 1992 | 87 |
| **Talas** | Reşadıye | Rockfall | 1992 | 24 |
| **Yeşilhisar** | Kavak1 | Rockfall | 1993 | 15 |
| **Kocasinan** | Kuşçu | Rockfall | 1995 | 64 |
| **Yeşilhisar** | Araplı | Rockfall | 1997 | 20 |
| **Talas** | Han | Rockfall | 1998 | 66 |
| **Yeşilhisar** | Soğanlı | Rockfall | 1999 | 98 |
| **Develi** | Kabaklı | Rockfall | 2006 | 9 |
| **İncesu** | Kızılören | Rockfall | 2006 | 32 |
| **Kocasinan** | Höbek | Rockfall | 2006 | 44 |
| **Tomarza-** | Alakuşak-2 | Rockfall | 2006 | 25 |
| **Yeşilhisar** | Başköy 2 | Rockfall | 2006 | 21 |
| **TOTAL** | | | | **901** |

The Plan dated 27 June 2005 was developed in accordance with Articles 26 and 29 of Law No. 5538 (published in Official Gazette No. 26226 on 12 July 2006) and also based on Article 6(a) of the amended Law No. 5302 on Provincial Special Administrations and Article 18(1)(c) of Law No. 5393 on

Municipalities. In this plan, 1/50000 scale plans were prepared to ensure sustainable development and to achieve a balance between services, agriculture, and livestock sectors on the one hand, and conservation and use on the other. In this context, land use decisions and strategic decisions for the city were created, and sub-scale plans were prepared to serve as a basis [38]. (Figure 5)

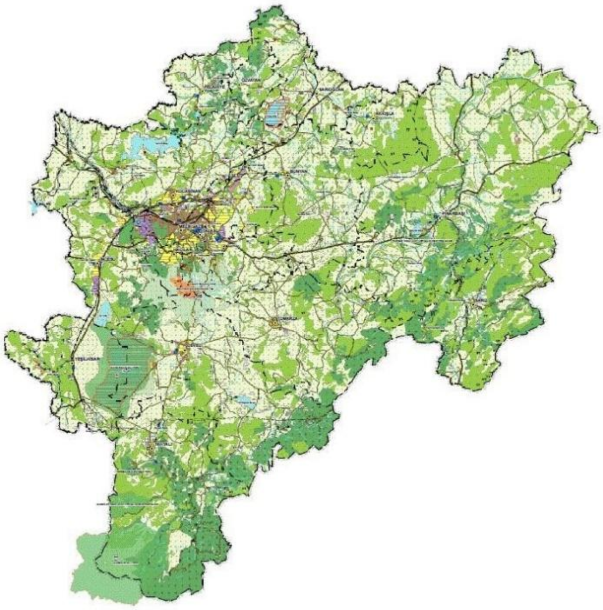


**Figure 5.** Kayseri Metropolitan Area 1/50,000 Scale Master Plan [38]

In accordance with the 1/50000 scale Kayseri Metropolitan Area Plan dated 27 June 2005, the 1/25000 scale master zoning plan was discussed by the Metropolitan Municipality Council on July 14, 2006, and approved by decision number 343. The purpose of this plan is to ensure that construction within the boundaries of Kayseri Metropolitan Municipality, under the authorization of the Metropolitan Municipality Law, the Municipality Law, and the Special Administration Law, is carried out in accordance with the principles and specifications of urban planning within the scope of the Zoning Legislation. Within the scope of the plan, the aim is to ensure that land use, settlement and construction are in accordance with the planning, science, art, health and environmental conditions, to reduce the effects of disasters and to protect, preserve and develop the natural, historical, cultural environment and ecological systems, and to develop a vision for Kayseri, which has many high-quality characteristics based on economic, natural, and historical data. The planning aims to improve the quality of life of people and to develop the agricultural, industrial, and service sectors, and to protect, use, and develop natural resources effectively in accordance with the decisions of the relevant regional plan [39]. Decisions regarding disasters and disaster areas were first mentioned in the 1/25000 scale Master Plan report dated 14.07.2006, and the following provisions regarding disasters were determined, and the necessary steps were taken for their implementation.

General policies and decisions regarding disasters:

1.The relevant regulations regarding structures to be built in disaster areas apply, and the preparation of geological and geotechnical studies is mandatory for the 1/1,000 scale implementation plans. These studies must cover at least 100.00 m. radius around the area in question. For areas prone to flooding, the opinion of the General Directorate of State Hydraulic Works (DSI) must be requested, and compliance with this opinion is mandatory.

2.In the planning of sub-scale (1/5000 and 1/1000 scale) development plans to be carried out in these areas, it is mandatory to conduct an assessment in the area subject to planning by researching the probability of the area being affected by a disaster and the effects of natural disasters on the natural structure and construction/investment in these areas. Building block and typology will be determined in line with geological surveys with boreholes, disaster and risk assessments. In sub-scale planning, in addition to the information and documents required for planning, it is mandatory to use geological and seismic assessments related to the region, analyses related to the natural structure, and other necessary natural disaster (earthquake, fire, flood, landslide, etc.) data.

3.In the selection of locations and routes for energy, communication, transportation, and similar infrastructure projects to be undertaken regionally by relevant institutions and organizations, and in natural gas pipelines and facilities, necessary safety measures will be taken in accordance with the geological and, if necessary, geotechnical study reports approved by the relevant institution.

4.In master plans and implementation plans, road widths will be determined in a way and width that will not hinder traffic flow after a disaster. In the development of roads and changes to building heights during plan preparation, the distance between buildings cannot under any circumstances be less than the value calculated in the formula “k=(h1+h2)/2+7” (k: distance between opposite building facades (m), h1: height of the proposed building on one side of the road, h2: height of the proposed building on the other side of the road).

5.Areas that can be used as emergency aid and support centers and management centers after disasters, warehouses, and distribution stations will be created and proposed in the necessary regions in sub-scale plans.

6.The regional parks, urban parks, playgrounds, sports fields, and similar areas shown in this plan can primarily be used to meet the city's management and gathering needs in case of disaster and crisis. Other functions to be designed in these areas will be designed within this scope [ 39]. With these provisions, we see that they emphasize pre-disaster and disaster response efforts by requiring geological and geotechnical surveys, specifying road widths in zoning plans to ensure effective disaster response operations, and establishing general provisions for emergency assembly areas.

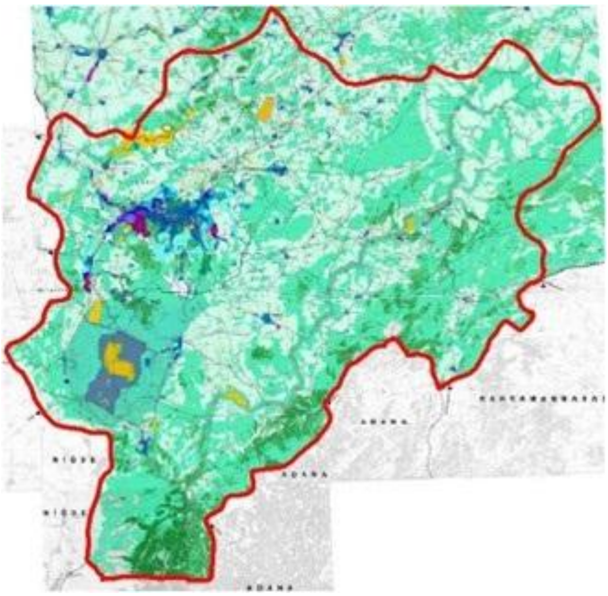


**Figure 6.** Kayseri-Sivas-Yozgat District Plan (Scale: 1/100.000) [39]

The 1:100,000-Scale Plan for the Yozgat–Sivas–Kayseri TR-72 Planning Region was approved on September 7, 2012 (Figure 6) [40]. Developing Protective Land Use Decisions in Disaster Risk Areas is one of the main planning principles of this plan. In line with the main principles of all these plans, studies related to disasters are carried out in Kayseri , and the opinions of the Provincial Disaster and Emergency Management Directorate are particularly important in areas to be opened for development and construction. . According to studies on disasters conducted between 2006 and 2017, a total of 258 disaster victim houses were constructed. During this period, most houses were built in Yeşilhisar, Felahiye, and Tomarza districts. The most effective type of disaster is rockfall (Table 5).

**Table 5.** Disaster housing in Kayseri (2006 - planning period) [37,29]

| Districts | Neighbourhood | Disaster Type | Construction Year | Number of Houses |
|---|---|---|---|---|
| **Pınarbaşı** | Dılcıler | Rockfall | 2007 | 18 |
| **Tomarza** | Çukurağaç | Rockfall | 2007 | 33 |
| **Yeşılhısar** | Güzelöz | Rockfall | 2007 | 22 |
| **Yeşılhısar** | Başköy 1 | Rockfall | 2007 | 21 |
| **Yeşılhısar** | Kavak-2 | Rockfall | 2007 | 6 |
| **Sarız** | Kırkısrak | Flood | 2007 | 21 |
| **Develi** | Derebaşı Alaylı | Flood | 2007 | 11 |
| **Felahıye** | Sılahtar | Landslide | 2008 | 31 |
| **Bünyan** | Burhaniye | Earthquake | 2009 | 9 |
| **Bünyan** | Kardeşler | Earthquake | 2009 | 11 |
| **Develi** | Büyükkünye | Landslide | 2009 | 11 |
| **Melikgazi** | Konaklar | | 2009 | 7 |
| **Pınarbaşı** | Saçlı | Rockfall | 2009 | 5 |
| **İncesu** | Süksün | Rockfall | 2010 | 9 |
| **İncesu** | Saraycık | Rockfall | 2013 | 12 |
| **Kocasinan** | Güneşli | Rockfall | 2013 | 1 |
| **Tomarza** | Alakuşak-2 | Rockfall | 2014 | 14 |
| **Kocasinan** | Taşhan | Rockfall | 2014 | 4 |
| **Yeşilhisar** | Başköy 3 | Rockfall | 2016 | 12 |
| **TOTAL** | | | | **258** |

## 4. Discussion and Conclusion

An examination of the improvement works and city planning process carried out after the disaster inventory of Kayseri reveals that the city is prone to frequent disasters such as rockfalls, landslides, and floods. As seen in Table 1 and Figure 8, which display the results of the prepared disaster inventory, there were 50 rockfalls, 22 floods/water inundations, 22 landslides, 3 earthquakes, and 1 avalanche, totaling 98 disasters in the province. When evaluating the settlements affected by these disaster types, Develi is the most affected district with 17 disaster events (Figures 7, 8). This district was affected by the following settlements in order: Sarız (12), Kocasinan and Pınarbaşı (10), Bünyan (9), Melikgazi (8), Yeşilhisar and Tomarza (6), Talas, İncesu and Yahyalı (5), Akkışla (3), and Felâhiye, Özvatan and Sarıoğlan (2). The results obtained in the ArcGIS environment show that the districts of Develi, Sarız, Pınarbaşı, and Kocasinan are highly exposed to disasters (Figure 7).

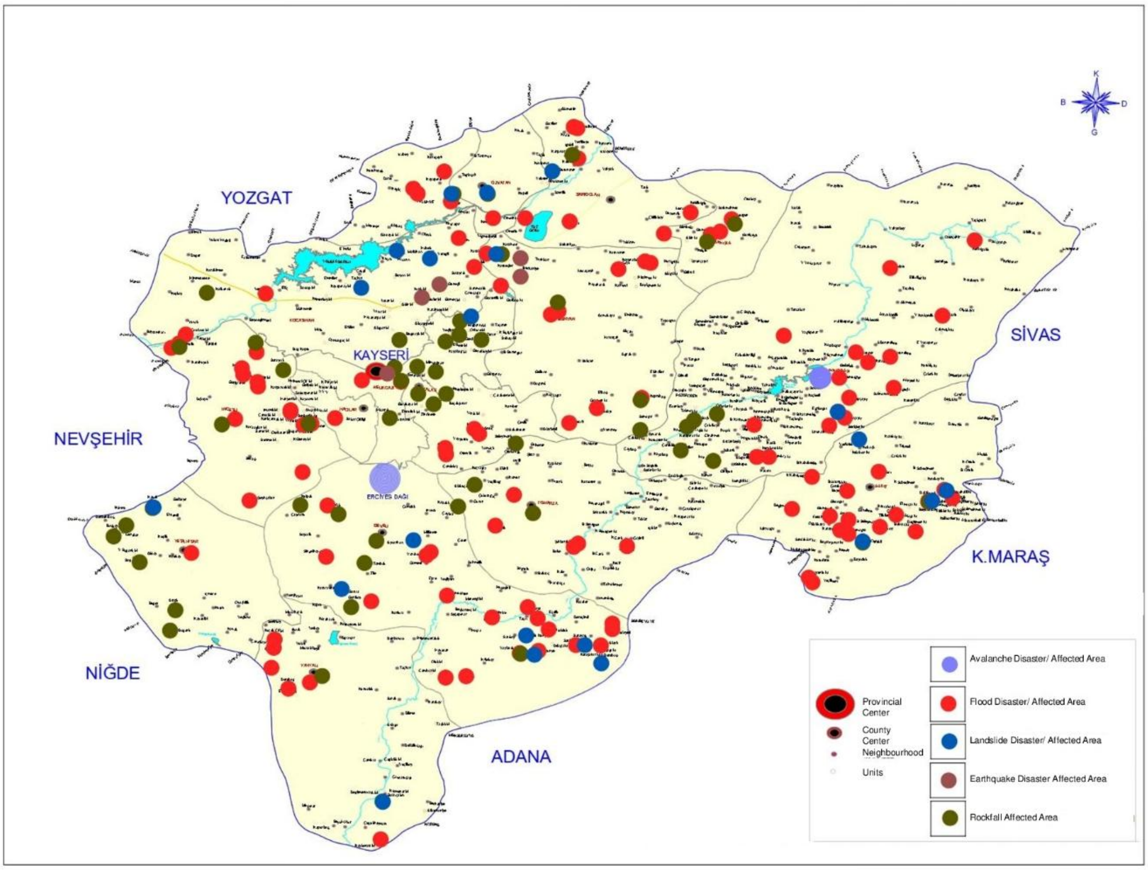



**Figure 7**. Disaster-affected areas [29]

In the planning process, no detailed provision regarding disasters was found until the 5th Plan period, but the number of disaster housing units built by the relevant institutions and organizations for the eligible persons affected by the disaster between 1967 and 2017 was obtained. This data is the first sample data prepared for Kayseri. When we evaluate the number of disaster housing units built according to the districts, the highest number of housing units was produced in the Melikgazi district, with 339 units, followed by Kocasinan with 321, İncesu with 283, Develi with 279, Yeşilhisar with 229, Tomarza with 173, Talas with 90, Özvatan with 87, Felahiye with 84, Sarız with 78, Bünyan with 69, and Pınarbaşı with 40 disaster housing units [37]. (Figure 8)

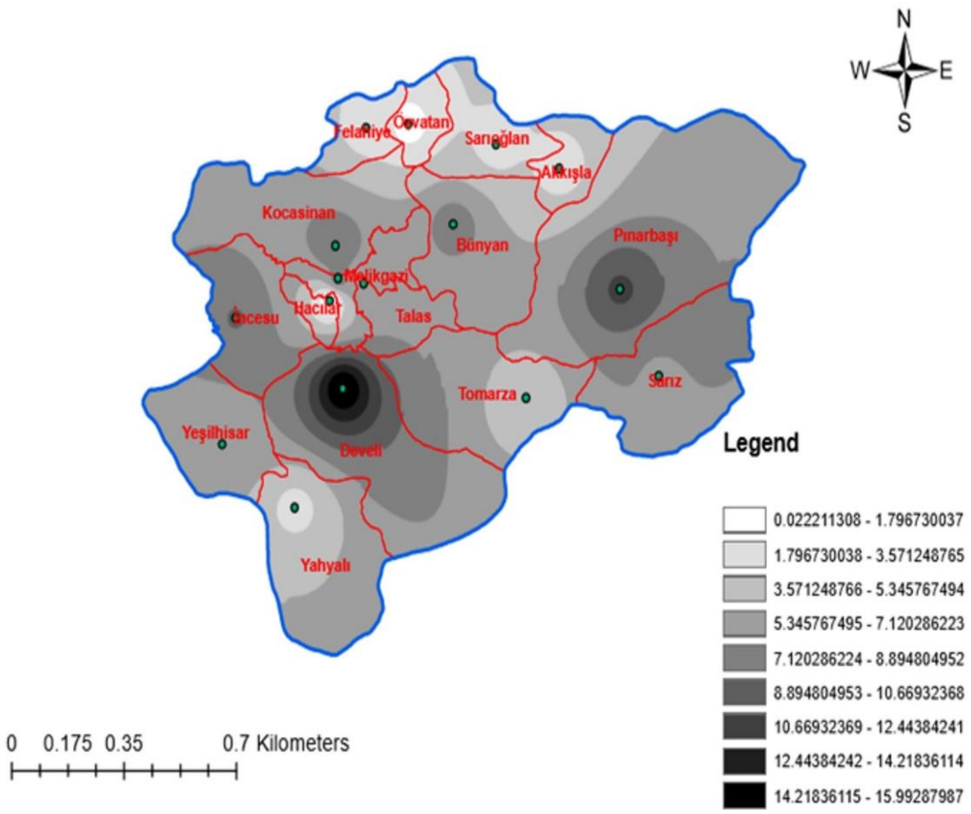



**Figure 8**. Disaster-prone area density map [29]

This study not only offers a critical assessment of the relationship between disaster and planning in the city but also emphasizes the important implications for the future of projections developed through the history of disasters, especially in rapidly urbanizing cities. Unlike previous studies focusing on a single hazard or relying on static assessments, it is prepared from a multifaceted perspective. The findings highlight the urgent need for integrated public policy recommendations that align disaster risk reduction with sustainable urban development goals. In Kayseri, as in Türkiye as a whole, the legal and institutional context in the relationship between urban planning and disasters must be critically evaluated to achieve a properly functioning and, more importantly, socially equitable planning system. In this context, development decisions are initiated by powerful central government institutions rather than democratic institutions. Increasingly fragmented planning and implementation, lack of coordination, and overlapping areas of authority make it difficult to apply the fundamental principles of planning. The mosaic of projects undermines holistic planning. The principle of the incremental integration of plans, which our current planning system has left inadequate and incomplete, has once again come to the forefront of its importance today. At the macro level, Spatial Strategy Plans require the integration of Sub-Regional and Urban Spatial Strategy Plans, as well as Metropolitan Area Strategy Plans, within the scope of National and Regional Spatial Strategy Plans. The second level consists of master and implementation plans titled “Master Plan and Zoning Plans.” At the most basic level, it is envisioned that action programs containing multiple projects will be prepared for areas with different characteristics and features (disaster, industrial, recreation, etc.) within the city, whose boundaries are defined in the plans. In this context, Integrated Disaster Maps, where map information from areas exposed to different natural disasters is combined in a single database within the same coordinate system, necessitate the preparation of Disaster Action Programs for settlement areas identified as Disaster-Risk Areas. These action programs should involve the preparation of numerous projects with diverse dimensions to address a wide range of issues before a disaster strikes. These issues include determining which structures in disaster-risk areas will be demolished, which will be maintained in their current form or strengthened, and what rights and procedures will be followed for property owners and residents of structures slated for demolition. The traditional method of spatial planning remains valid. Land use allocations should be tested against integrated risk maps to determine their ability to address potential disaster risks.

In conclusion, planning processes should be improved to include limiting urban expansion in risky areas, evaluating temporary housing programs, developing hazard-focused planning policies, creating a risk assessment database, improving coordination within and between institutions, and involving communities in disaster planning. Thus, unlike postmodern discourse, this approach proposes a restructuring that, far from detaching the planning system from its entirety, actually enhances it while allowing for diverse approaches within that holistic framework. One of the key contributions of this study lies in its focus on a medium-sized Anatolian city, a scale that has received comparatively limited attention in disaster and urban studies, which have largely concentrated on metropolitan areas. By examining Kayseri's urban growth dynamics, spatial expansion, and proximity to active fault systems, the study provides empirically grounded insights that are transferable to other cities with similar socio-spatial characteristics. These findings support comparative urban analyses and contribute to the development of context-sensitive and evidence-based planning and policy recommendations aimed at disaster risk reduction and urban resilience. The outcomes of this research are relevant to a wide range of disciplines and professional fields. Disaster risk reduction and emergency management professionals may draw on the results to strengthen preventive and planning-oriented approaches at the local level. In addition, local governments and public administrators can use the study's insights to inform urban development policies, land-use regulations, and resilience strategies. Finally, researchers in urban studies, human geography, environmental studies, and related interdisciplinary fields may find the study valuable for advancing theoretical and empirical discussions on disaster risk, urban vulnerability, and resilient city planning. Future studies could attempt to systematize the proposed guiding discussion and shed light on specific aspects that have been neglected or inadequately addressed in the current literature.

✵ ✵ ✵

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***1. Statement of Originality:***

This work is original.

***2. Author Contributions:***

***Concept:*** NYB,ŞŞ; ***Conceptualization:*** NYB,ŞŞ; ***Literature Search:*** ŞŞ; ***Data Collection:*** ŞŞ; ***Data Processing:*** ŞŞ; ***Analysis:*** NYB,ŞŞ; ***Writing – original draft:*** NYB,ŞŞ; ***Writing – review & editing:*** NYB,ŞŞ.

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The authors declare no competing interests.

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***7. Sustainable Development Goals:***


## REFERENCES


[1] Harrison, C. G., & Williams, P. R. (2016). A systems approach to natural disaster resilience. Simulation Modelling Practice and Theory, 65, 11-31.

[2] Cerè, G., Rezgui, Y., & Zhao, W. (2017). Critical review of existing built environment resilience frameworks: Directions for future research. International Journal of Disaster Risk Reduction, 25, 173-189.

[3] Jülich, S. (2015). Development of a composite index with quantitative indicators for drought disaster risk analysis at the micro level. Human and Ecological Risk Assessment: An International Journal, 21(1), 37-66.

[4] Gibson, T. D., Pelling, M., Ghosh, A., Matyas, D., Siddiqi, A., Solecki, W., ... & Du Plessis, R. (2016). Pathways for transformation: Disaster risk management to enhance resilience to extreme events. Journal of Extreme Events, 3(01), 1671002.

[5] Sujatha, E. R., Rajamanickam, V., Kumaravel, P., & Saranathan, E. (2013). Landslide susceptibility analysis using probabilistic likelihood ratio model—a geospatial-based study. Arabian Journal of Geosciences, 6(2), 429-440.

[6] Yılmaz, G. (2023). Digital solutions to support emergency response and relief based on the findings from ground zero after the 6th February 2023 Kahramanmaraş Earthquake series. Erciyes Üniversitesi Fen Bilimleri Enstitüsü Fen Bilimleri Dergisi, 39(3), 369-378.

[7] Nas, S. S., & Nas, E. (2015). Olası taşkınların altyapı tesislerine etkileri: Harşit Çayı-Gümüşhane. Erciyes Üniversitesi Fen Bilimleri Enstitüsü Fen Bilimleri Dergisi, 31(1).

[8] Xie, Z., Xu, J., & Deng, Y. (2016). Risk analysis and evaluation of agricultural drought disaster in the major grain-producing areas, China. Geomatics, Natural Hazards and Risk, 7(5), 1691-1706.

[9] Marsap, G. (2023). Afet Yönetimi ve Kentlerde Afetler Açısından Geliştirilen Gelecek Odaklı Dinamik Yönetim Anlayışları. JENAS Journal of Environmental and Natural Studies, 5(3), 237-251.

[10] BALAMİR, M., & ODTÜ, Ş. (2007). Sakınım Planlaması. Şehir Plancıları Odası Haber Bülteni, 87, 21-31.

[11] Gözlükaya, H., & Türk, A. (2016). Sakınım planlaması sürecinde Burdur kentsel sit alanı ve yakın çevresinin incelenmesi ve değerlendirilmesi. Journal of Architectural Sciences and Applications, 1(2), 31-47.

[12] Nelson, A. C., & French, S. P. (2002). Plan quality and mitigating damage from natural disasters: A case study of the Northridge earthquake with planning policy considerations. Journal of the American Planning Association, 68(2), 194-207.

[13] Choe, T., Kim, J., Shin, M., Kim, K., & Kim, M. (2023). Complex disaster response framework to

reduce urban disaster vulnerability. Science progress, 106(1), 00368504231152770.

[14] UNISDR. (2009). "Terminology on disaster risk reduction". Accessed Adress: http://www.undrr.org/publication/2009-unisdr-terminology-disaster-risk-reduction (Accessed: 14.06.2024).

[15] Ersoy, M. (2001). Fiziksel planlama sistemimiz ve doğal afetler. Planlama Dergisi, 3, 16-23.

[16] Balamir, M. (2007). Afet politikası, risk ve planlama. TMMOB Afet Sempozyumu, 5-7.

[17] Wamsler, C. (2014). Cities, disaster risk and adaptation. Routledge.

[18] AFAD. Açıklamalı Afet Yönetimi Terimleri Sözlüğü.; 2014. https://www.afad.gov.tr/aciklamali-afet-yoneti- mi-terimleri-sozlugu

[19] Beck, U. (2006). Risk Society Revisited: Teory, Politics and Research Programmes. In The Sociology of Risk and Gambling Reader (pp. 68-90). Routledge.

[20] Taubenböck, H., Post, J., Roth, A., Zosseder, K., Strunz, G., & Dech, S. (2008). A conceptual vulnerability and risk framework as outline to identify capabilities of remote sensing. Natural Hazards and Earth System Sciences, 8(3), 409-420.

[21] Burby, R. J., Beatley, T., Berke, P. R., Deyle, R. E., French, S. P., Godschalk, D. R., & Platt, R. H. (1999). Unleashing the power of planning to create disaster-resistant communities. Journal of the American Planning Association, 65(3), 247-258.

[22] Singh, R., & Manoharan, G. (2025). AI Integration to Strengthen Disaster Resilience in Smart Cities. In AI and Emerging Technologies for Emergency Response and Smart Cities (pp. 1-30). IGI Global Scientific Publishing.

[23] Fuady, M., Buraida, Kevin, M. A., Farrel, M. R., & Triaputri, A. (2025). Enhancing urban resilience: opportunities and challenges in adapting to natural disasters in Indonesian cities. Sustainability, 17(4), 1632.

[24] Nelson, A. C., & French, S. P. (2002). Plan quality and mitigating damage from natural disasters: A case study of the Northridge earthquake with planning policy considerations. Journal of the American Planning Association, 68(2), 194-207.

[25] Schwab, J. C. (2019). Planning Systems for Natural Hazard Risk Reduction. In Oxford Research Encyclopedia of Natural Hazard Science.

[26] Albrechts, L. (2006). Shifts in strategic spatial planning? Some evidence from Europe and Australia. Environment and planning A, 38(6), 1149-1170.

[27] Greiving, S., Fleischhauer, M., & Wanczura, S. (2006). Management of natural hazards in Europe: The role of spatial planning in selected EU member states. Journal of environmental planning and management, 49(5), 739-757.

[28] Wisner, B., & Wisner, B. (2004). At risk: natural hazards, people's vulnerability and disasters. Psychology Press.

[29] Şahin, Ş. (2019). Afet sonrası iyileştirme sürecinde yaşanan sorunlar ve çözüm önerileri: Kayseri ili örneği

[30] Gökçe, O., Özden, Ş., Demir, A., (2008). Türkiye'de Afetlerin Mekansal ve İstatistiksel Dağılımı Afet Bilgileri Envanteri, Afet İşleri Genel Müdürlüğü, Afet Etüt ve Hasar Tespit Daire Başkanlığı, Ankara] kitap

[31] Afet Başkanlığı, (2017) Türkiye'de Afet Yönetimi ve Doğa Kaynaklı Afet İstatistikleri. AFAD ANKARA,

[32] Kayseri İl Afet ve Acil Durum Müdürlüğü, Kayseri İl Afet Müdahale Planı,(2018 ),Kayseri

[33] Özmen, M. (2023). Evaluating earthquake vulnerability of 2023 Kayseri, Türkiye via BWM-ABAC method. Sādhanā, 48(3), 179.

[34] Yücel, C., Erkara, A., & Kıtlık, N. Deprem Koşulları Karşısında İmar Planlama Pratiğimiz: Kayseri İmar Planları Üzerinden Bir Değerlendirme. İDEALKENT, 16(46), 2195-2231.

[35] Kayseri Büyükşehir Belediyesi Arşivi (2006) Kayseri Nazım İmar Planı Raporu,KBB Arşivi,Kayseri

[36] Yılmaz, N. (2005). Kent Merkezlerindeki Kentsel Sit Alanlarında Değişim Sürecinin Değerlendirilmesi Kayseri Kentsel Sit Alanı Ve Talas Kentsel Sit Alanları Örneği (Yüksek Lisans Tezi, Fen Bilimleri Enstitüsü).

[37] AFAD (Afet ve Acil Durum Yönetim Başkanlığı), (2018) Kayseri İl Afet Kayseri İl Afet ve Acil Durum Müdürlüğü Arşivi, Kayseri

[38] Kayseri Büyükşehir Belediyesi Arşivi (2006), Kayseri 2006 Yılı Nazım Imar Planı, Kayseri

[39] Kayseri Büyükşehir Belediyesi Arşivi (2017) Kayseri 1/25000 Ölçekli Nazım İmar Planı Açıklama Raporu, Kayseri

[40] T.C. Çevre ve Şehircilik Bakanlığı, Mekânsal Planlama Genel Müdürlüğü. (2012). Yozgat-Sivas-Kayseri Planlama Bölgesi 1/100.000 Ölçekli ÇDP Açıklama Raporu. Erişim adresi (20.07.2019): https://webdosya.csb.gov.tr/db/mpgm/editordosya/file/CDP_100000/ysk/YSK_PLAN_ACIKLAMA_RAPORU_25112016.pdf