

# THE EFFECTS OF ENVIRONMENTAL AND NATURAL DISASTERS ON THE STOCK EXCHANGE INDICES: THE EXAMPLE OF TÜRKİYE

## OS EFEITOS DOS DESASTRE AMBIENTAIS E NATURAIIS NOS ÍNDICES BOLSISTAS: O EXEMPLO DA TURQUIA

Article received on: 01/08/2026

Article accepted on: 04/09/2026

**Meltem Keskin\***

\*Ankara Yıldırım Beyazıt University (AYBU), Ankara, Türkiye  
Orcid: <https://orcid.org/0000-0002-8536-4940>  
[meltemkeskin@aybu.edu.tr](mailto:meltemkeskin@aybu.edu.tr)

**Selma Aytüre\*\***

\*\*Bartın University (BARÜ), Bartın, Türkiye  
Orcid: <https://orcid.org/0000-0003-0184-5040>  
[sayture@bartin.edu.tr](mailto:sayture@bartin.edu.tr)

The authors declare that there is no conflict of interest

### Abstract

Traditionally, development and progress are considered only in economic terms, and as a result of this approach, environmental and social values are ignored. The cost of not being environmentally compatible in every field, including finance, is very high. To achieve sustainable economic development, socioeconomic development and environmental values should also be taken into account. In this study, events and their effects in Türkiye are discussed as an example. Whether the effects of the environmental disasters experienced in Türkiye between the 2020:1-2024:4 periods showed a change in the investment sensitivities of investors on the BIST Sustainability (XUSRD) index and subsequently on the BIST100 (XU100) index was examined by the Event Study method. The results of the study show that Turkish investors did not make positive discrimination towards sustainable companies and environmental disasters did not affect their investment preferences.

**Keywords:** XUSRD. XU100. Türkiye. Environmental Disasters. Natural Disasters. Event Study.

### Resumo

*Tradicionalmente, o desenvolvimento e o progresso são considerados apenas em termos econômicos e, como resultado dessa abordagem, os valores ambientais e sociais são ignorados. O custo de não ser ambientalmente compatível em todos os setores, incluindo o financeiro, é muito alto. Para alcançar um desenvolvimento econômico sustentável, o desenvolvimento socioeconômico e os valores ambientais também devem ser levados em consideração. Neste estudo, discutem-se os eventos e seus efeitos na Turquia como exemplo. Foi examinado, pelo método de Estudo de Eventos, se os efeitos dos desastres ambientais ocorridos na Turquia entre os períodos 2020:1-2024:4 mostraram uma mudança nas sensibilidades de investimento dos investidores no índice BIST Sustainability (XUSRD) e, subsequentemente, no índice BIST100 (XU100). Os resultados do estudo mostram que os investidores turcos não fizeram discriminação positiva em relação às empresas sustentáveis e que os desastres ambientais não afetaram suas preferências de investimento.*

**Palavras-chave:** XUSRD. XU100. Turquia. Desastres Ambientais. Desastres Naturais. Estudo de Eventos.



## 1 INTRODUCTION

As we move towards a sustainable future with the green economy transformation, companies, along with the whole society, need to be sustainable to reach economies where development takes place in an order where resources are used efficiently, social equality is ensured, biodiversity is protected and damage to the ecosystem is reversed.

Changes in the world's climate cause many problems, such as sudden weather changes, differentiation of habitats of plants and animals, and melting of glaciers. Climate change; It is triggered by the increase in the amount of greenhouse gases in the atmosphere as a result of fossil fuels, industrial and/or agricultural practices and deforestation. As a result, environmental problems such as rising sea water levels, floods, erosion, fires due to excessive evaporation and drought, decreasing lake and river water levels, and extinction of plant and animal species are experienced. All environmental problems have negative effects on human life. Climate change and environmental problems that threaten people's access to basic needs and their health, of course, also affect the economy. In one aspect of this, companies have started to carry out international studies on changing the energy source they use in industry, recycling waste, and zeroing out their carbon footprint in order to reverse the effects of climate change and environmental problems. The responsibility of investors here is to support companies that are environmentally friendly and make sustainability efforts in their investments, as well as reduce their carbon footprint. Having a holistic perspective in combating climate change and environmental problems will be a realistic approach to solving the problems. Thus, investors will support sustainability while achieving their targeted profits.

As in the rest of the world, sustainable companies in Türkiye are listed in the sustainability indices of Borsa Istanbul. As of today, 81 companies are listed in the BIST, XUSRD index. These companies can take their place in this index depending on international agreements and rules. The responsibilities and audits of companies included in the sustainability indices are at relatively high levels. This study aims to examine the levels and connections of collective approaches that have the ability to direct economies and societies to a more sustainable goal. In accordance with this purpose, whether investor preferences turned towards sustainable companies in the face of environmental disasters and natural disasters experienced in Türkiye between 2020 and 2024 was examined with the Event Study method.

This study consists of a theoretical review, literature, analysis and conclusion sections.

## **2 THEORETICAL BACKGROUND**

The unpredictable effects of climate change on financial markets expose investors and institutions to risks. Increasing atmospheric temperatures will affect not only supply chains but also many sectors, and temperature control practices will be mandatory. This will result in the creation of new costs and the consumption of extra resources.

Climate finance is “national or international financing from public, private and alternative financing sources aimed at addressing climate change, supporting mitigation and adaptation actions” (UNFCCC, 2022). Climate finance is financial resources that enable the implementation of environmentally friendly projects (Keskin,2022: 59). It is a healthy method to ensure the economic growth of countries by using balanced, environmentally friendly and green financing rather than rapid economic growth. One of the first studies in the context of environmentally friendly production and economy was conducted by an international research team at the Massachusetts Institute of Technology in 1970. In this study, they examined five main factors: increasing population, increasing food production, rapid depletion of non-renewable resources, industrial production and pollution growth. The findings of this research remain valid today. In the study, which emphasises the interconnectedness of all resources in the world, people can create an environment in which they can live forever if they set limits and rules for themselves

during the production phase to ensure global balance with production (Meadows et al., 1972). Again, at the United Nations World Environmental Issues conference held in Stockholm in 1972, it was emphasised that sustainable economic development should be compatible with the environment. In the report titled "Our Common Future" by the United Nations in October 1987, the conditions that will enable future generations to access resources and ensure sustainable development without harming the environment have been examined. To ensure that the environment and sustainable development are maintained in harmony, the United Nations organised Rio in 1992, New York in 1997, New York in 2000, Johannesburg in 2002, New York in 2005, New York in 2008, New York in 2010, Rio in 2012, and Rio in 2013. It gathered in New York in 2015 and 2022 in Stockholm and created an agenda on the subject. This series of conferences is a recommendation for international environmental action, but it is also binding (United Nations, 2022). The financial background of sustainability is relative to the 20th century. Although bonds used as green and climate financing instruments were considered among the issues of the 19th century, when evaluated thematically, they were considered as a subject of the 19th century. The presence of railway bonds in the markets in the 19th century has benefited sustainable development for the future of the world. Sustainable development means a clean, livable, sustainable and reliable world future adopted by all societies as a lifestyle. The environment and the economy are factors that are directly affected by each other. The necessity of a balanced reflection of environmental resources across generations and societies forms the basis of economic growth. Misuse and destruction of the environment and natural resources and misuse of funds to be used for this purpose, will disrupt economic indicators (Keskin, 2022: 57-58).

There has been international acceptance that every individual, including states, companies and the public, must take rapid and vital measures to reduce greenhouse gas emissions. Based on the prediction that climate change will affect not only a part of the world but the entire world population and disrupt the economic process, it is based on the necessity of rapidly introduce alternatives to fossil fuels into economic life to reduce greenhouse gases. In this context, it is also necessary to quickly implement the financing required for the transition to a low-carbon economy (Keskin, 2023a: 60). As atmospheric temperature increases, sustainable development is disrupted. To stop climate change, it is necessary to limit the increase to 1.5 °C. Determining the limits of these temperature

increases was also signed in the Paris Agreement and the Kyoto Protocol. However, the current temperature increase is not even close to this figure. All stakeholders, whether in developed or developing countries, use financing methods to stop the effects of climate change, minimize greenhouse gas emissions and ensure the transition to a low carbon footprint economy (Keskin, 2022: 56). In line with the Paris Agreement, Türkiye has committed to reducing greenhouse gas emissions by 2% to 1°C until 2030, according to the scenario created within the reference values. After the Paris Agreement, the fight against climate change and, therefore, climate financing has become important. Within the framework of the Paris Agreement, all investments to be made until 2030 must be designed to implement a low-carbon economy to keep the world's atmospheric temperature increase below 2°C at most. To implement climate projects, significant investments are needed and funds are needed to realise these investments. The United Nations Environment Program (UNEP) has predicted that the annual investment amount should be 150 billion US Dollars for the realisation of projects in 2025-2030 within the scope of adaptation to climate change. In addition, the amount of investment required until 2050 to realise the scenario where atmospheric temperature remains limited to a maximum of 2°C is estimated to be 250 billion to 500 billion US Dollars (Climate Funds Update, 2018: 5).

To talk about sustainable finance, people, companies, or countries need to develop their ability to sustain themselves economically and protect themselves and the environment in the long term. Sustainable finance: The financial system needs to be developed to meet environmental, social and governance criteria. Within the framework of these criteria, it also means that companies, states and individuals must use sustainable resources when providing financing. Thus, it is possible to transition to a sustainable economy by creating an environmentally friendly financial system. The environmental costs of companies without sustainability goals are not only limited to the region in which they are located, but also threaten the whole world. Capital markets, stock exchanges, and states need to guide companies not only on economic issues but also on environmental, social and sustainability issues. For this purpose, many stock exchanges, the Sustainable Stock Exchanges Initiative, the World Federation of Exchanges, UN Principles of Responsible Investment and the United Nations Global Compact also act together within the framework of sustainability. (Keskin, 2023b: 2-3).

### 3 BIST SUSTAINABILITY INDEX (XUSRD) AND BIST 100

One way to reverse the bad trend in climate change is through the implementation of sustainability targets for companies and the sustainability efforts of stock exchanges. Sustainability indices, stock markets; It is a tool through which companies scale their sustainability according to environmental and social factors. Sustainability indices are not considered a measure of risk but are a measure of environmental impact. The sustainability index allows investors to access non-financial data that enables them to understand the value that companies they invest in place on environmental management and social responsibility. Only companies in BIST30 were evaluated in XUSRD, which was first published on November 4, 2014. As of today, 81 companies are listed in the XUSRD index, where companies started to be evaluated voluntarily as of November 21, 2022 (Keskin, 2023b: 3-14). The XUSRD index aims to increase sustainability practices at the corporate level in the field of sustainability. XUSRD; It also has an important place in evaluating companies voluntarily, ranking them comparatively and increasing their competitiveness.

In the evaluation of the XUSRD index, Ethical Investment Research Services Limited (EIRIS) evaluates Borsa Istanbul companies using "publicly available"<sup>1</sup> information according to international sustainability criteria. EIRIS's valuation exercise has three stages:

- a. In the first stage, the report is prepared according to the document "BIST Sustainability Index Research Methodology" (EIRIS; 2015: 1-66) prepared by EIRIS; Using companies' publicly available information, a document containing information about their policies and activities in the fields of environment, biodiversity, climate change, board structure, anti-bribery, human rights, supply chain, health and safety is sent to companies.
- b. In the next stage, companies examine the profiles sent to EIRIS and send feedback to EIRIS with information containing comments and corrections regarding the profile.

---

<sup>1</sup> It is the consideration of reports prepared by third parties and disclosed to the public, such as companies' annual financial reports, sustainability and corporate social responsibility reports, websites, Carbon Disclosure Project reports, etc.

- c. In the final stage, EIRIS integrates feedback from companies into the profiles, creating final profiles for the relevant companies. EIRIS creates a list of companies that will be included in the index according to the "Index Selection Criteria" determined by Borsa Istanbul.

The criteria and subheadings used in environmental, social and governance (ESG) calculations can be summarised as follows. Environmental Criteria: Resource Use, Greenhouse Gas Emissions, Innovation. Social Criteria: Employee Relations, Human Rights, Community Impact, Product/Service Responsibility. Corporate Governance Criteria; Management Structure, Communication with Stakeholders and Corporate Social Responsibility (EIRIS, 2025: 11-45).

Another index is listed on Borsa Istanbul. It is the BIST 100 index. It consists of the 100 stocks with the highest market value and transaction volume traded on Borsa Istanbul.

#### 4 ENVIRONMENTAL PROBLEMS AND NATURAL DISASTERS IN TÜRKİYE

Since the study covers the period 2020:1-2024:4, environmental disasters and natural disasters experienced in Türkiye between these dates are shown in Table 1.

**Table 1**

*Environmental disasters and natural disasters*

| Date               | Event                    | Description  |
|--------------------|--------------------------|--|
| February 4-5, 2020 | Van Avalanche Disaster   | These are two avalanche events that resulted in the death of 42 people. After the first avalanche, the second avalanche fell on the rescue team who went to the scene. 7 people died in the first incident and 35 people died in the second incident. <sup>2</sup> |
| July 6, 2020       | Gallipoli Peninsula Fire | Nearly 300 hectares of forest area were destroyed.   |
| August 11, 2020    | Dereli Sel Felaketi      | It is a flood caused by the explosion of a hydroelectric power plant tank. Some districts of Giresun and Sivas suffered financial damage from this flood. As a result of this incident, 8 people died. <sup>3</sup>  |
| October 30, 2020   | Aegean Sea Earthquake    | It caused the death of a total of 119 people and the injury of 1053 people in Türkiye and Greece.  |

<sup>2</sup> [https://tr.wikipedia.org/wiki/2020\\_Van\\_%C3%A7%C4%B1%C4%9F\\_facias%C4%B1](https://tr.wikipedia.org/wiki/2020_Van_%C3%A7%C4%B1%C4%9F_facias%C4%B1)

<sup>3</sup> [https://tr.wikipedia.org/wiki/2020\\_Dereli\\_sel\\_felaketi](https://tr.wikipedia.org/wiki/2020_Dereli_sel_felaketi)

|                                 |  |  |
|---------------------------------|--|--|
| May-June 2021                   | Sea of Marmara (Sea Saline)            | The ecosystem of the Sea of Marmara has been disrupted. Underwater research has shown that it has been determined that corals and sponges were severely damaged and some died. <sup>4</sup>  |
| July 28, 2021-12 Ağustos 2021   | Forest fires                           | The forest fire that started in Manavgat expanded and spread to other districts. As a result of the fires, 7 people died. The fires continued for days in 21 different points on the borders of Manavgat, Akseki, Gündoğmuş, İbradı and Alanya. Thousands of hectares of forest land, hundreds of houses, barns and warehouses, as well as forest creatures and domestic animals of the local people, were destroyed in the fire. The Manavgat fire went down in history as the largest fire in Türkiye. <sup>5</sup>      |
| August 11, 2021                 | Western Black Sea Flood Disaster       | A total of 97 people lost their lives and 228 people were injured in the floods that affected Kastamonu, Sinop and Bartın provinces. <sup>6</sup>  |
| November 18, 2021               | Nesko Şebinkarahisar Mine Disaster     | As a result of the collapse of waste pool number 2 in the mining operation on November 18, 2021, due to deterioration in the ground, approximately 4,500 tons of chemical waste containing heavy metals were spread into the environment. The waste reaching the Kılıçkaya Dam, which meets the agricultural irrigation needs of the region, polluted agricultural lands and water resources. The disaster not only negatively affected the people and wildlife in the region, but also damaged biodiversity. <sup>7</sup> |
| June 7, 2022                    | Ankara Floods                          | A total of 6 people died in the flood that occurred after heavy rain. <sup>8</sup>   |
| June 21, 2022                   | Explosion of the Erzincan cyanide pipe | In the Çöpler Gold Mine belonging to the Anagold Mining company, where gold is mined by the cyanide leaching method in Erzincan's İliç district, the pipe carrying the cyanide solution burst and 210 cubic meters of cyanide solution mixed into the soil. This incident resulted in the death of 42 of the 110 workers working in the mine. The earthquake was also felt in Izmir, Manisa, Balıkesir, Denizli and Aydın provinces.   |
| October 14, 2022                | Amasra Mine Disaster                   | This incident resulted in the death of 42 of the 110 workers working in the mine.  |
| November 4, 2022                | Buca Earthquake                        | The earthquake was also felt in Izmir, Manisa, Balıkesir, Denizli and Aydın provinces.   |
| February 6, 2023                | Kahramanmaraş Earthquakes              | 7 There were two earthquakes with magnitudes of 7.8 Mw and 7.5 Mw. According to official figures in Türkiye, there are at least 53,537, 8 thousand 476 people lost their lives in Syria. <sup>9</sup>  |
| March 15, 2023                  | Adıyaman-Şanlıurfa Flood Disaster      | A total of 21 people lost their lives due to the floods that affected Adıyaman and Şanlıurfa. The residences, workplaces and vehicles of 3,154 people were damaged in two provinces. <sup>10</sup>   |
| June 10, 2023                   | Ankara Elmadağ MKE Explosion           | 5 workers lost their lives in the explosion that occurred at the Machinery and Chemical Industry Corporation (MKE) Rocket and Explosives Factory in Ankara's Elmadağ district.   |
| July 16, 2023 - August 22, 2023 | Canakkale Forest Fire                  | 1,300 hectares of land were destroyed in the forest fire near Kızıltepe Village.   |

<sup>4</sup> [https://tr.wikipedia.org/wiki/Marmara\\_Denizi\\_deniz\\_salyas%C4%B1\\_felaketi](https://tr.wikipedia.org/wiki/Marmara_Denizi_deniz_salyas%C4%B1_felaketi)

<sup>5</sup> <https://dumlupinargazetesi.com/haber/15660874/turkiyede-tanik-oldugumuz-cevre-felaketleri>

<sup>6</sup> [https://tr.wikipedia.org/wiki/2021\\_Bat%C4%B1\\_Karadeniz\\_sel\\_felaketi](https://tr.wikipedia.org/wiki/2021_Bat%C4%B1_Karadeniz_sel_felaketi)

<sup>7</sup> [https://tr.wikipedia.org/wiki/Nesko\\_%C5%9Eebinkarahisar\\_Maden\\_%C4%B0%C5%9Fletmesi\\_felaketi](https://tr.wikipedia.org/wiki/Nesko_%C5%9Eebinkarahisar_Maden_%C4%B0%C5%9Fletmesi_felaketi)

<sup>8</sup> [https://tr.wikipedia.org/wiki/2022\\_Ankara\\_selleri](https://tr.wikipedia.org/wiki/2022_Ankara_selleri)

<sup>9</sup> [https://tr.wikipedia.org/wiki/2023\\_Kahramanmara%C5%9F\\_depremleri](https://tr.wikipedia.org/wiki/2023_Kahramanmara%C5%9F_depremleri)

<sup>10</sup> [https://tr.wikipedia.org/wiki/2023\\_Ad%C4%B1yaman-%C5%9Eanl%C4%B1urfa\\_sel\\_felaketi](https://tr.wikipedia.org/wiki/2023_Ad%C4%B1yaman-%C5%9Eanl%C4%B1urfa_sel_felaketi)

|                   |                   |        |  |
|-------------------|-------------------|--------|--|
|                   |                   |        | In the forest fire that broke out near Kayadere Village on August 22, a total of 3,400 hectares, of which 2,100 hectares were burned.  |
| November 4, 2023  | Canakkale Fire    | Forest | 700 hectares of forest area burned.  |
| February 13, 2024 | Erzincan Accident | Mine   | It is an accident that occurred as a result of the pile of soil stored after the cyanide leaching process in the Çöpler gold mine in Erzincan's İliç district, turning into a landslide.<br>The mass, with a volume of 10 million m <sup>3</sup> , moved at a speed of 10 meters/second and spread over an area of 300 decares. 9 miners died. |

## 5 LITERATURE REVIEW

It is possible to examine the literature research in three parts. Firstly, studies on sustainability were examined, in the second part, studies on environmental problems, and in the third part, studies on the relationship between environmental problems and the stock market were examined.

### 5.1 Studies on sustainability and economic relations

Although sustainability studies are relatively new, Bosselmann (2016) stated that the idea of sustainability was first introduced by Hans Carl von Carlowitz in 1713. The first formal definition of sustainability was made by Brundtland (1987). Sustainability: It is to ensure development without reducing the opportunities of future generations to meet their needs. In Daly's (1990) study, XI. He predicted that economic development and environmental issues would be the most important conceptual problems in the 21st century. Future studies include Ryszawska (2016). The author determined the purpose of her study to be emphasising the role of sustainable finance in the transition to sustainability. Schoenmaker (2017) underlined that providing resources for sustainable projects and achieving sustainable development goals goes through the financial system. In his study, Lehner (2016) divided sustainable finance and investments into sections and focused on areas ranging from sociological foundations to critical approaches to markets. He defined sustainability analysis and measurement methods as risk prevention by specifying business models. In the last part of the study, case studies examining various perspectives on sustainable banking are included. In their study, Schoenmaker and Schramade (2018) discussed how sustainable finance principles can activate the financial

sector and discussed using finance as a tool to achieve the goal of a sustainable world. In their study, Schumacher et al. (2020) reviewed the applications used in sustainable finance and emphasised the importance of green bonds in Japan for the development of sustainable investment markets. The study also included climate change scenarios. In their study, Olokoyo et al. (2020) investigated the impact of macroeconomic indicators on capital market performance in Nigeria. For this purpose, they applied the Vector Error Correction Model analysis using Johansen cointegration. They found a weak link in the long-term relationship between stock market sustainability performance and macroeconomic fundamentals. Hanley (2020) examined the policy need for sustainability indicators in his study. He emphasised that there is no single measurement to measure sustainability, but the need for a comprehensive approach. In their research, Popescu et al. (2021) set out to ensure that funds are directed to priority sectors for the transition to a low-carbon and more inclusive economy and that there is a need for reliable sustainability assessment methods. In the study, they prepared a seven-criteria matrix developed based on the gaps they found by examining the reports of international organisations. In conclusion, they determined that the investments have various shortcomings that fail to capture the sustainability impact in real life. Jackson and Victor (2020) created a macroeconomic simulation model for Canada in their study. They complemented the model with a sustainable prosperity scenario for the future of the Canadian economy that includes a carbon reduction scenario by 2067 and additional measures to improve environmental, social and financial conditions. In their study, Cunha et al. (2021) emphasised that sustainable finance and investments are the key to promoting sustainable globalisation. Sustainable companies; They described themselves as committed to financial performance and sustainability. Jeronen, E. (2023) studied economic sustainability; She emphasized that it means continuity in business life, productivity, economic growth and the ability to maintain profitability by using the company's assets efficiently. Thiele (2024) researched the concept and practices of sustainability in his study and also suggested sustainability solutions.

## 5.2 Studies on environmental problems and economic relations

There are many studies in the literature about the effects of environmental disasters on social and economic lives. Some of these studies are as follows: Gephart's (1984) study; addressed organisational-based environmental disasters. In the study, Turner's (1976, 1978) model of the organisational foundations of disasters was reviewed. As a result, attention is drawn to the importance of the model in understanding environmental disasters. An alternative political model of disasters has also been proposed. The main element of Quarantelli's (1992) study is that the environmental problems caused by increasing industrialisation and urbanisation must be addressed with an effective plan. In their study, Adrianto & Matsuda (2002) explained the fragility caused by environmental disasters, sea level rise and natural disasters in the economy between 1980 and 2000, using the variable measurement and composite method, on the example of Japan's Amami Island. Skanavis et al. (2005) examined the role of the public in environmental disasters. In the study, which emphasises the need for people to change their lifestyles or their lives, the current unsustainable education, legal and social systems are explained. Major environmental accidents/disasters, such as Minamata, Japan; Bhopal, India; Seveso, Italy; Chernobyl, Ukraine; and Exxon-Valdez, specifically discussed in Alaska, concluded that there would be fewer environmental disasters if citizens around the world were active participants in environmental issues. Zhang et al. (2009) emphasised in their study the vulnerability of the business to natural disasters. This study evaluated five sub-topics. First, it identified how businesses are exposed to the effects of climate change. In the second subheading, the consequences of the environmental disaster are discussed. In the third part, the stages of the process of returning businesses to their pre-disaster situation are explained. Fourth, measures that can be taken by individuals, companies and community planners to reduce the effects of environmental disasters are explained. Finally, the need for public policy and future research to reduce the vulnerability of businesses to environmental disasters is identified. Cho (2009) conducted a case study on the environmental impact of Total, one of the oil companies, on the sinking of the Erika tanker on the Atlantic coast of Bretagne in 1999, resulting in a large oil spill along the river, and the damage from the explosion in the factory in the suburbs of Toulouse, France, in 2001. In this study, it was emphasised that

Total uses communication strategies to legitimise its actions and that environmental disclosures continue to be a powerful tool of legitimacy. In their study, Vallero & Letcher (2012) provide basic information about ways to prevent disasters and methods to reduce the risk of similar disasters in the future. In their study, Anttila-Hughes & Hsiang (2013) examined the social and economic effects of typhoons, one of the Filipino environmental disasters, with the LICRICE model. They stated that environmental disasters cause deaths, health problems, income losses and economic contraction. In their study, Mata-Lima et al. (2013) stated the environmental, economic and social dimensions of sustainability and concluded that sustainability has an effect on reducing the fragility of social capital. In the study of Hewitt (2013), natural disasters, social conditions in the disaster and disaster management problems were examined. The study revealed a view of disaster causality by listing the failures of the measures while emphasising the preventive, protective and response measures of natural disasters. Ambrosetti & Petrillo (2016) stated in their study that environmental disasters trigger migration. Davidsson (2020). This study is a case study of large-scale logging and forest regeneration that occurred after Storm Gudrun in Sweden in 2005. It provides empirical support for the theory that environmental disasters can sometimes be beneficial. In his study, Mulvihill (2021) emphasised that the term environmental disaster is ambiguous and that ecological problems need to be addressed more clearly. In this study, Park (2022) stated that the basis of environmental and sustainability failures is due to prioritising political and economic activities rather than knowledge, and criticised the inadequacies of sovereign states at the root of the problem. In their study, Ai and Gao (2023) examined the effects of climate disasters on companies using mathematical analysis between 1996 and 2017. It has been concluded that companies where environmental problems are financially important reduce their costs with better environmental performance, and as environmental awareness increases, their impact returns increase.

### 5.3 Examples of work related to environmental issues, sustainability and stock markets

Until recently, studies on the development of stock markets, their functions and their effects on the economies of countries have taken their place extensively in the literature. Sustainability in capital markets has been a relatively new field of study. XXI. This issue was not discussed extensively until the beginning of the century. For this reason, although early examples of studies on the relationship between environment and finance were seen in 1990, the actual studies started intensively after the 2008 world economic crisis. Some of these studies are given in Table 2:

**Table 2**

*Examples of studies on sustainability and the stock market*

| Author                   | Subject   | Data Set  | Method  | Result  |
|--------------------------|---|---|---|---|
| Lorraine vd. (2004)      | Effects of advertising about environmental performance on the stock market. | USA<br>England,<br>Northern<br>Ireland and<br>Scotland<br>1995-2000 | Mathematical<br>Analysis                                | News about the fines received by companies usually creates a reaction in the stock market up to 1 week after the news is published. |
| Lo'pez vd. (2007)        | Sustainable development and corporate performance                           | USA<br>1998-2004  | Mathematical<br>Analysis                                | There is a relationship between the sustainability responsibilities and performances of 55 companies.                               |
| Sivalingam (2008)        | Kuala Lumpur Stock Exchange and Sustainability.                             | Kuala Lumpur<br>1973-2004   | Efficient Market<br>Hypothesis                          | Unsustainable small and medium-sized company performance is low.  |
| Cahaya vd. (2008)        | Sustainability at the Jakarta Stock Exchange.                               | Jakarta<br>2004   | Regression analysis                                     | Social disclosures bring transparency and profitability to companies.   |
| Royal & O'Donnell (2008) | Valuation of intangible assets in publicly traded companies.                | Sidney and<br>Hong Kong<br>1999-2001                                | Qualitative research<br>techniques                      | Companies need to be redesigned to contribute to a sustainable economy.   |
| Sariannidis vd (2009)    | Comparison of macroeconomic data and the sustainability index.              | USA<br>2000-2008  | Autoregressive<br>Conditional<br>Variability<br>(GARCH) | Oil price exchange rate volatility negatively affects Dow Jones Sustainability index returns.                                       |
| Panait & Lupu (2009)     | Bucharest Stock Exchange and sustainability.                                | Bucharest<br>2007-2009  | Contagion   | Sustainability provides stability.  |
| Drimbetas vd (2010)      | Effects of macro-economic factors on  | USA<br>2000-2008  | GARCH   | Dow Jones and the US Large-Scale Enterprise   |

|                           |  |   |                                |  |
|---------------------------|--|---|--------------------------------|--|
|                           | the sustainability index.  |   |                                | (DJUSL) indices react differently.   |
| Zhongfu et al.(2011)      | Relationship between environmental information disclosure and economic performance with data from the Shanghai Stock Exchange. | Shanghai 2008-2009  | Regression model               | The more companies disclose their environmental information, the better they perform.  |
| Burhan et al. (2012)      | The impact of sustainability reporting on company performance.   | Indonesia 2006-2009   | Mathematical Analysis          | Sustainability reporting positively affects company performance.   |
| Oberndorfer et al. (2013) | Stock market and sustainability.   | Germany 1999-2002   | Event study                    | Companies' inclusion in the sustainable stock index has negative effects in the examined period.                               |
| Kong et al. (2014).       | Environmental policy and stock market performance.   | China 2010-2012   | Event study                    | It has been found that environmental policy increases the market value of companies.   |
| Paramati et al. (2018)    | The role of stock markets in environmental degradation.  | 20 developed economy countries, 22 developing economy countries 1992-2011 | Mathematical Analysis          | It affects stock markets negatively/positively in developed/developing countries, respectively.                                |
| Boitan (2020),            | Performance evaluation of sustainable stock market indices.  | Europe, Japan, the US 2010 - 2019   | Principal components analysis. | Sustainable indices are an alternative method of risk diversification and hedging.   |
| Ionita & Dinu (2021)      | The impact of intangible assets on sustainable growth and firm value.  | Bucharest Stock Exchange 2016–2019  | Linear Regression              | Being sustainable has an impact on the performance of companies listed on the Romanian stock exchange.                         |
| Keskin & Günay (2022)     | Value analysis of companies included in the BIST Sustainability Index.   | Türkiye 2014-2021   | Quantile Regresyon             | A significant relationship was determined between market-added value, asset profitability ratios and the price-earnings ratio. |
| Keskin & Türkoğlu (2022)  | Performance evaluation of sustainable banks.   | Türkiye 2020-2022   | Wedba                          | The performance ranking of the banks traded in the sustainable index has been made.  |
| Slimane (2023)            | Stock exchanges and sustainability goals.  | 85 Country Stock Exchanges 2017   | Qualitative analysis           | All of the exchanges examined contribute to the Sustainable Development Goals.   |
| Musah (2023)              | Stock market development and environmental quality   | 17 EU member countries 1995-2014  | Cointegration tests            | No causal relationship has been found between stock markets and ecological pollution.  |

|  |                         |  |  |  |
|--|-------------------------|--|--|--|
|  | in EU member countries. |  |  |  |
|--|-------------------------|--|--|--|

In this study, it was investigated whether there was a change in investment preferences depending on investors' environmental sensitivities during and after the environmental disasters in Türkiye. The absence of any study in this direction in the literature makes this study unique.

## 6 METHOTOLGY

In this study, the effects of environmental disasters that occurred in Türkiye between 2020:1 and 2024:4 on the XUSRD and XU100 indices were examined with the event study method.

### 6.1 Event Study

An event study is widely used in capital markets and the business world. This analysis method is used to conduct event research and predict stock returns in abnormal situations to identify the event, participate in the event, and then test the significance of the event (Sitthipongpanich, 2011: 59). For this reason, to achieve the purpose of the study, data on environmental problems and natural disasters in Türkiye and on companies traded in the XUSRD and XU100 indices were examined by the Event Study method. This method was used to measure the reaction of investors when disasters occur, especially in sustainable markets.

### 6.2 Data

Data on Türkiye's environmental disasters and natural disasters for the 2020:1-2024:4 period used in the study were compiled from different sources, as can be seen in Table 1; XUSRD and XU100 index data were provided from the BIST official website.

## 7 EMPIRICAL FINDINGS

It is thought that environmental disasters and natural disasters experienced in Türkiye may cause volatility, especially in the BIST sustainability indices. Literature research shows that preventing climate and environmental problems and reversing their bad effects requires collective action with society, states and companies. In this context, the possibility of investors investing in sustainable, environmentally friendly companies, especially during environmental disasters, has been evaluated because companies contribute to sustainability in harmony with the environment and are sensitive to the environment to be included in sustainable indices. For this reason, the event study method was preferred to see the impact of environmental disasters on the determined variables. The environmental disasters that occurred between 2020 and 2024 and the most important ones, are listed in Table 3.

**Table 3**

*Natural Environmental Disasters in Türkiye between 2020 and 2024 years*

| Date              | Event   |
|-------------------|---|
| February 4, 2020  | Van avalanche disaster                        |
| July 6, 2020      | Gallipoli Peninsula fire                      |
| August 11, 2020   | Stream Flood Disaster                         |
| October 30, 2020  | Aegean Sea Earthquake                         |
| 15 May-June 2021  | Sea Saliva of the Sea of Marmara              |
| July 28, 2021     | Forest fires                                  |
| August 11, 2021   | Western Black Sea Flood Disaster              |
| November 18, 2021 | Nesko Şebinkarahisar Mining Facility disaster |
| June 7, 2022      | Ankara Floods                                 |
| June 21, 2022     | Explosion of the Erzincan cyanide pipe        |
| October 14, 2022  | Amasra Mine Disaster                          |
| November 4, 2022  | Buca Earthquake                               |
| February 6, 2023  | Kahramanmaraş Earthquakes                     |
| March 15, 2023    | Adıyaman-Şanlıurfa flood disaster             |
| June 10, 2023     | Ankara Elmadağ MKE Explosion                  |
| July 16, 2023     | Canakkale Forest Fire                         |
| November 4, 2023  | Canakkale forest fire                         |
| February 13, 2024 | Erzincan Mine Accident                        |

The event study method is generally used to examine the abnormal impact of an event occurring on any date on stock market indices and stocks or short-term abnormal movements in stock market indices and stocks (Campbel et al., 1997). There are two main reasons for using the event study method. The first of these is the examination of the

reaction of financial markets to the event, and the other is due to the fact that macroeconomic phenomena cannot always explain the volatilities that occur (Gürkaynak and Wright, 2013). In event studies, the stages of determining dependent variables, creating a timeline, estimating returns or losses in the forecast period, calculating abnormal returns or losses and testing statistical significance are followed (Sitthipongpanich, 2011). After the events, their dates and the indices that are thought to have an impact are determined, the event window must be determined. In order to evaluate the impact of the event, abnormal returns must be calculated (MacKinlay, 1997). To determine abnormal returns or losses, it is necessary to first determine the model with normal returns and losses. The timeline in the case study is shown in Figure 1:

**Figure 1**

*Case study timeline*



"T<sub>0</sub>-T<sub>1</sub>" period is the period when normal returns and losses are obtained, "T" is the day the event occurs, "T<sub>1</sub>-T<sub>2</sub>" period is the time period before and after the day the event occurs, "T<sub>2</sub>-T<sub>3</sub>" period is the period when abnormal returns and losses are balanced. represents the time period. The most commonly used method for calculating abnormal return is the market return model, which assumes a linear relationship between market return and stock (or index) return. The market return model is shown in Equation 1 (Eryiğit and Eryiğit, 2017):

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t} \quad (1) \quad \text{Equation 1}$$

where

$R_{m,t}$  is the market portfolio at the time,

$\alpha_i$  and  $\beta_i$  are the normal return/loss in the market model and

$\varepsilon_{i,t}$  is the error term. Parameters can be estimated with the least squares (LSC) estimator. Abnormal return/loss (abnormal return-AR) is shown in Equation 2:

$$AR_{i,t} = \hat{\alpha}_i - \beta_i R_{m,t} \quad (2) \quad \text{Equation 2}$$

Since examining only one event (environmental disaster) or dependent variable is not sufficient for the assumption that "environmental disasters cause volatility in the market", the average abnormal return/loss (AAR) equation is calculated as in Equation 3 (MacKinlay, 1997):

$$AAR_t = \frac{1}{N} \sum_{i=1}^N AR_{i,t} \quad (3) \quad \text{Equation 3}$$

In Equation 3, the N element shows the number of financial assets examined, and in this study, it is determined as 2 (BIST sustainability index, BIST 100).

The most important problem encountered when applying the event study method is that the event is known beforehand and those who have this information react in advance. This causes the real impact of the event to be overlooked. Another reason is that a better and more explainable result is obtained by summarising all abnormal returns/losses in the examined time period (calculating the cumulative abnormal return). Since it is not possible to predict the environmental disasters that are the subject of this study, the equation in Equation 4 (cumulative abnormal return - CAR) is used to better explain all abnormal returns/losses in the examined time period (Bodie et al.2014):

$$CAR_t = \frac{1}{N} \sum_{t=t_1}^{t_2} AR_{i,t} \quad (4) \quad \text{Equation 4}$$

$t_1$  and  $t_2$  in Equation 4 are located between the " $T1-T2$ " periods. By summing the average abnormal returns over a certain period of time, the cumulative average abnormal return (CAAR) in Equation 5 can be obtained:

$$CAAR_t = \frac{1}{N} \sum_{t=t_1}^{t_2} CAR_{i(t_1,t_2)} \quad (5) \quad \text{Equation 5}$$

In event studies, the "T0-T1" forecast period is between 100-300 days, and if it is longer, it causes the event to lose its currency. If a forecast period of less than 100 days is selected, events will not be distinguishable (Benninga, 2014). Since the time difference between the environmental disasters that are the subject of this study is over 100 days, events with a time difference of less than 100 days were excluded, and 7 environmental disasters with a time difference of more than 100 days (the lowest being 116 days) were included in the models. Table 4 shows the events included in the study, their dates and sequence numbers.

**Table 4**

*Disasters included to Research*

| Order | Date       | Event                     |
|-------|------------|---------------------------|
| 1     | 06.07.2020 | Gallipoli Peninsula fire  |
| 2     | 30.10.2020 | Aegean Sea Earthquake     |
| 3     | 28.07.2021 | Forest fires              |
| 4     | 07.06.2022 | Ankara Floods             |
| 5     | 06.02.2023 | Kahramanmaraş Earthquakes |
| 6     | 16.07.2023 | Canakkale Forest Fire     |
| 7     | 13.02.2024 | Erzincan Mine Accident    |

In this study, the event window (T1-T2) is 10 days before and 10 days after the day of the event [-10, 10], 5 days before and 5 days after [-5, 5], and 1 day before and 1 day after [-1, 1].

Table 5 includes CAR and CAAR values for each event day. According to Table 5, five of the 7 selected environmental disasters (environmental disasters 2, 3, 4, 5 and 7) occurred in the selected event windows ([-10, 10], [-5, 5], [-1, 1]). It was determined that it caused a decrease in the BIST Sustainability index, but this effect was not statistically significant. Four of the 7 selected environmental disasters (environmental disasters 1, 3, 6, 7) caused a decrease in the BIST 100 index in the selected event windows ([-10, 10], [-5, 5], [-1, 1]), but It was determined that this effect was not statistically significant. According to the findings, the sum of environmental disasters or any environmental disaster causes statistically significant abnormal returns/losses in the BIST Sustainability and BIST 100 indices in the specified event windows ([-10, 10], [-5, 5], [-1, 1]). It has been determined that it does not cause.

**Table 5**

*Abnormal returns/losses in BIST Sustainability and BIST 100 during periods of environmental disasters*

| Order | Date                      | Event                        | O.P.                            | BIST S                  | BIST 100                | CAAR                    |
|-------|---------------------------|------------------------------|---------------------------------|-------------------------|-------------------------|-------------------------|
| 1     | 06.07.2020                | Gallipoli Peninsula fire     | [-10, 10]<br>[-5, 5]<br>[-1, 1] | 0,94<br>0,94<br>0,94    | -1,19<br>-1,18<br>-1,19 | -1,30<br>-1,29<br>-1,29 |
| 2     | 30.10.2020                | Aegean Sea Earthquake        | [-10, 10]<br>[-5, 5]<br>[-1, 1] | -0,59<br>-0,59<br>-0,59 | 1,35<br>1,35<br>1,35    | 1,43<br>1,42<br>1,43    |
| 3     | 28.07.2021                | Forest fires<br>Ankara       | [-10, 10]<br>[-5, 5]<br>[-1, 1] | -0,08<br>-0,08<br>-0,08 | -0,07<br>-0,07<br>-0,07 | -0,06<br>-0,06<br>-0,06 |
| 4     | 07.06.2022                | Ankara Floods                | [-10, 10]<br>[-5, 5]<br>[-1, 1] | -0,11<br>-0,11<br>-0,11 | 0,03<br>0,03<br>0,03    | 0,04<br>0,04<br>0,04    |
| 5     | 06.02.2023                | Kahramanmaraş<br>Earthquakes | [-10, 10]<br>[-5, 5]<br>[-1, 1] | -0,59<br>-0,58<br>-0,59 | 1,59<br>1,59<br>1,60    | 1,68<br>1,68<br>1,68    |
| 6     | 16.07.2023                | Canakkale Forest Fire        | [-10, 10]<br>[-5, 5]<br>[-1, 1] | 1,14<br>1,13<br>1,13    | -0,50<br>-0,50<br>-0,50 | -0,61<br>-0,61<br>-0,61 |
| 7     | 13.02.2024                | Erzincan Mine Accident       | [-10, 10]<br>[-5, 5]<br>[-1, 1] | -1,16<br>-0,17<br>-1,16 | -0,14<br>0,39<br>-0,14  | -0,03<br>0,41<br>-0,03  |
| -     | 02.01.2020-<br>09.04.2024 | Environmental Disasters      | [-10, 10]<br>[-5, 5]<br>[-1, 1] | -0,14<br>-0,17<br>-0,17 | 0,40<br>0,39<br>0,42    | 0,42<br>0,41<br>0,44    |

Note: The values in the table are t-values of the significance of the regression coefficient. BIST S: BIST Sustainability index O.P.: Event Window (T1-T2) \*p<0.05 and \*\*p<0.01

## 8 DISCUSSION AND CONCLUSION

Environment, climate and sustainable financial cooperation are among the issues that are considered and carefully taken into action every day. Of course, protecting the atmosphere and environment we live in has a price. The necessity of individuals and companies operating in all industries to bear this cost is the most important point in solving the problem. Green financial instruments developed to provide the necessary financial resources to protect the environment are important for sustainability.

Global trends towards environmental protection and climate balancing have now reached irreversible levels. Nowadays, companies evaluate their share prices not only by the numbers on their balance sheets but also by the company's reputation. Individual

and/or corporate investors are willing to invest in sustainable projects with an environmental dimension. In this way, they enable the growth and development of activities that benefit society and the economy as a whole. On the other hand, the number of companies in the world and the stock exchanges where these companies are listed, aiming to create common value for a clean and sustainable environment with environmentally and climate-friendly working methods, is increasing day by day, and this provides environments where green finance methods can develop. In this context, BIST has been listing companies that have been able to meet sustainability conditions since 2014.

In this study, the effects of environmental and natural disasters that occurred in Türkiye between 2020 and 2024 on the XUSRD and XU100 indices were examined using the event study method. 7 environmental disasters where the time difference between two events was over 100 days (minimum 116 days) were included in the model. According to the research findings, five of the 7 selected environmental disasters (environmental disasters 2, 3, 4, 5 and 7) were in the XUSRD index in the selected event windows ([-10, 10], [-5, 5], [-1, 1]). It was determined that this effect caused a decrease, but this effect was not statistically significant. Four of the 7 selected disasters (disasters 1, 3, 6, 7) caused a decrease in the XU100 index in the selected event windows ([-10, 10], [-5, 5], [-1, 1]), but this effect It was determined that it was not statistically significant. According to the findings, it was determined that the sum of environmental disasters or any single environmental disaster did not lead to statistically significant abnormal gains/losses in the BIST Sustainability and BIST 100 indices within the specified event windows ([-10, 10], [-5, 5], [-1, 1]).

As can be understood from here, sustainability criteria are not taken into account when making investment choices in Türkiye, and natural disasters and environmental disasters do not affect investor preferences. This situation shows that environmental awareness in society is not sufficiently developed.

The findings of this study are in stark contrast to the findings of Kong et al. (2014), Gupta and Goldar (2005) that the market generally punishes environmentally unfriendly behaviour when companies announce their poor environmental performance. It is thought that this difference arises from the period, subject and geography in which the study was conducted. The study is somewhat similar to Oberndorfer et al.'s (2013) study and

Musah's (2023) study, with the conclusion that the performance of German companies included in the Dow Jones STOXX Sustainability Index was negatively affected.

The limitation of this study is to examine the environmental disasters experienced in Türkiye between 2014-2024 and the BIST Sustainable Index. Work that can be done from now on: It is considered that environmental disasters occurring in a wide geographical area may lead to the examination of situations in which investor preferences in stock markets with developed economies are directed towards sustainable companies or the stocks of other companies.

## REFERENCES

- Adrianto, L., & Matsuda, Y. (2002). Developing economic vulnerability indices of environmental disasters in small island regions. *Environmental Impact Assessment Review*, 22(4), 393-414. [https://doi.org/10.1016/S0195-9255\(02\)00012-4](https://doi.org/10.1016/S0195-9255(02)00012-4)
- Ai, L. ve Gao, LS (2023). Firm-level risk of climate change: Evidence from climate disasters. *Global Finance Journal*, 55, 100805. <https://doi.org/10.1016/j.gfj.2022.100805>
- Ambrosetti, E., & Petrillo, E. R. (2016). Environmental disasters, migration and displacement. Insights and developments from L'Aquila's case. *Environmental Science & Policy*, 56, 80-88. <http://dx.doi.org/10.1016/j.envsci.2015.11.002>
- Anttila-Hughes, J., & Hsiang, S. (2013). Destruction, disinvestment, and death: Economic and human losses following environmental disaster. *Available at SSRN 2220501*.
- Benninga, S. (2014). *Financial modeling*. MIT Press.
- Bodie, G. D., & Crick, N. (2014). Listening, hearing, sensing: Three modes of being and the phenomenology of Charles Sanders Peirce. *Communication Theory*, 24(2), 105-123.
- Boitan, I. A. (2020). "Sustainable Stock Market Indices: A Comparative Assessment of Performance". *Journal of Research in Emerging Markets*, 2(1), 7-14.
- Bosselmann, K. (2016). *The Principle of Sustainability: Transforming Law And Governance*. Routledge. 2nd Edition eBook Published. London. <https://doi.org/10.4324/9781315553955>.
- Brundtland, G. H. (1987). Our common future—Call for action. *Environmental conservation*, 14(4), 291-294.

- Burhan, AHN ve Rahmanti, W. (2012). The impact of sustainability reporting on company performance. *Ventura Journal of Economics, Business and Accounting*, 15 (2), 257-272.
- Cahaya, F. R., Porter, S. A., & Brown, A. M. (2008). Social disclosure practices by Jakarta Stock Exchange listed entities. *Journal of the Asia-Pacific Centre for Environmental Accountability*, 14(1), 2-11.
- Campbel, B. (1997). Arterial waveform monitoring changes in configuration. *Heart & Lung*, 3, 204.
- Cho, C. H. (2009). Legitimation strategies used in response to environmental disaster: A French case study of Total SA's Erika and AZF incidents. *European Accounting Review*, 18(1), 33-62.
- Cunha, F., Meira, E., & Orsato, R. J. (2021). "Sustainable Finance And Investment: Review And Research" Agenda. *Business Strategy and the Environment*, 30(8), 3821-3838.
- Daly, H. E. (1990). Sustainable development: from concept and theory to operational principles. *Population and development review*, 16, 25-43.
- Davidsson, Å. (2020). Disasters as an opportunity for improved environmental conditions. *International Journal of Disaster Risk Reduction*, 48. <https://doi.org/10.1016/j.ijdrr.2020.101590>
- Drimbetas, E., Sariannidis, N., Giannarakis, G., & Litinas, N. (2010). "The Effects of Macroeconomic Factor on the Sustainability, Large-Cap and Mid-Cap Dow Jones Indexes". *International Journal of Business Policy and Economics*, 3, 21-36.
- EIRIS (2015). BIST Sustainable Index Research Methodology. Empowering Responsible Investment. Available: <https://borsaistanbul.com/tr/duyuru/234/bist-surdurulebilirlik-endeksi-arastirma-metodolojisi-degisiklik>
- Eryigit, C., & Eryigit, M. (2017). The Effect of Sponsorship Announcements on Stock Returns: Does Industry Concentration Matter. *International Journal of Social Science*, 3, 239-251.
- Gephart Jr, R. P. (1984). Making sense of organizationally based environmental disasters. *Journal of Management*, 10(2), 205-225.
- Gupta, S. ve Goldar, B. (2005). Do stock markets penalize environment-unfriendly behaviour? Evidence from India. *Ecological Economics*, 52 (1), 81-95. <https://doi.org/10.1016/j.ecolecon.2004.06.011>
- Gürkaynak, R. S., & Wright, J. H. (2013). Identification and inference using event studies. *The Manchester School*, 81, 48-65. <https://doi.org/10.1111/manc.12020>

- Hanley, N. (2000). “Macroeconomic Measures Of ‘Sustainability’”. *Journal of economic surveys*, 14(1), 1-30.
- Hewitt, K. (2013). Environmental disasters in social context: toward a preventive and precautionary approach. *Natural Hazards*, 66, 3-14.
- [https://tr.wikipedia.org/wiki/2020\\_Van\\_%C3%A7%C4%B1%C4%9F\\_facias%C4%B1](https://tr.wikipedia.org/wiki/2020_Van_%C3%A7%C4%B1%C4%9F_facias%C4%B1)  
Available on April 4, 2026
- [https://tr.wikipedia.org/wiki/2020\\_Dereli\\_sel\\_felaketi](https://tr.wikipedia.org/wiki/2020_Dereli_sel_felaketi) Available on April 4, 2024
- [https://tr.wikipedia.org/wiki/Marmara\\_Denizi\\_deniz\\_salyas%C4%B1\\_felaketi](https://tr.wikipedia.org/wiki/Marmara_Denizi_deniz_salyas%C4%B1_felaketi)  
Available on April 4, 2026
- <https://dumlupinargazetesi.com/haber/15660874/turkiyede-tanik-oldugumuz-cevre-felaketleri> Available on April 4, 2026
- [https://tr.wikipedia.org/wiki/2021\\_Bat%C4%B1\\_Karadeniz\\_sel\\_felaketi](https://tr.wikipedia.org/wiki/2021_Bat%C4%B1_Karadeniz_sel_felaketi) Available on May 4, 2026
- [https://tr.wikipedia.org/wiki/Nesko\\_%C5%9Eebinkarahisar\\_Maden\\_%C4%B0%C5%9Fletmesi\\_felaketi](https://tr.wikipedia.org/wiki/Nesko_%C5%9Eebinkarahisar_Maden_%C4%B0%C5%9Fletmesi_felaketi) Available on April 4, 2026
- [https://tr.wikipedia.org/wiki/2022\\_Ankara\\_selleri](https://tr.wikipedia.org/wiki/2022_Ankara_selleri) Available on April 4, 2026
- [https://tr.wikipedia.org/wiki/2023\\_Kahramanmara%C5%9F\\_depremleri](https://tr.wikipedia.org/wiki/2023_Kahramanmara%C5%9F_depremleri) Available on April 4, 2024
- [https://tr.wikipedia.org/wiki/2023\\_Ad%C4%B1yaman-%C5%9Ean%C4%B1urfa\\_sel\\_felaketi](https://tr.wikipedia.org/wiki/2023_Ad%C4%B1yaman-%C5%9Ean%C4%B1urfa_sel_felaketi) Available on April 4, 2026
- <https://borsaistanbul.com/tr/endeks> Available on April 4, 2026
- Ionita, C., & Dinu, E. (2021). The effect of intangible assets on sustainable growth and firm value—Evidence on intellectual capital investment in companies listed on Bucharest Stock Exchange. *Kybernetes*, 50(10), 2823-2849.  
<https://doi.org/10.1108/K-05-2020-0325>
- Jackson, T., & Victor, P. A. (2020). The transition to a sustainable prosperity—a stock-flow-consistent ecological macroeconomic model for Canada. *Ecological Economics*, 177, 106787.
- Jeronen, E. (2023). Economic Sustainability. In *Encyclopedia of Sustainable Management* (pp. 1257-1263). Idowu, S.O., Schmidpeter, R., Capaldi, N., Zu, L., Del Baldo, M., Abreu, R. (eds). Cham: Springer International Publishing  
[https://doi.org/10.1007/978-3-031-25984-5\\_197](https://doi.org/10.1007/978-3-031-25984-5_197)

- Keskin, M. & Günay, B. (2022). Quantile Regression Method Evaluation Of Value Analysis of BIST Sustainability Index Companies. *The Journal Of Academic Social Science*, 131(131), 123-134. <http://dx.doi.org/10.29228/ASOS.63554>
- Keskin, M. & Türkoğlu, S. P. (2022). Performance evaluation of banks traded in BIST sustainable index with the wedba method. *International Social Sciences Studies Journal*, 8(102), 3237-3244 <http://dx.doi.org/10.29228/sss.64364>
- Keskin, M. (2022). Climate Transformation and Green Finance. *Euroasia Journal Of Social Sciences & Humanities*. 9/2, 54-69. <http://dx.doi.org/10.38064 /eurssh.339>
- Keskin, M. (2023a). Sustainable Stock Exchanges and Borsa İstanbul . In: Buğan, M. F. & Tuna, İ. (eds.), *Evolution of Financial Markets IV*. Özgür Publications. DOI: <https://doi.org/10.58830/ozgur.pub395.c1721>
- Keskin, M. (2023b). Sürdürülebilir Tahvillerle Değer Yaratma. *Sosyal Bilimlerde Toplumsal Sorunlara Bakış: Teorik Çalışmalar*. Ed. B. Öçal. Efe Yayınları, pp, 59-92. İstanbul. E.ISBN: 9786250901
- Kong, D., Liu, S., & Dai, Y. (2014). Environmental policy, company environment protection, and stock market performance: Evidence from China. *Corporate Social Responsibility and Environmental Management*, 21(2), 100-112. [10.1002/csr.1306](https://doi.org/10.1002/csr.1306)
- Lehner, O. M. (2016). *Routledge Handbook of Social and Sustainable Finance*. Routledge.
- Lo'pez, M., Garcia, A. & Rodriguez, L. (2007). "Sustainable Development and Corporate Performance: A Study Based on The Dow Jones Sustainability Index". *Journal of Business Ethics*, 75/3, 285–300.
- Lorraine, N. H., Collison, D. J., & Power, D. M. (2004). An analysis of the stock market impact of environmental performance information. In *Accounting forum* (Vol. 28, No. 1, pp. 7-26). No longer published by Elsevier. <https://doi.org/10.1016/j.accfor.2004.04.002>
- MacKinlay, A. C. (1997). Event studies in economics and finance. *Journal of economic literature*, 35(1), 13-39.
- Mata-Lima, H., Alvino-Borba, A., Pinheiro, A., Mata-Lima, A., & Almeida, J. A. (2013). Impacts of natural disasters on environmental and socio-economic systems: What makes the difference?. *Ambiente & Sociedade*, 16, 45-64.
- Meadows, D.H., Meadows, D.L., Randers, J. & Behrens, W (1972). *The Limits To Growth*: Universe Books. New York. <https://www.donellameadows.org/wp-content/userfiles/Limits-to-Growth-digital-scan-version.pdf> (17.04.2024).
- Mulvihill, P.R. (2021). The ambiguity of environmental disasters. *Journal of Environmental Studies and Sciences*, 11 (1), 1-5. <https://doi.org/10.1007/s13412-020-00646-1/>

- Musah, M. (2023). Stock market development and environmental quality in EU member countries: A dynamic heterogeneous approach. *Environment, Development and Sustainability*, 25(10), 11153-11187.
- Oberndorfer, U., Schmidt, P., Wagner, M., & Ziegler, A. (2013). Does the stock market value the inclusion in a sustainability stock index? An event study analysis for German firms. *Journal of Environmental Economics and Management*, 66(3), 497-509. <https://doi.org/10.1016/j.jeem.2013.04.005>
- Olokoyo, F. O., Ibhagui, O. W., & Babajide, A. (2020). “Macroeconomic Indicators And Capital Market Performance: Are the links sustainable?”. *Cogent Business & Management*, 7(1), 1792258.
- Panait, I., & Lupu, I. (2009). The behaviour of the Bucharest Stock Exchange during the current financial markets crisis and proposed measures for its sustainable development. *Annals of Spiru Haret University Annals–Economic Series*, 1(1), 73-80.
- Paramati, S. R., Alam, M. S., & Apergis, N. (2018). The role of stock markets on environmental degradation: A comparative study of developed and emerging market economies across the globe. *Emerging Markets Review*, 35, 19-30. <https://doi.org/10.1016/j.ememar.2017.12.004>
- Park, S. (2022). The role of the Sovereign state in 21st century environmental disasters, *Environmental Politics*, 31:1, 8-27. <https://doi.org/10.1080/09644016.2021.1892983>
- Popescu, I. S., Hitaj, C., & Benetto, E. (2021). “Measuring The Sustainability Of Investment Funds: A Critical Review Of Methods And Frameworks In Sustainable Finance”. *Journal of Cleaner Production*, 314, 128016.
- Quarantelli, E. L. (1992). The environmental disasters of the future will be more and worse but the prospects are not hopeless. Avalibale: <https://udspace.udel.edu/server/api/core/bitstreams/f85a8287-c868-4823-9abd-761e24d62845/content>
- Royal, C., & O'Donnell, L. (2008). Emerging human capital analytics for investment processes. *Journal of Intellectual Capital*, 9(3), 367-379. <https://doi.org/10.1108/14691930810891983>
- Ryszawska, B. (2016). “Sustainability transition needs Sustainable Finance”. *Copernican Journal of Finance & Accounting*, 5(1), 185-194.
- Sariannidis, N., Litinas, N., Konteos, G., & Giannarakis, G. (2009). A GARCH Examination of Macroeconomic Effects on US Stock Market: A Distinguish Between The Total Market Index And The Sustainability Index. Avalibale at SSRN 1340574.

- Schoenmaker, D. (2017). From risk to opportunity: A framework for sustainable finance. RSM series on positive change, 2.
- Schoenmaker, D., & Schramade, W. (2018). Principles of sustainable finance. Oxford University Press.
- Schumacher, K., Chenet, H., & Volz, U. (2020). “Sustainable Finance in Japan”. Journal of Sustainable Finance & Investment, 10(2), 213-246. <https://doi.org/10.1080/20430795.2020.1735219>
- Sitthipongpanich, T. (2011). Understanding the event study. Journal of Business Administration, 34(130), 59-68.
- Sivalingam, G. (2008). Entry, exit, ownership structure and the efficient market hypothesis: A case study of the Kuala Lumpur Stock Exchange. Corporate Ownership & Control, 5, 4.
- Skarvanis, C., Koumouris, G. A., & Petreniti, V. (2005). Public participation mechanisms in environmental disasters. Environmental management, 35, 821-837.
- Slimane, F. B. (2023). Stock exchanges and sustainability goals: a commitment to progress. International Journal of Sustainable Development, 26(2), 86-  
<https://doi.org/10.1504/IJSD.2023.133606>
- Thiele, L. P. (2024). Sustainability. John Wiley & Sons.
- UNFCCC, (2022). Introduction to Climate Finance. <https://unfccc.int/> (19.04.2024).
- United Nations (2022). Conferences Environment and sustainable development, <https://www.un.org/en/conferences/environment> (17.04.2024).
- Vallero, D. A. & Letcher, T. (2012). Unraveling environmental disasters. Newnes. Available: <https://www.everand.com/book/679053916/Unraveling-Environmental-Disasters>
- Zhang, Y., Lindell, M. K., & Prater, C. S. (2009). Vulnerability of community businesses to environmental disasters. Disasters, 33(1), 38-57.
- Zhongfu, Y., Jianhui, J., & Pinglin, H. (2011). The study on the correlation between environmental information disclosure and economic performance-with empirical data from the manufacturing industries at Shanghai Stock Exchange in China. Energy Procedia, 5, 1218-1224.
- Zhongfu, Y., Jianhui, J., & Pinglin, H. (2011). The study on the correlation between environmental information disclosure and economic performance-with empirical data from the manufacturing industries at Shanghai Stock Exchange in China. Energy Procedia, 5, 1218-1224. <https://doi.org/10.1016/j.egypro.2011.03.213>