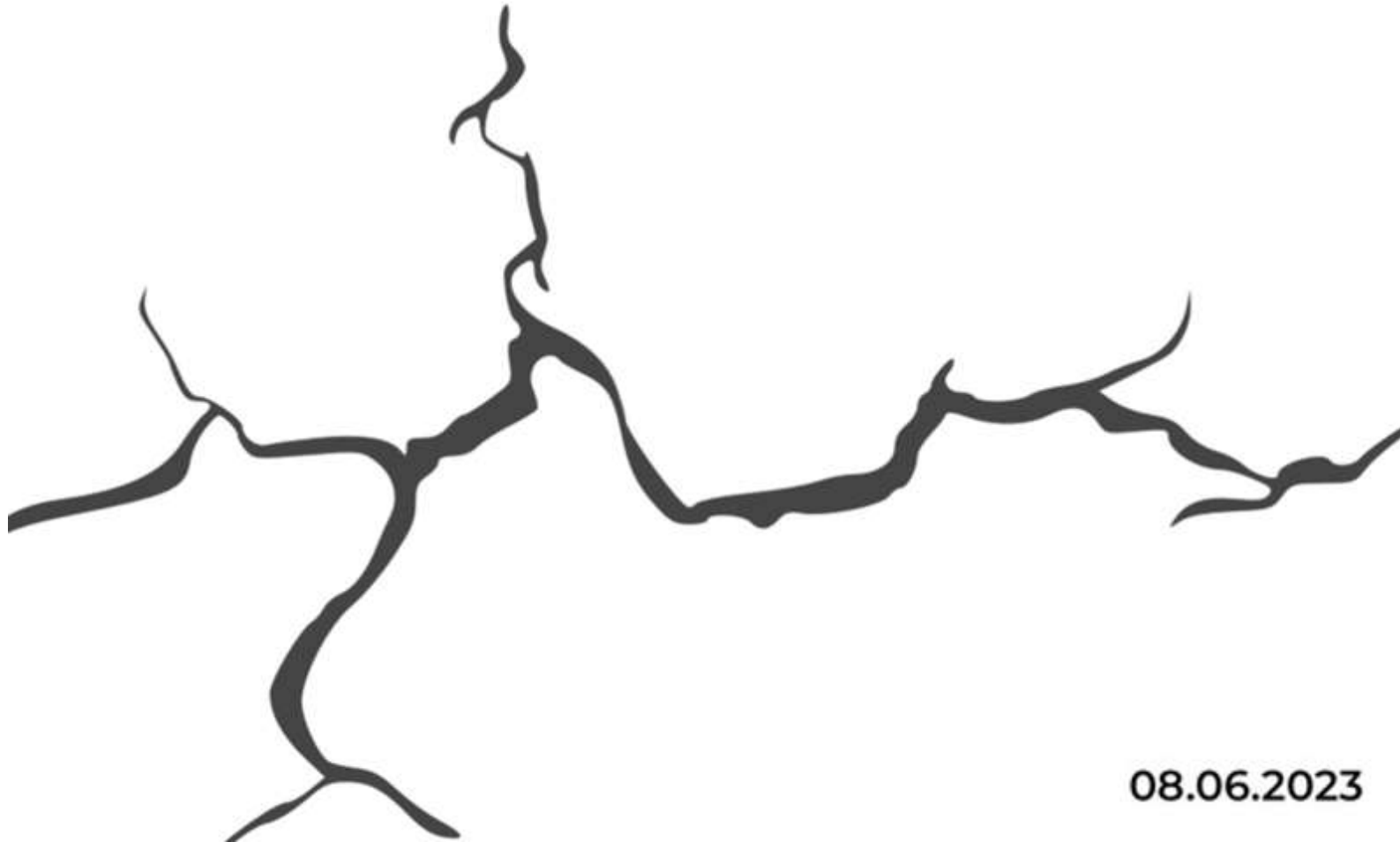


**2023 KAHRAMANMARAŞ EARTHQUAKE  
PRE-ASSESSMENT & STATUS REPORT**



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## 1. The Disaster: Two Major Earthquakes\*

### 1.a) The First Earthquake (7.7 Mw)

<b>Disaster Type and Magnitude</b>	Earthquake / 7.7 Mw
<b>Date and Time of Disaster</b>	February 6, 2023 / 04:17
<b>Epicenter</b>	Sofalaca-Şehitkamil-Gaziantep
<b>GPS Coordinates</b>	37.1123 N 37.1195 E
<b>Distances of the Epicenter to the City Centers of 10 Provinces</b>	Gaziantep 23 km, Kilis 45 km, Kahramanmaraş 52 km, Osmaniye 76 km, Hatay-İskenderun 101 km, Hatay-Anakya 130 km, Adıyaman 122 km, Malatya 169 km and Diyarbakır 282 km.

On February 06, 2023, at 04:17 local time; a devastating earthquake with a moment magnitude (Mw) of 7.7 occurred at the epicenter in Sofalaca Village of Şehitkamil District. The focal depth of the earthquake was approximately 5 km, and the seismic waves were felt in a wide area covering Southeastern Anatolia, Eastern Anatolia, Central Anatolia and Mediterranean Regions<sup>1</sup>.

Figure-1: Epicenter of the First Earthquake (Mw 7.7) and Measurements<sup>2</sup>

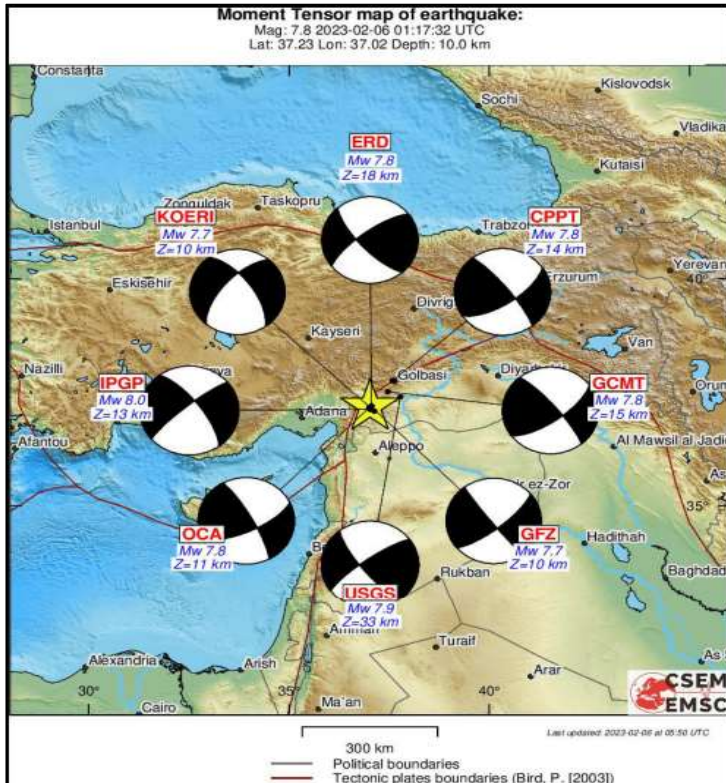
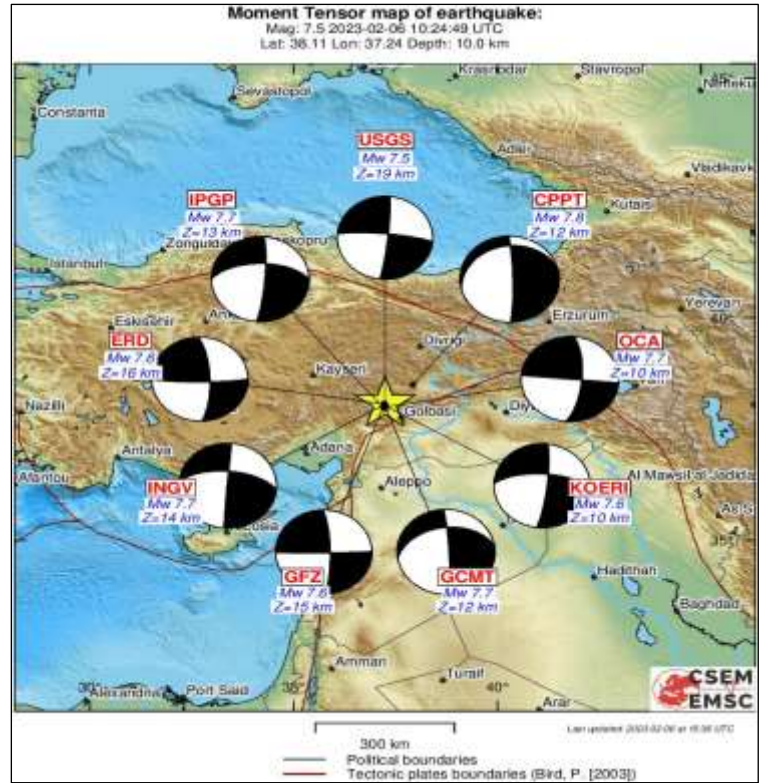


Figure -2: Epicenter of the First Earthquake (Mw 7.7) and Measurements<sup>3</sup>



\* This earthquake disaster, which consisted of two major earthquakes, is referred to as the Kahramanmaraş Earthquake in this document, but it is also referred to with different titles such as Gaziantep-Kahramanmaraş or Southeastern Anatolia Earthquakes.

<sup>1</sup> February 06, 2023, Sofalaca Şehitkamil Gaziantep Earthquake Press Release, B.U. Kandilli Observatory and Earthquake Research. Regional Earthquake-Tsunami Monitoring and Assessment Center

<sup>2,3</sup> European-Mediterranean Seismological Centre (EMSC), Moment tensors.

1.b) The Second Earthquake (7.5 Mw)

Disaster Type and Magnitude	Earthquake / Mw7.5
Date and Time of Disaster	February 6, 2023 / 13:24
Epicenter	Ekinözü-Kahramanmaraş
GPS Coordinates	37.1123 K 37.1195 D
Distances of the Epicenter to the City Centers of 10 Provinces	Gaziantep 110 km, Kilis 150 km, Kahramanmaraş 70 km, Osmaniye 147 km, Hatay-İskenderun 198 km, Hatay- Antakya 237 km, Adıyaman 114 km, Malatya 112 km and Diyarbakır 274 km.

On February 06, 2023, at 13:24 local time, another devastating earthquake with a moment magnitude (Mw) of 7.5 occurred at the epicenter in Ekinözü District of Kahramanmaraş Province. The focal depth of the earthquake was approximately 5 km, and the seismic waves were felt in a wide area covering Southeastern Anatolia, Eastern Anatolia, Central Anatolia and Mediterranean Regions<sup>3</sup>.

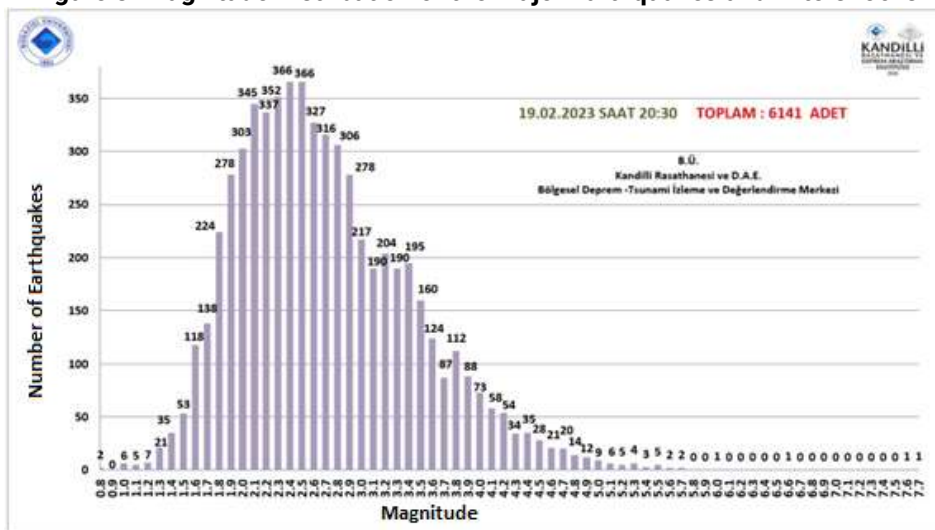
The distance between the epicenters of the two major earthquakes with magnitudes of 7.7 and 7.5, respectively, was approximately 105 km and a time difference of about 9 hours, and the second earthquake, which did not show any aftershocks, increased the lethal impact of the disaster.

1.c) Aftershocks

On February 6, 2023, at 04:17 in the morning, according to Kandilli Observatory data, 10 minutes after the 7.7 magnitude earthquake in Şehitkamil, Gaziantep, another 6.6 magnitude aftershock occurred approximately 27 km west of the epicenter. In addition, on February 6, 2023, at 13:24, 11 minutes after the second magnitude 7.5 earthquake, a 6.0 magnitude aftershock occurred 52 km northeast of the epicenter. The aftershocks' magnitude also increased the damage to the buildings. On February 20, 2023, at 20:04, a magnitude 6.4 earthquake occurred in Yayladağı, Hatay. Another major aftershock was a magnitude 5.6 earthquake in Malatya on February 27, 2023, at 12:04.

As seen in Figure-3, according to Kandilli Observatory data, 6,141 earthquakes occurred until 20:30 on February 19, 2023. Almost all of these are aftershocks and the number of earthquakes with magnitude 4.0 and above in the relevant time interval is 389.

Figure-3: Magnitude Distribution of the Major Earthquakes and Aftershocks



<sup>3</sup> 06 Şubat 2023 Ekinözü Kahramanmaraş Depremi Basın Bülteni, B.Ü. Kandilli Rasathanesi ve Dae. Bölgesel Deprem-Tsunami İzleme ve Değerlendirme Merkezi

## 2. The Demographic and Economic Data Of 11 Provinces Affected by the Disaster

### 2.a) The Demographic Data Of 10 Provinces within the Disaster Region

A total of 13.9 million people, or 16.4 percent of Türkiye's total population, live in the provinces declared disaster zones before the earthquake. While the population density in Türkiye is 110, the population density in the disaster zone is 144.

**Table-1: Population**

Province	Total Population	Share in Total Population	Population density
<b>11 Provinces Total</b>	<b>13.897.974</b>	<b>16,4%</b>	<b>144</b>
Adana	2.263.373	2,7%	163
Adiyaman	632.148	0,7%	90
Diyarbakır	1.791.373	2,1%	119
Elazığ	588.088	0,7%	70
Gaziantep	2.130.432	2,5%	312
Hatay	1.670.712	2,0%	287
Malatya	808.692	1,0%	69
Kahramanmaraş	1.171.298	1,4%	82
Şanlıurfa	2.143.020	2,5%	114
Kilis	145.826	0,2%	102
Osmaniye	553.012	0,7%	177

[Source: Turkish Statistical Institute, 2021]

In the 11 disaster-exposed provinces where 13.7 percent of Türkiye's 25.3 million households live, 52 percent of the buildings were constructed after 2001, 26 percent between 1981-2000, and 10 percent before 1980. Households, where the age of the building in which they reside could not be classified, constitute 12 percent. In sum, the total share of households living in buildings constructed before 2001 is at least 36.5 percent. 47.8 percent in Adana, 46.1 percent in Hatay, and 42.1 percent in Malatya.

### 2.b) The National Income Data of 11 Provinces in the Disaster Zone

Province	Total GDP Share	Agriculture, forestry and fishing Sectoral Share	Industry Sectoral Share	Manufacturing Industry Sectoral Share	Construction Sector Share	Services Sectoral Share	Finance and insurance activities Sectoral Share
Total of 11 Provinces	9,8%	15,1%	11,4%	11,5%	10,0%	7,4%	4,6%
Adana	2,0%	2,5%	2,2%	2,1%	1,7%	1,9%	1,5%
Hatay	1,4%	1,3%	1,8%	1,9%	1,0%	1,4%	0,5%
Kahramanmaraş	0,9%	1,4%	1,4%	1,3%	0,8%	0,4%	0,3%
Osmaniye	0,4%	.	0,7%	0,7%	0,3%	0,2%	0,1%
Malatya	0,5%	0,9%	0,5%	0,5%	0,7%	0,3%	0,3%
Gaziantep	0,5%	0,8%	0,2%	0,2%	1,3%	0,3%	0,2%
Adıyaman	2,0%	1,3%	3,6%	4,0%	1,7%	1,5%	0,8%
Kilis	0,3%	0,8%	0,3%	0,2%	0,3%	0,2%	0,2%
Şanlıurfa	0,1%	0,2%	0,1%	0,1%	0,1%	0,1%	0,0%
Diyarbakır	0,8%	3,0%	0,4%	0,3%	0,8%	0,5%	0,3%

**Table-2: Share of provinces in national income**

[Source: Turkish Statistical Institute, 2021]

While the share of the provinces in the earthquake zone in total national income is 9.8 percent, the shares of agriculture, industry, and manufacturing sectors are above their GDP shares. In 11 provinces, the share of the agriculture sector in national income is 15.1 percent, while the share of the finance and insurance sector is only 4.4 percent.

The first 10 provinces announced to have been affected by the disaster account for 11.7 percent of the total enterprises, 11.1 percent of the active taxpayers of income tax, 9.2 percent of the active taxpayers of corporate tax, and 10.5 percent of the active taxpayers of VAT. These 10 earthquake-stricken provinces produce 20.9 percent of the country's crop production, 12 percent of cereals and other vegetable production, 14.5 percent of the total cultivated agricultural area, 12 percent of cattle, and 16.3 percent of sheep and goats.

## 2.c) The Export Figures of 11 Provinces in the Disaster Zone

The provinces in the disaster zone before the earthquake realized 8.6 percent of total exports. According to TurkStat data, more than half of this \$2 billion in exports in 2022 was realized in Gaziantep with \$11.2 billion, while Hatay exported \$4 billion, Adana \$3.1 billion and Kahramanmaraş \$1.4 billion. Leading export items are cereals, pulses, oilseeds and products, steel, agricultural products, textiles and raw materials, ready-to-wear garments.

**Table-3: Exports by Province**

Province	Exports (x1.000\$)	Export Share
11 Provinces	\$ 21.943.499	8,6%
Adana	\$ 3.116.893	1,23%
Adıyaman	\$ 97.263	0,04%
Diyarbakır	\$ 421.919	0,17%
Elâzığ	\$ 366.888	0,14%
Gaziantep	\$ 11.195.087	4,40%
Hatay	\$ 4.066.993	1,60%
Malatya	\$ 456.234	0,18%
Kahramanmaraş	\$ 1.411.672	0,56%
Şanlıurfa	\$ 313.182	0,12%
Kilis	\$ 122.302	0,05%
Osmaniye	\$ 375.065	0,15%

[Source: Turkish Statistical Institute, 2021]

The earthquake caused structural damage to industrial facilities, and although machinery and equipment were usable, they lost their physical stability and many of them need to be readjusted. The biggest loss in industrial enterprises was on the labor force side, where some of the labor force lost their lives and the remaining labor force migrated to safer provinces due to financial damage and psychological motives. In field interviews, industrial facility managers reported that only one-third of their workforce was available within the first month of the earthquake.

The Ministry of Trade announced that exports in Adiyaman, Hatay, Kahramanmaraş and Malatya declined significantly after the earthquake. According to the Ministry's assessment based on the General Trade System (GTS), the initial impact of the earthquake on exports amounted to 1.5 billion dollars. According to the Turkish Exporters Assembly (TİM), which provides export figures of provinces according to the legal headquarters of exporters, exports of 11 provinces fell by 33.8 percent in February, the month of the earthquakes, compared to January, and decreased by 502 million dollars. When we compare the same data to February 2022, exports decreased by 42.3 percent in total and decreased by 722 million dollars. Compared to February last year, Hatay's exports decreased by 64 percent, Kahramanmaraş by 61 percent, Malatya by 51 percent, Elazığ by 50 percent and Gaziantep by 42.4 percent.

## 3. Impact Analysis

### 3.a) Macroeconomic Impact Analysis<sup>4</sup>

Table-4: 1999 - 2023 Earthquake Damage Statistics

	Marmara Earthquake (1999)	Marmara Earthquake (1999)	Maras Earthquakes (2023)
	<i>With 1999 data</i>	<i>With 2021 data</i>	<i>With 2021 data</i>
<b>Basic Statistics</b>			
Richter Magnitude Scale	7,4	7,4	7,7
Number of Provinces in the Earthquake Zone	8	8	11
GDP (Thousand \$)	42.703.106	101.674.062	79.090.865
Population (person)	6.072.315	8.742.179	13.897.974
Per Capita Income (\$)	7.032	11.630	5.691
Employment	2.283.624	3.287.684	5.226.631
Number of Households	1.894.863	2.727.993	3.478.573
Household Size	3,2	3,2	4,0
<b>Human and Material Damage</b>			
Casualties (person)	18.373	26.451	70.804
Injured (person)	48.901	70.402	188.451
Number of "demolished or heavily damaged" buildings	96.796	139.355	299.201
Number of Households with "collapsed or severely damaged"	774.368	1.114.841	2.393.609
Households whose "house was demolished or severely damaged" (%)	40,9	40,9	68,8
Minimum Wage (\$/Month)	153	453	453
Average Housing Payment Period (Month)	34	61	61
100 m2 Housing Price per Household (\$)	5.235	27.660	27.660
House Price (\$/m2)(Including 8% Construction Fee)	52	277	277
Number of Prefabricated Requests	43.264	62.286	225.172
Prefabricated Demand (%)	5,6	5,6	9,4
<b>Financial Damage</b>			
GDP Loss (Thousand \$)	7.117.184	16.945.677	13.181.811
Destroyed or severely damaged Housing Damage (Thousand \$)	4.053.545	30.836.493	66.207.233
Lost working days (Thousand \$)	698.789	2.978.641	4.735.328
Total Damage (Thousand \$)	11.869.518	50.760.811	84.124.371
<b>Macroeconomic Damage</b>			
GDP (Thousand \$)	254.119.116	815.811.879	815.811.879
Total Damage (% of GDP)	4,7	6,2	10,3

<sup>4</sup> The macroeconomic impact analysis was conducted by Economist Dr. Haluk R. Tükel.

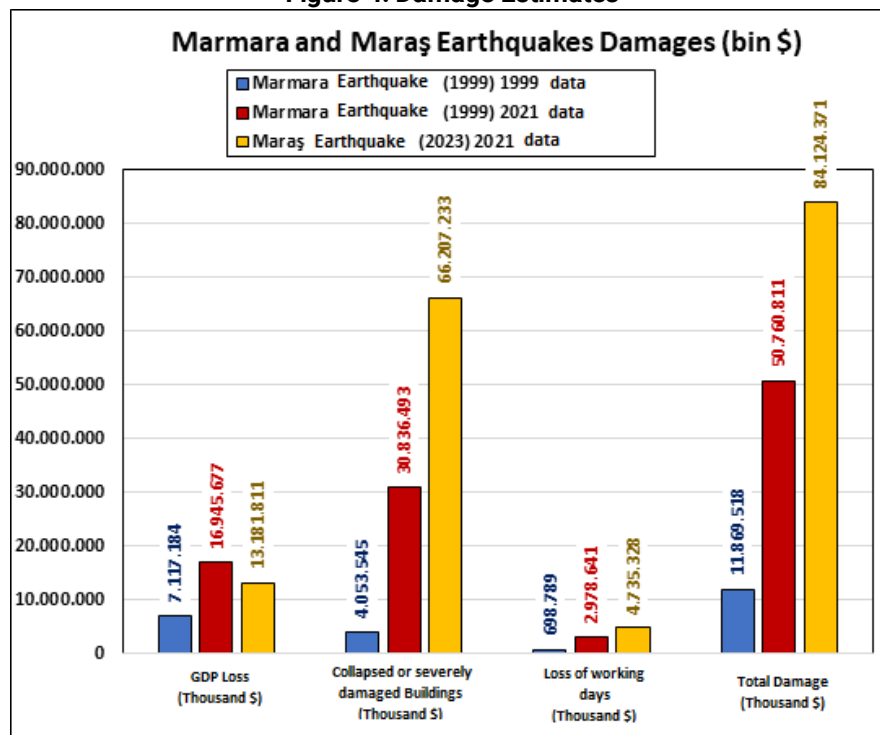


If looked at the data from the 1999 Marmara and 2023 Kahramanmaraş earthquakes with the 2021-dollar data, the differences and similarities and make a comparison in terms of total loss of life and financial damage can be highlighted.

**In summary, the results of our impact analysis are as follows:**

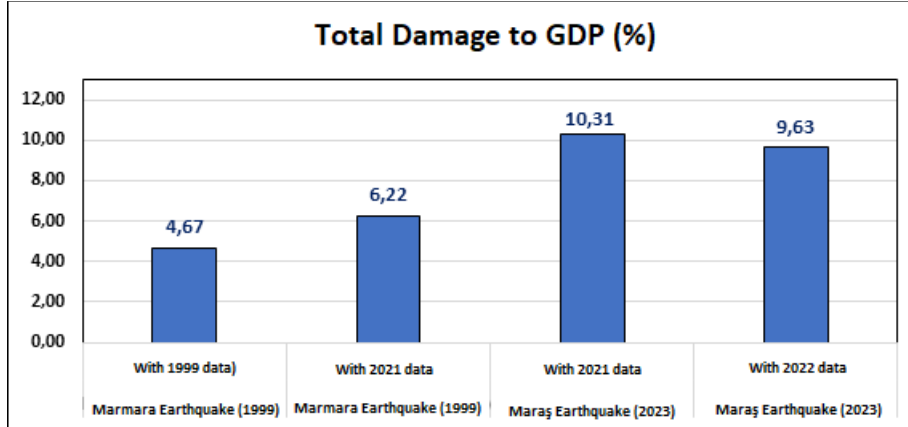
- According to the 2010 report of the Parliamentary Investigation Commission, the loss of life in the Marmara Earthquake was estimated at 18,373 people, while based on the collapsed building data in the relevant report, 11.87 billion dollars was calculated in 1999 dollars. If the Marmara Earthquake occurs in 2021, it is estimated that it will cause 26,451 deaths and 50.7 billion dollars in financial damage.
- If the Kahramanmaraş Earthquake is examined with the methodology using the data of the Marmara Earthquake, 70,804 loss of life and 84.1 billion dollars of financial damage are predicted. 193,399 people were estimated to be injured.

**Figure-4: Damage Estimates**



- On the other hand, considering the available data, the 2023 Kahramanmaraş Earthquake is expected to cause a total of USD 84.1 billion in damage, including USD 66.2 billion in residential damage, USD 13.2 billion in lost national income and USD 4.7 billion in lost working days. While the effects of the loss of national income and lost working days will be experienced in 2023, the policies to be implemented to compensate for housing damage will have an impact in the next few years.
- While the damage caused by the 1999 Marmara Earthquake corresponds to 6.2 percent of GDP based on 2021 data, the damage caused by the 2023 Kahramanmaraş Earthquake corresponds to 10.3 percent of GDP.

**Figure-5: Total Damage to GDP**



- Parallel to the decline in provinces' contribution to national income, exports of the 11 disaster-affected provinces may fall below 15 billion dollars due to the deterioration of the infrastructure that supports exports.
- As an expected consequence of the great earthquake, a huge wave of migration took place from Adana to Istanbul. It is estimated that at least 3.5 million people left the earthquake zone in the first month after the earthquakes. Although there is no reliable data available for the time being, except for one-on-one interviews, expert opinions have been obtained that the demographic structure of the provinces will change in the coming period. Large-scale migrations after disasters can lead to unexpected increases in population density and strain on infrastructure, increase the risk of inadequate health systems, cause rapid changes in the dynamics of the local economy and social structures, and permanently damage families and their social and local support networks.
- The 2023 budget deficit was targeted at 659.6 billion TRY. Bloomberg economics department estimates that public expenditures related to the earthquake could be equivalent to 5.5 percent of GDP. However, in the first four months of 2023 alone, the total budget deficit reached 382.5 billion Turkish Liras (TL). Under current conditions, the budget deficit can be expected to exceed at least 1 trillion TL. Considering that nominal GDP is expected to exceed 18 trillion TL in 2023, it is quite possible that the budget deficit to GDP ratio will be above 5.4 percent.

**3.b) Other Damage and Reconstruction Cost Estimates**

The World Bank's Disaster Assessment Report published in February reveals that the two major earthquakes that hit Turkey on February 6 caused an estimated \$34.2 billion in direct physical damage, equivalent to 4% of the country's 2021 GDP. The report also notes that recovery and reconstruction costs are likely to be much larger, up to double initial estimates, and that economic disruptions associated with the earthquakes will further add to the cost.

J.P. Morgan, one of the world's leading investment banks, published a study on the tenth day of the earthquake in which it estimated that the direct costs from the destruction of physical structures, together with upside risks, could reach 2.5% of GDP, about 25 billion dollars. Following J.P. Morgan, Morgan Stanley estimated that housing costs could reach up to 38 billion dollars, while direct damage could rise to 29 billion dollars, with an upper limit of 45 billion dollars.

2023 The most comprehensive study on the damage and reconstruction costs caused by the Kahramanmaraş Earthquakes is the "Turkey Earthquakes: Assessment of Recovery and Reconstruction" report. As detailed in Table-5, it is estimated that the earthquake caused a cost of 103.6 billion dollars, including all cost items. TURKONFED estimated the GDP loss caused by the Kahramanmaraş earthquakes as USD 13.2 billion based on the 1999 earthquake, while the report prepared by the Strategy and Budget Office (SBO) estimated the GDP output loss as USD 6.9 billion.

**Table-5: Strategy and Budget Office (SBO) Total Costs: Damage and Expenditures**

Estimated Total Costs	Damage (Billion TL)	Damage (Billion Dollar)	Damage Rate of GDP (%)
Emergency Expenditures	128	6,8	0,6
Estimated Public Damage	242,5	12,9	1,1
Estimated Private Damage	222,4	11,8	1,0
Estimated Housing Damage (requiring urgent demolition + collapsed + severely damaged)	1.073,9	56,9	5,0
Costs of Domestic Goods	58,5	3,1	0,3
Cost of Excavation (100-120 million m3) + Crusher (Public + Private)	41,9	2,2	0,2
Damage to Private Motor Vehicles	6,1	0,3	-
<b>Subtotal</b>	<b>1.773,2</b>	<b>94,0</b>	<b>8,2</b>
Cost of Motor Vehicle Insurance Compensation	1,2	0,1	-
DASK	36,4	1,9	0,2
Revenue Loss by Tradespersons	13,9	0,7	0,1
GDP Output Loss	130	6,9	0,6
<b>Grand Total</b>	<b>1.955</b>	<b>103,6</b>	<b>9</b>

[Source: SBO, Türkiye Earthquakes Recovery and Reconstruction Assessment]

The most comprehensive study on the damage and reconstruction costs caused by the 2023 Kahramanmaraş Earthquakes is the "Turkey Earthquakes Recovery and Reconstruction Assessment" report conducted under the leadership of the Presidential Strategy and Budget Office (SBO) with the support of the World Bank, UNDP, and European Union (EU). As can be seen in Table-5, it is estimated that the earthquake caused a cost of 103.6 billion dollars with all cost items. In the TÜRKONFED Macroeconomic Impact Analysis, based on the 1999 earthquake, the GDP loss caused by the Kahramanmaraş Earthquakes was estimated as 13.2 billion USD, while the GDP output loss was estimated as 6.9 billion USD in the report prepared by the Presidency SBO.

**Table-6: Total Damage and Loss in the Housing Sector**

Estimated Damage/Loss	Damage/Loss (Billion TL)	Damage/Loss (Billion Dollar)
<b>Damage</b>		
Reconstruction Cost of Unusable Housing	1.032	54,7
Reconstruction Cost of Unusable Barns	3,0	0,2
Reconstruction Cost of Unusable Businesses	39	2
Repair Assistance for Lightly Damaged Housing	12,8	0,7
Furniture Cost in Unusable Housing	58,5	3,1
<b>Total Damage</b>	<b>1.145,3</b>	<b>60,7</b>
<b>Loss</b>		
Debris Removal and Cleaning Cost	29,8	1,6
Household Payments for Housing with Severe Damage + Requiring Urgent Demolition + Moderate Damage	6,5	0,3
Temporary Accommodation	25	1,3
Meal and Accommodation	40,5	2,1
<b>Total Loss</b>	<b>101,8</b>	<b>5,3</b>
<b>Total Damage and Loss</b>	<b>1.247,1</b>	<b>66</b>

[Source: SBO, Türkiye Earthquakes Recovery and Reconstruction Assessment]

## 3.c) Infrastructure Damages

<b>Transportation</b>	According to the information shared by the Ministry of Transport and Infrastructure (MoTI), there are 10 thousand kilometers of road and 2 thousand kilometers of railway network in the earthquake zone, while viaducts and tunnels have not been heavily damaged and are usable. Ninety-seven percent of the railway lines are open for transportation and are being used for the delivery of earthquake aid. The earthquake report of the Strategy and Budget Office estimates the damage to be 32.9 billion TL.
<b>Electricity</b>	Transformer substations were destroyed in most of the affected provinces and the electricity distribution network was severely damaged in some areas. Problems in the main power transmission facilities and lines have been resolved and problems in the urban distribution parts in some districts and provincial centers have been resolved within two weeks after the earthquake. Electricity is being supplied to undamaged and lightly damaged buildings. The Strategy and Budget Office's earthquake report estimated the cost of the electricity generation and distribution infrastructure at 9.1 billion TL.
<b>Natural Gas</b>	The earthquake caused explosions in natural gas pipelines and Petroleum Pipeline Corporation (BOTAŞ) quickly cut off the flow to Gaziantep, Hatay, and Kahramanmaraş. The ministry announced that BOTAŞ's main transmission lines had suffered breakdowns and ruptures, and where repairs had been made, the damage was reoccurring with aftershocks. According to the ministry's latest statement, there are no problems with electricity and natural gas transmission lines in the 11 provinces affected by the earthquake. Natural gas is supplied to undamaged and slightly damaged buildings. According to the earthquake report of the Strategy and Budget Office, the damage to the natural gas distribution infrastructure was estimated to be 827 million TL.
<b>Oil Lines</b>	BOTAŞ halted the flow of oil to the terminal to inspect the facility after the first earthquake on Monday, February 6, but said no leakage or damage was found. BOTAŞ resumed the flow of crude oil to the Ceyhan export terminal on the Mediterranean coast late on Tuesday, February 7. The Kurdistan Regional Government (KRG) of Iraq administration also confirmed that the flow of oil continued.
<b>Communication</b>	With 11.5 million mobile subscribers, telecommunication services in provinces and districts in the disaster zone have not completely stopped, but serious disruptions have been experienced. While base stations at high elevations are estimated to be mostly undamaged or slightly damaged, damage control work is ongoing on base stations installed on top of collapsed buildings and in crowded areas of city centers. According to the Mobile Telecommunications Operators Association, of which Turkcell, Türk Telekom, and Vodafone are members, 2,451 base stations were disabled, 190 mobile stations were dispatched, and 3,485 generators were urgently dispatched to the region by the operators to meet the energy needs.
<b>Hospitals</b>	Block A of Iskenderun State Hospital, which received a negative earthquake resistance report in 2012, was used for intensive care services and collapsed with the first earthquake. In Hatay province, two public hospitals collapsed, and many private hospitals were also destroyed or permanently damaged. While the number of hospitals destroyed has not yet been shared by the authorities, the need for field hospitals and health workers is reported in the field. According to the damage control data in the Strategy and Budget Office's report, a total of 42 hospital buildings, 27 belonging to the Ministry of Health, 6 to universities and 9 to the private sector, were severely and moderately damaged. A total of 94 hospitals, including 75 hospitals belonging to the Ministry of Health, 12 university hospitals and 7 private hospitals, were slightly damaged.
<b>Schools</b>	The Ministry of Education postponed the opening date of all schools in 81 provinces after the semester break and the Ministry announced that schools will open on Monday, February 20, 2023. It was announced that students studying in the 10 provinces affected by the earthquake will be able to transfer to the provinces of their choice. According to the damage control data in the Strategy and Budget Presidency's report, 8,162 out of 20,340 educational buildings in the region have been inspected, of which 72 have collapsed (428 classrooms), 504 are heavily damaged and require urgent demolition (3,739 classrooms), 331 are moderately damaged (3,693 classrooms) and 2,533 are slightly damaged (30,961 classrooms). The financing required to bring these

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schools/institutions back into service amounts to 39.69 billion TL (2.11 billion USD). It is also noted that this cost may increase with further inspections.

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**Water**

According to the Ministry of Environment, Urbanization and Climate Change 95 percent of city water infrastructure lines have been repaired, but access to water remains limited due to shelter problems. Infrastructure for hot water and drinking water for hygiene purposes is being built in temporary accommodation areas. Following tests in Nurdağı and İslahiye, the Ministry of Health announced that tap water should never be used as drinking water. Experts also warn caution in the use of groundwater due to the possible chemical effects of earthquakes.

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**3.d) Earthquake Impact in Organized Industrial Zones (OIZs)**

According to SBO’s Earthquakes: Recovery and Reconstruction Assessment Report, 38 Organized Industrial Zones (OIZs) are active in the region. There are 4,997 companies in these OIZs, employing approximately 550,000 people. Employment in the region’s OIZs accounts for about 22 percent of employment in all OIZs. Production in some facilities may be disrupted for some time due to loss of workforce or damage to electricity, transportation, and communication infrastructure.

In Kahramanmaraş OIZs, the destruction was greater than it was in other OIZs. OIZs in Adıyaman have suffered moderate damage. However, most of the OIZs in the earthquake zone remained undamaged. Therefore, OIZs are vital for economic recovery after the earthquake. Since the biggest problem of OIZs is a labor shortage, employers in OIZs need safe and socio-economically adequate temporary settlements.

Industrial production in the earthquake zone is unlikely to return to previous levels in the short term. However, the loss of production in the most affected provinces such as Hatay, Kahramanmaraş, and Adıyaman is expected to be partially offset by increased capacity from neighboring provinces. Collection of trade receivables has slowed considerably and for many firms has come to a standstill, and banks' measures such as discounting and write-offs of receivables may provide economic relief. While the physical damage to large industrial facilities in the earthquake zones may be recoverable, the situation in the service sector and small local production facilities is more serious. Moreover, the biggest problem facing the surviving production facilities after the earthquake is labor and housing. Finally, orders from earthquake-hit areas have stopped and there are demands to stimulate supply where production has resumed.

**Table-6: Damages Detected in OIZs within the First Week of the Earthquake**

Name of OIZ	Situation of Service	Destruction of Earthquake In Nearest County/Town (Satelite)	Destruction in OIZ/ID (Satelite)	Number Of Firms By Sectors
Adıyaman Besni OIZ	Partially In service - Organizational Structure in progress	Moderate Destruction	Possible Less Damage	9 Wholesale Trade, 7 Textiles, 3 Retail Trade, 3 Food, 2 Chemicals, 2 Agriculture and Animal, 1 Electricity and Gas, 1 Metals, 1 Food and Beverage, 1 Rubber and Plastics and 1 Education
Adıyaman Gölbaşı OIZ	In Service	Severe Destruction	Possible Moderate Damage	5 Metal, 4 Wholesale Trade, 2 Textile, 2 Food, 1 Furniture, 1 Agriculture and Animal
Adıyaman Kahta OIZ	In Service	Severe Destruction	Possible Less Damage	34 Textile, 14 Food, 4 Wood, 2 Nonmetal, 1 Machinery and Equipment and 1 Furniture
Adıyaman OIZ	In Service	Severe Destruction	Possible Less Damage	56 Textiles, 53 Food, 17 Furniture, 15 Metals, 15 Rubber and Plastics, 5 Electronics, 5 Metal, 4 Paper, 3 Chemicals, 2 Wood, 2 Machinery and Equipment, 2 Agriculture and Animal, 1 Recycling, 1 Wholesale Trade, 1 Mining supporting activity, 1 Transportation Vehicles and 1 Construction
Gaziantep Islahiye OIZ	In Service	Severe Destruction	Possible Severe Damage	6 Food and 2 Textile
K.maraş Elbistan OIZ	In Service	Severe Destruction	Possible Moderate Damage	8 Construction, 4 Wood, 3 Metal, 3 Textile, 3 Wholesale Trade, 3 Retail Trade, 2 Food, 2 Rubber and Plastic, 1 Non-building, 1 Office Management, 1 Machinery and Equipment, 1 Metal and 1 Furniture
K.maraş Erkenez OIZ	Partially In service - Organizational Structure in progress	Severe Destruction	Possible Severe Damage	Partially In Service (many factories nearby)
K.maraş Türkoğlu OIZ	In Service	Severe Destruction	Possible Severe Damage	12 Textile, 4 Metal, 3 Food, 2 Wholesale Trade, 2 Machinery and Equipment, 1 Electricity and gas, 1 Furniture, 1 Education and 1 Chemical
K.maraş Türkoğlu-2 OIZ	Partially In service - Organizational Structure in progress	Severe Destruction	Possible Moderate Damage	Partially In Service (many factories nearby)
Malatya II. OIZ	In Service	Severe Destruction	Possible Less Damage	48 Wholesale Trade, 37 Textiles, 16 Metal, 14 Food, 13 Rubber and Plastics, 13 Retail Trade, 7 Machinery and Equipment, 5 Metal, 4 Petroleum, 4 Means of Transport, 3 Leather, 3 Paper, 3 Construction, 2 Recycling, 2 Administration, 1 Health, 1 Architecture and engineering, 1 Non-building structures, 1 Furniture, 1 Chemical, 1 Financial services, 1 Agricultural and Animal, 1 Education, 1 Other professional activities, 1 Electronics and 1 Computer programming

## 4. TÜRKONFED's Earthquake and Disaster Activities

TÜRKONFED has been organizing workshops and publishing research reports to raise awareness among businesses, especially SMEs, with the aim of raising awareness in our country, which has a high risk of disasters and earthquakes. Before the earthquake that occurred on February 6, 2023, TÜRKONFED had ongoing projects and initiatives in partnership with various organizations.

### Establishment of CBI Türkiye Platform (August 2018)

TÜRKONFED's earthquake and disaster management efforts began with an international collaboration signed in Hatay in 2018. TÜRKONFED and the United Nations Development Program (UNDP) brought the international platform called Connecting Business initiative (CBI) to Türkiye to strengthen businesses' resilience against natural disasters and complex emergencies such as earthquakes, fires, floods, and refugee crises. Through this partnership, CBI Turkey was established to create awareness among SMEs nationwide and help them recover faster after disasters.

As part of CBI Türkiye's implementation, the "Resilience in Businesses" project was launched in collaboration with the UPS Foundation to increase disaster awareness among SMEs and strengthen their preparedness and resilience. The project aims to raise awareness in SMEs nationwide, not only limited to natural disasters but also addressing all extraordinary natural or human-induced situations that could disrupt business continuity. The project started in 2018 and has been ongoing for 5 years.

CBI Türkiye Platform also collaborates with TÜRKONFED, TÜSİAD, and UNDP Türkiye within the Business for Goals Platform, working in a coordinated manner in the field of disaster and crisis management.

Initiated under the leadership of TÜRKONFED in Hatay and continuing its activities under the UN, CBI Türkiye, of which TÜRKONFED is the founder, became one of the first teams to provide support in our country during the Kahramanmaraş earthquake through its international network, including Mexico and Japan search and rescue teams.

## **Resilience in SMEs: New Risks, New Priorities Report (August 2019)**

The "Resilience in SMEs: New Risks, New Priorities" Report was prepared in 2019 by CBI Türkiye Platform established through the collaboration of TÜRKONFED and UNDP. It was shared with the public on the 20th anniversary of the August 17 earthquake. The report emphasized that potential risks have grown in parallel with the Turkish economy over the past 20 years, particularly earthquakes, climate change-related disasters such as floods and inundations, refugee issues, and complex emergencies that have been on the agenda in recent years. The report provides a general assessment of the current situation and guidance on what needs to be done in terms of solutions in these areas.

According to the report, the SMEs, which constitute a significant backbone of the country and the region, were affected by the 1999 Marmara earthquake, along with large factories. More than 30,000 businesses suffered damage in the earthquake that struck the heart of the Turkish industry, resulting in losses amounting to 200 billion Turkish Liras in today's currency. While the efforts made since the 1999 Marmara earthquake primarily focused on ensuring safety, the report highlights that there is still much to be done to ensure business continuity and reduce economic losses. In the last 20 years, the risk posed by a potential earthquake to the economy has increased in parallel with the growth of the Turkish economy.

## **Istanbul Earthquake Business Preparedness Scenario Report (August 2022)**

The "Istanbul Earthquake Business Preparedness Scenario Report" was prepared in collaboration between TÜRKONFED-TÜSİAD-SEDEFED with the aim of drawing attention to the social and economic damages expected from the anticipated major Istanbul earthquake on the 22nd anniversary of August 17. The report, which also received contributions from the Business for Goals Platform, was published with the support of the UPS Foundation. A workshop series was organized focusing on the scenario of the anticipated Great Marmara Earthquake in Istanbul, starting with five critical sectors (transportation and logistics, energy, information and communication technology, insurance and finance, food and agriculture). The phase was completed with a report addressing the resilience points, vulnerabilities, and areas that need to be strengthened in these five critical sectors.

It was stated that Istanbul, which constitutes one-third of Türkiye's national income, 40% of national industrial production, 46% of tax revenues, and half of the exports, is the "heart of the economy," and the estimated economic damage in an earthquake would range between 25 and 300 billion dollars.

## **Report on Sectoral Readiness for the Istanbul Earthquake (March 2022)**

Workshops were conducted with the participation of leading companies and non-governmental organizations from five sectors, namely energy, information and communication technologies, transportation and logistics, agriculture and food, insurance, and finance, under the coordination of TÜRKONFED and TÜSİAD, SEDEFED, and the Business for Goals Platform, with the support of the UPS Foundation. The report examined the sectors' vulnerabilities, methods, collaboration, and support mechanisms to reduce these vulnerabilities, and evaluated the extent to which this preparation process is possible for the future of the sectors. According to the result report of the Istanbul Earthquake Workshop held by the Istanbul Metropolitan Municipality in 2019, it is predicted that after an earthquake with a magnitude of 7.5, out of the 1.2 million building stock in the city, 194,000 buildings would suffer moderate to severe damage, and 48,000 buildings would experience heavy and very heavy damage.

Based on the findings, workshops were conducted with the participation of leading companies and non-governmental organizations from five sectors, namely energy, information and communication technologies, transportation and logistics, agriculture and food, insurance, and finance, under the coordination of TÜRKONFED and TÜSİAD, SEDEFED, and the Business for Goals Platform, with the support of the UPS Foundation.

According to the findings in the report "Sectoral Readiness for the Istanbul Earthquake," the expectation that the government will come to the rescue in disasters creates a misleading guarantee. We believe that active participation in this process as local governments, civil society, private sector, and business community is the only valid way to prevent the possible destructive consequences of an earthquake. Increasing the resilience of SMEs, which are the main strength of the economy, reducing the risks that may occur in a potential disaster or crisis situation, and the rapid recovery of our sectors are of greater importance than ever. These findings necessitate a rapid and collective series of actions, movements, and collaborations.

The report highlights priority areas such as strengthening transmission and distribution lines and transformers in the energy sector, addressing the weaknesses and inadequacies of base stations in the information and communication technology sector, risk factors in the insurance and finance sector, and the condition of major roads and viaducts in the transportation and logistics sector.

### **Disaster and Crisis Management Efforts for the 2023 Kahramanmaraş Earthquake**

Immediately after the initial earthquake centered in Kahramanmaraş, the Earthquake Crisis and Coordination Center was established at the TÜRKONFED headquarters in the early hours of the morning. The center initiated coordinated efforts with the presidents of TÜRKONFED member federations (ÇUKUROVASIFED/Adana-Mersin, DASIFED/Hatay, Osmaniye, Kahramanmaraş, GÜNSİFED/Gaziantep-Adıyaman-Kilis, DOĞÜNSİFED/Diyarbakır-Şanlıurfa, and FIRATSİFED/Elazığ, Malatya, Bingöl) and member associations in the earthquake-affected region, in coordination with AFAD (Disaster and Emergency Management Presidency), governorships, local administrations, and public agencies. The center provided coordination and support for search and rescue operations in addition to material assistance totaling tens of thousands during the acute phase of the earthquake.

## **5. Economic Recovery after the Disaster and the Recommendations**

The economics literature indicates that there is no universal plan for post-earthquake recovery for individuals and nations. The process of economic reconstruction should be tailored to each country affected by a natural disaster. Immediately after the disaster, there may be a decline in economic activity followed by an economic growth boom during the reconstruction phase, which is more likely to be observed in relatively wealthier countries. However, for local businesses, whether in developed or developing countries, the situation is much more complex. While dealing with pre-existing economic vulnerabilities, the combination of these vulnerabilities with the effects of the disaster leads to challenges such as the need for relocation, loss of experienced personnel, changes in consumer behavior, disruptions in the supply chain, and difficulties in insurance payments. Therefore, to achieve rapid regional development after a disaster, it is necessary to develop specific policies that target and prioritize SMEs (Small and Medium Enterprises).

Considering the challenges encountered at the regional level, changes caused by the disrupted economy, including the position of consumers, changing demographic characteristics, insurance payments, geographical relocations, and other factors, should be utilized for economic recovery. Furthermore, regardless of whether insurance payments, personal savings, or direct government intervention fuel it, an inevitable reconstruction boom may occur. During the recovery process, both challenges and opportunities will arise as each sector repairs and transforms itself. Policymakers and business owners should engage in medium and long-term planning while reviewing economic processes that encourage troubled economic sectors in need of assistance and highlight growth opportunities.



Approximately half of the country's territory (42%) is located in the first-degree earthquake zone, and 24% is in the second-degree earthquake zone. Therefore, 43-45% of Turkey's population lives in the first-degree earthquake zone, while 22.9-27.9% lives in the second-degree earthquake zone. Natural disasters like earthquakes can have devastating effects on societies, leading to loss of life, destruction of property, and widespread disruptions. While immediate response to an earthquake is critical for saving lives and providing emergency assistance, planning for the post-earthquake period, and taking post-earthquake measures are equally important. Therefore, policymakers, community leaders, and individuals need to make a continuous effort to implement practical, medium- and long-term policy recommendations aimed at reducing future earthquake risks, enhancing infrastructure resilience, and ensuring the well-being of affected communities. By taking proactive steps now, we can mitigate the impact of future earthquakes and build stronger, more resilient societies.

According to the earthquake report published by ITU (Istanbul Technical University) in February, existing collection and separation facilities and recycling facilities in the recyclable area, such as paper, plastic, metal, glass, and wood, can be integrated into the economy in coordination with methods similar to the example of the mobile recycling facility.

### **Urgently Recommended Measures to be Taken:**

- Detailed analyses should be conducted regarding the macroeconomic and socio-economic dimensions of the economic impacts of earthquakes, with examples available<sup>5,6</sup>. Impact assessments will assist in formulating appropriate policies. Damage analyses, economic recovery plans, and financial approaches should be transparently shared with the public and civil society as much as possible to foster stakeholder engagement. These damage assessment reports and effective communication will enhance the crisis management capabilities of the private sector and NGOs. The coordination issues during earthquake processes have also highlighted the necessity for public collaboration with NGOs.
- A scientific approach should be emphasized in earthquake risk and economic preparedness efforts for the future. For instance, a recent scientific article published on May 30, 2020, with the joint authorship of two Turkish seismologists, Ezgi Karasözen from the University of Alaska, and Didem Cambaz from Boğaziçi University, indicated that the 6.8 magnitude Elazığ earthquake on January 24, 2020, signaled a major rupture on the Eastern Anatolian fault line<sup>7</sup>. Numerous academic studies on seismic gaps point to locations with the potential for generating earthquakes. Based on scientific findings, prompt planning for disaster preparedness should commence at the provincial and regional levels.
- Urban transformations in earthquake-prone regions or areas with seismic risk in Turkey should be approached from an inclusive perspective, considering island-based development rather than parcel-based development.
- Special arrangements can be made for businesses that have been affected by earthquakes but have the potential to resume operations, such as waiving half of the accumulated tax and social security premium debts for the year 2022 and deferring the remaining amount interest-free until 2024. Significant simplifications should be implemented regarding rental withholding tax and rental declaration obligations.

<sup>5</sup>[Economic Effects Of The 1999 Turkish Earthquakes: An Interim Report](#) Economics Department Working Papers No. 247 By Alexandra Bibbee, Rauf Gonenc, Scott Jacobs, Josef Konvitz And Robert Price-26 June 2000

<sup>6</sup>[Turkey Marmara Earthquake Assessment](#), September 14, 1999 Turkey Country Office The World Bank-14 September 1999

<sup>7</sup>[“The 2020 Mw 6.8 Elazığ \(Turkey\) Earthquake Reveals Rupture Behavior of the East Anatolian Fault”](#)

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- To preserve production and export capacity, especially in regions severely affected by earthquakes, exemption from credit restrictions imposed by the Banking Regulation and Supervision Agency (BDDK) and the Export Credit Bank of Turkey (Eximbank) for a period of 12 months should be considered.
- The provinces of Adana, Adıyaman, Diyarbakır, Gaziantep, Hatay, Kahramanmaraş, Kilis, Malatya, Osmaniye, Şanlıurfa, and Elazığ, which are under a state of emergency, possess advanced industrial facilities and contribute positively to Turkey's GDP by increasing their export activities. These provinces have the potential to become locomotives of Anatolia's production power. In order to facilitate rapid recovery in the operating capital of businesses affected in these regions, the cost of industrial energy can be reduced by nearly half for a period of 18 months.
- Earthquake insurance, although varying for each case and policy, covers approximately 80% of the damages incurred by earthquakes through deductibles. Businesses with damaged factories need to finance the remaining portion that cannot be covered by insurance through their own resources. To assist in financing a portion of the losses, the government can introduce a support package in the form of a 5 or 7-year loan, with a repayment holiday of 2 years, indexed to the Reference Interest Rate. Distressed businesses that meet the criteria can benefit from this loan package to quickly address their damages and resume operations. Heavy penalties should be imposed to deter the misuse of support and incentives.
- The proposal for SMEs to own factories and workshops as easily as paying rent was an important suggestion by TÜRKONFED to support regional development. It has become a significant need for the Construction and Housing Development Administration (TOKİ) to focus on the construction of workplaces, factories, and workshops, in addition to its existing role in eliminating both national and regional development issues and restoring normal economic functioning through the TOKİ Model and the Support Package for Regional Development.
- Field surveys conducted by TÜRKONFED indicate that the Anatolian business community reports a heavier impact from the migration of workforce from earthquake-prone regions to their own regions compared to capital migration. Our fixed capital and industrial facilities have lost their workforce. In addition to incentives and support for the return of the workforce, it is essential to provide housing, healthcare, and education services at a humane level. The main reason for employers and employees not returning is the disruption in housing, healthcare, and education services. State institutions have seen significant personnel migration. Special incentives should be provided for professional officials who will be deployed in these regions to ensure that the quality of education, healthcare, and other services does not decline.
- According to survey and interview results, lack of planning and coordination problems are mentioned as the most fundamental issues by the business community at both the local and national levels. Policies should be formulated on a reasonable basis and carried out within the framework of impact analysis. Moreover, collaboration and coordination should be enhanced among civil society, central and local governments.
- The banking sector, in general, is unable to create the necessary financing for businesses to sustain their working capital and make new investments. Through our surveys, interviews, and direct discussions, we have learned that although a 50 billion Turkish Liras KGF (Credit Guarantee Fund) loan has been announced for the earthquake-stricken region, banks are reluctant to provide credit to affected companies. During such a period, KGF loans need to be rapidly activated. Financial stress and price instability continue to reduce banks' appetite for lending, while the earthquake-affected region remains negatively divergent from the national average.

- The social fabric of cities has been damaged. Housing is a fundamental need, and local culture and the historical essence of cities should be preserved.
- There has been a demographic change in the labor market after the earthquake, and both the business community and economic management should take joint steps to increase youth employment at the regional level. Direct support, such as social security premium exemptions, tax incentives, and even temporary wage subsidies, rather than just incentives, can make a meaningful contribution to youth employment for SMEs and organized industrial zones (OIZs).
- Legal regulations and corporate governance issues related to earthquakes should be addressed, allowing for opportunities for "better city planning for earthquake resilience" initiatives.
- The post-earthquake reconstruction and economic rehabilitation processes should be approached within the framework of an economic development approach that emphasizes the market economy. Exemplary basins can be created in a well-planned reconstruction process.

## 6. Disaster Risk Management

### 6.a) Japan as an Exemplary Country in Disaster Risk Management

In recent years, the Great East Japan Earthquake has emerged as the biggest disaster that highlights both the dimensions of the disaster and the success of its management in terms of disaster risk management. The Great East Japan Earthquake (GEJE) was a complex disaster involving an earthquake, tsunami, nuclear accident, and disruption of supply chains. According to a report by the World Bank written after the disaster, Japan's advanced disaster risk management (DRM) system, built over centuries, was effective in reducing the impact. The key elements of the DRM system include investments in structural measures, early warning systems, participation of various stakeholders, effective legislation, and the use of advanced technology. However, advancements in risk assessment, coordination mechanisms, and addressing the needs of vulnerable groups are seen as important lessons for future disaster response.

**Table-7: Roles of Multi-Hazard Society According to DRM**



[Source: Ranghieri, F., & Ishiwatari, M. (Eds.). (2014)]<sup>8</sup>

Japan's DRM system has highlighted both its successes and areas for improvement following the Great East Japan Earthquake. Japan's DRM approach emphasizes a comprehensive and integrated strategy that combines preventive structural measures with non-structural measures and a deep understanding of uncertainties. The country is aware of the importance of learning from past disasters and has incorporated these lessons into policies, laws, investment models, and societal behaviors. DRM is seen as everyone's responsibility, with clear roles and responsibilities defined for national and local governments, and collaboration with stakeholders from the public and private sectors. Community engagement and participation are crucial, with the integration of community-based DRM activities into daily life and active involvement of communities in response and recovery efforts. Partnerships with the private sector have also played a critical role in facilitating rapid rehabilitation and recovery.

Japan has implemented many successful measures in preparation for disasters such as earthquakes. To summarize the findings from the World Bank's study, successful strategies and practices include investments in structural measures, advanced risk assessment and early warning systems, hazard mapping and scenario development, cultural preparedness for disasters, and effective legislation and regulation. These contributions have helped Japan reduce the impact of earthquakes and other natural disasters, protect lives, and minimize damage.

### 6.b) Disaster Risk Management in Türkiye

The Türkiye Disaster Risk Reduction Plan (TDRRP) is a national plan prepared under the coordination of AFAD, covering the years 2022 to 2030. It involves public institutions and organizations, local governments, the private sector, civil society organizations, universities, and individuals to carry out risk reduction efforts for all types and scales of disasters that may occur in Türkiye. While the Türkiye Disaster Risk Reduction Plan (TDRRP) and Türkiye Disaster Response Plan (TDRP) have been completed, the Turkey Post-Disaster Recovery Plan (TPDRP) is in the preparation stage, which will have 10 sectors and 39 primary task areas. The aim is to address disaster management in these three main processes, develop plans, action strategies, and the necessary infrastructure.

<sup>8</sup> Ranghieri, F., & Ishiwatari, M. (Eds.). (2014). Learning from megadisasters: lessons from the Great East Japan Earthquake. World Bank Publications.

However, we observe that the recovery plan, TPDRP, for the Kahramanmaraş earthquake has not been published. On the other hand, Provincial Disaster Risk Reduction Plans (PDRRP) have been published for all 81 provinces by the Ministry of Interior. PDRRP focuses on local governments, including authorities and managers at the provincial or regional levels, to address the need for managing the underlying factors of disaster risk and strengthening good governance in disaster risk management. A total of 1,503 action decisions have been made for the 81 provinces affected by earthquakes, including 503 related to earthquakes. However, the TDRRP and PDRRP plans could not be implemented shortly after the February 2023 Kahramanmaraş earthquakes, and there were shortcomings in the implementation of risk management processes even after the disaster occurred.

Developing and reviewing practical and comprehensive plans for disaster preparedness, response, and post-disaster recovery is of great importance, not only for the central government and organizations but also for involving civil society organizations (CSOs), regional organizations, the private sector, and businesses as key stakeholders. This collaborative approach will enable well-coordinated and effective disaster response as well as rapid and effective economic recovery in the post-disaster period. By actively involving these different organizations, the plans can benefit from their expertise, resources, and networks, and provide a more resilient and sustainable recovery process. Regularly reviewing and updating the plan will ensure its ongoing relevance and alignment with evolving challenges and lessons learned from past disasters. In conclusion, a robust and inclusive disaster management framework will enhance the overall capacity for risk reduction, effective response, and promoting long-term resilience in the face of future disasters.

