

Recommendations for Mitigating Earthquake Damage and Promoting Economic Recovery in Turkey

– Insights from the 2023 Kahramanmaraş Earthquake Survey –

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Abstract

This paper presents an analysis of Turkey's economic policies and insurance systems in contributing to post-disaster economic recovery, based on interviews conducted with Organized Industrial Zone (OIZ) and companies in the main affected areas of the Kahramanmaraş earthquake from October 8 to 15, 2023. The study identifies several key issues. Firstly, Turkey's chronic inflation diminishes insurance payouts and adversely affects post-disaster living conditions and business recovery plans. Thus, controlling inflation through appropriate monetary policies is crucial for economic recovery. Secondly, the structural problem of the Turkish Catastrophe Insurance Pool (TCIP) compulsory earthquake insurance is discussed, highlighting the lack of mandatory renewal requirements, which reduces the incentive for policyholders to maintain their insurance coverage. Thirdly, OIZs are presented as successful examples of disaster preparedness, underscoring the need to assess the impact at other industrial areas and at the civic level. Finally, the paper examines employment issues arising from the outflow of residents and high labor mobility, proposing the implementation of effective Business Continuity Plans (BCPs) that consider these factors.

Key words: Kahramanmaraş earthquake, Turkey, Disaster recovery, BCP, Monetary policy

1. Introduction

The primary objectives of this paper are twofold: firstly, to discuss whether Turkey's economic policies and insurance systems are structured to support post-disaster economic recovery from a Business Continuity Plan (BCP) perspective; and secondly, to highlight the remaining challenges based on the field survey conducted in the affected areas. The 2023 Kahramanmaraş earthquake resulted in significant economic losses for Turkey. Recovery efforts require not only the restoration of infrastructure but also comprehensive recovery plans that consider economic policies, insurance systems, and cooperative frameworks among the government, businesses, and citizens in the context of Turkey's socio-economic system. Considering these socio-economic aspects in recovery planning is vital for effective disaster risk management and BCPs, offering a strategic approach to reducing social costs and achieving faster economic recovery. Based on the survey conducted from October 8 to 15, 2023,

this paper examines the issues to be addressed for mitigating disaster damage and promoting economic recovery, focusing on Turkey's economic and monetary policies.

2. Efforts for Recovery and Reconstruction in Turkey

The World Bank has estimated that the direct damage caused by the Kahramanmaraş earthquake exceeds \$34 billion¹⁾. Additionally, the long-term reconstruction costs are projected to range between \$45 billion and \$80 billion²⁾. These estimates include the direct costs of debris removal, reconstruction and renovation of buildings and housing, restoration of infrastructure and public facilities, and economic losses resulting from labor force disruptions. Moreover, considering secondary indirect costs, the total could increase to as much as \$150 billion. This variance in reconstruction costs underscores the complexity of fully grasping the extent of earthquake damage.

In response, at the end of June 2023, the World Bank approved a \$1 billion loan package for Turkey’s earthquake-affected areas as part of an earlier agreed financial support totaling \$1.8 billion³). This loan focuses on public services and rural housing, representing international support. Additionally, the World Bank, in collaboration with Turkey’s Ministry of Finance, agreed on a new supplementary project worth \$450 million for Turkish SMEs (Small and Medium Enterprises) in the 11 affected provinces⁴).

Furthermore, the Turkish government initiated a project to construct over 180,000 new residential units in the earthquake-affected areas.

The 11 affected provinces represent 10% of Turkey’s economy, including three key economic regions: Gaziantep, Adana, and Hatay⁵). These regions play crucial roles in agricultural production, industrial production, and manufacturing. Thus, the restoration of economic activities in these affected areas is vital for Turkey’s overall economic growth. The economic benefits of recovering and reconstructing the disaster-hit regions extend beyond the affected areas, contributing to national economic growth. This indicates the importance of economic and disaster prevention policies that leverage both domestic and international support.

3. Chronic Inflation in Turkey and Measures for Improvement

Turkey has experienced chronic inflation for over 20 years, with the annual inflation rate exceeding 80% at times in 2022 (Fig. 1). Inflation driven by economic booms can be seen as a positive aspect, as it results from increased economic activity and expanded money supply, leading to a virtuous

cycle (it should be noted that inflation and economic boom are distinct phenomena). However, chronic and sudden inflation disrupts corporate production planning and exerts pressure on consumer living standards, thereby negatively impacting the economy. It is foreseeable that the living conditions of Turkish citizens will deteriorate as inflation accelerates. In our survey, residents and business managers in the disaster-stricken areas expressed that inflation has made living conditions more difficult, wages for employees have skyrocketed, and the amount paid out as insurance claims has decreased, all of which adversely affect disaster recovery efforts.

Despite these circumstances, the Central Bank of Turkey has continued to intervene by selling dollars to support the exchange rate of the Turkish lira, further accelerating inflation. Additionally, amidst persistent inflation, the bank has implemented interest rate cuts to promote investment and, conversely, sharp interest rate hikes to curb inflation. Such frequent adjustments in policy interest rates have devalued the lira (Fig. 2). Moreover, while raising policy interest rates to control inflation is desirable from a monetary policy perspective, a sudden increase of up to 50% can disrupt corporate investment and residents’ lives, necessitating decisions made after several adjustments.

Inflation impacts the economy by reducing purchasing power due to soaring recovery costs, decreasing investment incentives, and lowering export competitiveness due to increased production costs. Particularly in the case of major disasters like the recent earthquake, the economic burden on the affected residents increases, and the related recovery costs escalate due to high demand. Damage to production facilities caused by the earthquake exacerbates these issues.

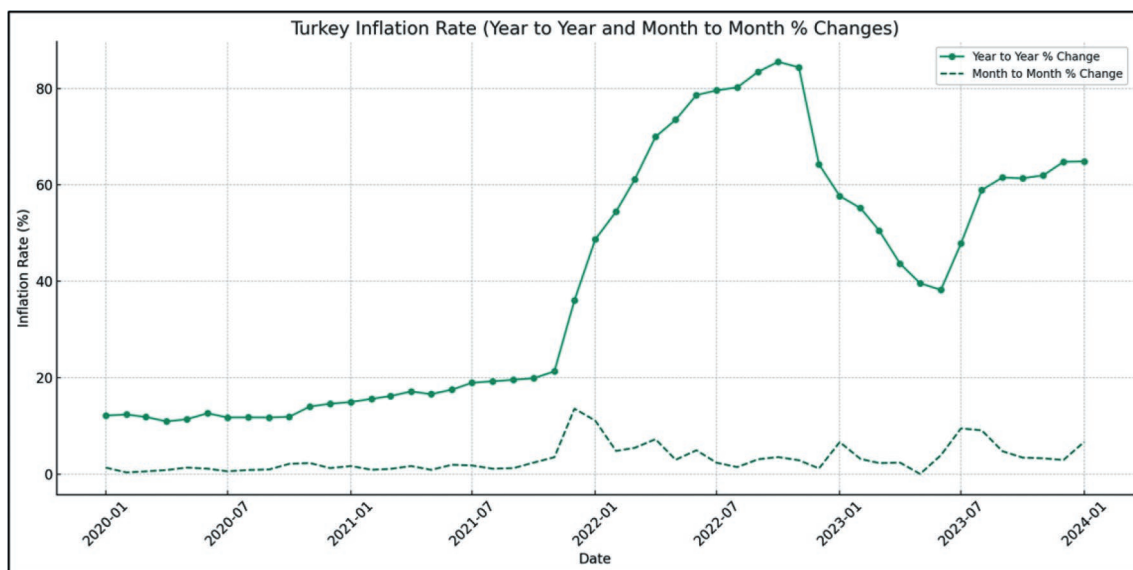


Fig. 1 Annual and Monthly Changes in Turkey's Inflation Rate.

Source: Author's own creation based on Consumer Price Index data (base year 2003) from the Central Bank of Turkey⁶).

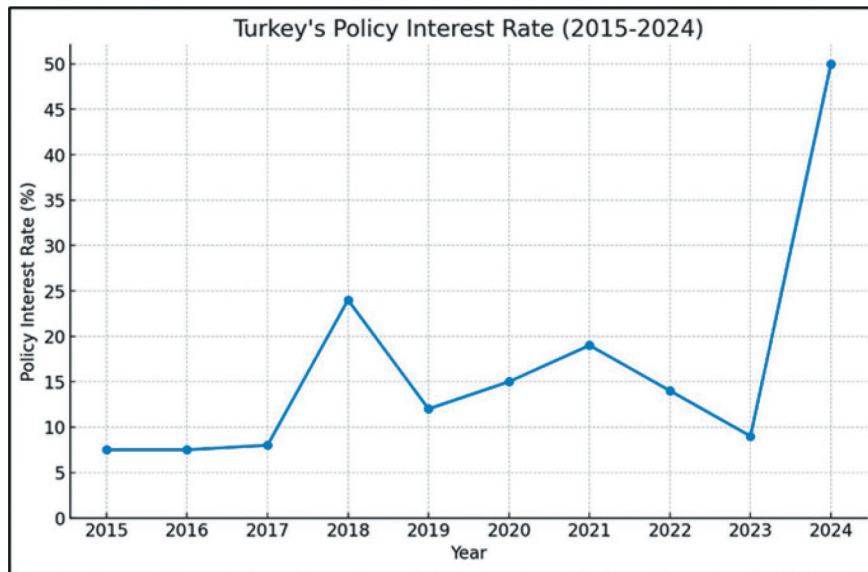


Fig. 2 Annual Changes in Turkey’s Policy Interest Rate.

Source: Author’s own creation based on Interest Rates Index data from the Central Bank of Turkey⁷⁾.

However, Turkey is active in trade with the EU, supported by advanced technology in the manufacturing sector and a high level of university education, ranking as the 19th largest economy in the world by GDP. Therefore, by correcting extreme interest rate and monetary policies and implementing appropriate macroeconomic policies, it is expected that inflation can be controlled, leading to economic growth and mitigation of economic damage post-disaster.

4. Disaster Preparedness and Seismic Resilience Evaluation in Industrial Zones: Focusing on OIZs

This section discusses the role of Organized Industrial Zones (OIZs) in disaster preparedness and the challenges of disaster response in different industrial areas, based on the seismic resilience evaluation conducted by our survey and by Gulsah Sagbas and her team.

By 2022, the Turkish government had established 392 OIZs, employing approximately 2 million people. In the 11 provinces affected by the earthquake, there are 38 OIZs with about 550,000 workers⁸⁾. The Gaziantep OIZ resumed operations 15 days after the earthquake, with electricity and water restored immediately, although it took five days to restore the gas supply. The Adiyaman OIZ, being closer to the epicenter, saw 15 out of 158 buildings collapse, and due to wastewater treatment issues, it reopened a month after the earthquake.

OIZs independently manage their lifelines, such as electricity, water, and gas, leading to faster recovery compared to other facilities in the city. Additionally, OIZs provided shelters within their premises, supplied container housing for employees, and supported the rebuilding process by assessing damage and assisting with reconstruction

procedures. In contrast, Gulsah Sagbas and her team, prior to this survey, visited five provinces (Adana, Osmaniye, Kahramanmaraş, Gaziantep, and Hatay) from February 17 to 21, 2023, and conducted retrospective interviews with facility owners and industrial representatives, surveying 131 industrial facilities, including OIZs⁹⁾.

The evaluation of industrial zone buildings, as depicted in **Fig. 3(a)** to **(c)**, builds upon the survey results presented by Gulsah Sagbas and her team⁹⁾. This analysis focuses on both structural elements (columns, beams, floors, roofs, etc.) and non-structural components (external and internal finishes, ceiling and floor treatments, windows, doors, piping, electrical systems, etc.) across Organized Industrial Zones (OIZ), small-scale industrial areas (IS), and Free Zones (FS). In **Fig. 3(a)**, the structural damage is categorized on a severity scale from 1 to 5, with 1 indicating minimal damage and 5 indicating complete failure or collapse. Similarly, **Fig. 3(b)** outlines non-structural damage using the same 1 to 5 scale. **Fig. 3(c)** evaluates the functionality of the industrial sites, where 1 signifies fully operational facilities, 2 partially operational, and 3 entirely non-operational.

The graph’s vertical axis, labeled “Contribution,” reflects the proportion of each zone (OIZ, IS, FS) contributing to a specific damage or functionality category, rather than indicating the absolute damage levels. This distinction is essential for understanding how much each zone contributes to the overall damage state across the industrial zones. For instance, a higher contribution in categories with more severe damage (e.g., 4 or 5) would suggest that those zones were disproportionately impacted by the earthquake. The horizontal axis displays the respective damage or functionality states, allowing for a comparative evaluation

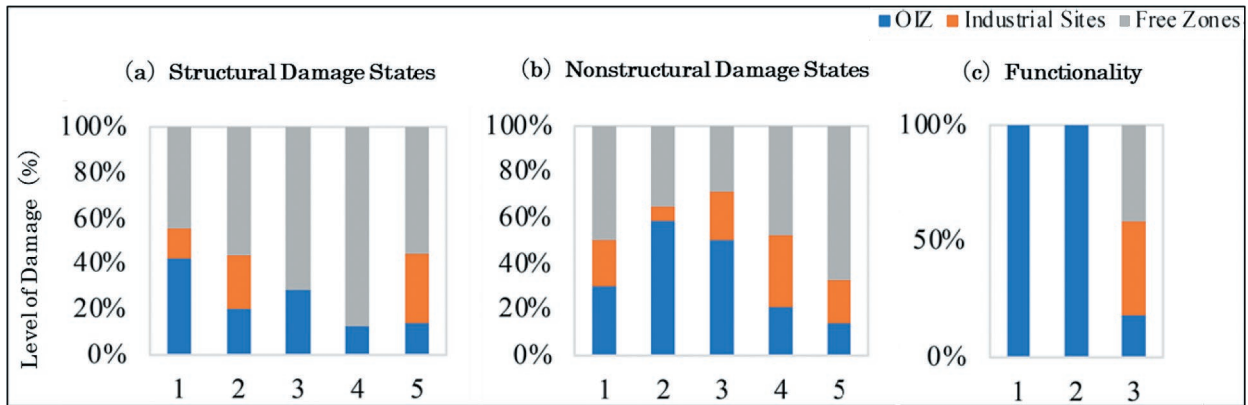


Fig. 3 Distribution of Function Evaluations Based on Industrial Classification.
Source: Gulsah Sagbas *et al.*, 2024, P238⁹⁾.

across the three industrial zones.

Importantly, the survey found that industrial buildings constructed before 2000, particularly those in FS and IS, experienced disproportionately higher levels of damage, both structurally and non-structurally. These older buildings, built before modern seismic codes were fully enforced, exhibited significant vulnerabilities to earthquake-induced forces. In contrast, OIZ facilities generally adhered to stricter, updated building standards, leading to better seismic performance.

The figures reveal that FSs generally experienced more substantial structural and non-structural damage compared to OIZs and IS, which implies that FSs may not adhere to the same stringent seismic design and construction standards as those enforced in OIZs. Additionally, OIZs maintained a significantly higher operational capacity following the earthquake, as evidenced by a greater proportion of facilities remaining fully functional (category 1 in **Fig. 3(c)**).

This performance disparity underscores the effectiveness of OIZs in disaster preparedness and recovery. The stringent building codes and regulations within OIZs, especially for buildings constructed after 2000, likely played a pivotal role in minimizing damage and facilitating swift post-disaster recovery. Conversely, the higher damage rates and reduced functionality in FS and IS facilities, particularly those with older structures, highlight the need for improved disaster planning and resilience in these areas. The economic implications of these findings are also critical; while OIZs were able to resume operations quickly, facilities in FSs and ISs faced longer recovery times and substantial economic losses, including lost productivity and delayed recovery efforts. Understanding the distribution of damage and operational disruption across these industrial zones, especially in relation to the age of the buildings, is crucial for crafting more comprehensive disaster risk reduction strategies and ensuring economic resilience at both local and national levels.

5. The Significance and Challenges of Earthquake Insurance: Focusing on TCIP Enrollment Rates

The Japanese earthquake insurance system aims to promote widespread adoption of earthquake insurance by having the government reinsure the liability of insurance companies, thereby contributing to the stability of the lives of disaster victims¹⁰⁾. This system plays a critical role in mitigating economic losses caused by disasters, supporting the recovery and economic stability of victims, enhancing risk awareness, and influencing public policy formation. In Japan, reinsurance funds are secured through government bonds. The significance of this system lies in sharing national and regional risks and providing security to disaster victims, enabling citizens to live with peace of mind while ensuring financial resources for reconstruction and support. This public expenditure on disaster-related costs demonstrates the public nature of the system.

In terms of financial support for disaster-affected enterprises, the government and banks provide loans, and there is an earthquake insurance system. Turkish earthquake insurance comprises two types: compulsory earthquake insurance and non-compulsory earthquake insurance. Compulsory earthquake insurance is mandated for buildings under public projects and those in rural areas.

Initially, the Turkish government's comprehensive compensation for earthquake-related housing damages discouraged the uptake of earthquake insurance¹¹⁾. However, following the 1999 Marmara Earthquake, the Turkish government recognized the importance of designing systems to mitigate risks arising from large-scale earthquake damage, a burden that could not be shouldered by the government alone. Consequently, in cooperation with the World Bank, the government established the Turkish Catastrophe Insurance Pool (TCIP).

Despite being a compulsory earthquake insurance system,

Table 1 TCIP Insurance Policies and Enrollment Rate.

Province	Total Homes	Insured Homes	Insurance Enrollment Rate (%)
KAHRAMANMARAŞ	210,000	116,173	55.3
HATAY	315,000	120,390	38.2
ADANA	479,000	276,928	57.8
ADIYAMAN	89,000	41,228	46.3
GAZIANTEP	339,000	234,859	69.3
ELAZIĞ	135,000	91,500	67.8
KİLİS	25,000	16,719	66.9
DIYARBAKIR	231,000	88,690	38.4
OSMANIYE	101,000	62,505	61.9
ŞANLIURFA	198,000	90,778	45.8
MALATYA	188,000	117,059	62.3

Source: Author's own creation based on “Active Policies” from Dask (Natural Disaster Insurance Institution) ¹²⁾.

the enrollment rate for TCIP remains low. As shown in **Table 1**, the enrollment rate in the 11 provinces near the epicenter varies from 38.2% in Hatay to 69.3% in Gaziantep, with an average enrollment rate of only 55.5% as of the end of February 2024. The enrollment rate in **Table 1** is calculated by dividing the number of insured houses by the total number of houses in each province.

The low enrollment rate, despite the compulsory nature of earthquake insurance, is due to the lack of a requirement for policyholders to renew their contracts in subsequent years¹³⁾. Renewal is only required once when using water and electricity subscriptions, paying municipal taxes, conducting registration transactions, or during the loan period of a mortgage provided by a bank. Consequently, renewals are generally not carried out.

Certainly, the generous housing compensation in Turkey might reduce the incentive to renew TCIP-provided earthquake insurance. However, the underutilization of an earthquake insurance system designed based on lessons from the 1999 Marmara Earthquake indicates that the role of TCIP and the effective use of tax funds for system operation are not being fully realized. The significance of such earthquake insurance lies in providing financial measures to aid the recovery and reconstruction of residents, shops, and enterprises after a disaster. Although TCIP insurance is mandatory, it represents a critical and pioneering system globally for mitigating economic damage following a major earthquake. Moving forward, it is essential to determine how to balance housing compensation with private insurance, and to adjust the coverage provided by each system to ensure residents and the enterprises they belong to have a clear direction for recovery-focused insurance. This is also important from the perspective of BCP in the financial domain.

6. Issues Raised Based on the Survey in Turkey: Remaining Challenges

This chapter addresses the challenges that need to be tackled based on our survey. The first issue is the depreciation of insurance payout amounts due to ongoing inflation. As shown in **Fig. 1** of Chapter 1, continuous inflation reduces the real value of payouts that disaster victims or affected companies expected at the time of the initial contract. In a situation like Turkey, where the annual inflation rate ranges between 60-80%, it is easy to imagine that the real payout amounts based on the contract year would depreciate exponentially. During the investigation of the OIZ in Adiyaman, the person in charge expressed the opinion that the insurance payments received after the disaster were substantially reduced in real terms due to hyperinflation, rendering them of little use for restoration purposes. In such an inflationary environment, possible solutions include introducing (1) inflation-adjusted insurance—where payouts are periodically adjusted to maintain their value relative to inflation; (2) index-linked insurance—where payouts and premiums are automatically adjusted based on specific indices like the Consumer Price Index; and (3) value-adjusted life insurance—where the insurance amount is periodically evaluated and adjusted according to market inflation rates. Alternatively, paying insurance in USD or EUR could mitigate the depreciation risk of the Turkish lira. However, these insurance options generally come with higher premiums, so the benefits of reducing inflation risks must be weighed against the costs of these premiums.

The second issue is the employment problems caused by the outflow of human resources post-disaster. Our survey found that some disaster victims did not return to the affected areas, resulting in labor shortages and wage inflation due to the negative synergy with overall inflation. Business

managers reported that wages had doubled compared to pre-disaster levels. One reason for the labor shortage is the high proportion of rental contracts among residents, leading to a lack of incentive to return to the disaster-affected areas. Consequently, businesses face a shortage of skilled employees who had previously been working before the disaster. Similar employment outflow issues may arise in Japan following a major disaster.

In addressing these problems, the third consideration is the relevance of ISO 14001's Environmental Management System (EMS) guidelines, which emphasize the participation of all employees. ISO 14001's clause 7.2 "Competence, Training, and Awareness" stresses the importance of identifying the competencies of all employees and providing education and training to ensure they understand environmental policies, goals, procedures, roles, and responsibilities¹⁴). Drawing from ISO 14001's clause 7.2, BCP manuals should be shared, including (1) distributing disaster response procedure manuals to all employees to clarify emergency response steps, (2) regularly reviewing and updating these manuals to reflect the latest information, and (3) conducting regular BCP training to simulate evacuation procedures and recovery tasks during an earthquake. Additionally, it is crucial to establish communication channels between employees and managers by introducing a messaging app to share emergency information quickly and prepare for emergencies.

Moving forward, it is essential to enhance the effectiveness of BCP and ensure swift recovery and business continuity post-disaster by conducting comparative institutional analyses considering the socio-economic differences between Turkey and Japan. In Japan, with its skewed population structure due to aging and declining birth rates, some young and child-rearing generation members did not return to their homes post-disaster, as observed after the 2011 Great East Japan Earthquake. They found new jobs or settled in evacuation sites, indicating a future outflow of regional economic contributors, potentially impacting local economies. Therefore, the government needs to formulate economic policies that facilitate the return of disaster victims while also ensuring economic sustainability in scenarios where some residents do not return. This multifaceted approach, including BCP training mechanisms, is crucial.

The fourth issue is establishing defense systems against asbestos dispersion in waterworks and buildings during earthquakes. Asbestos, characterized by its fine fibers, resistance to heat, friction, and chemicals, ease of processing, and low cost, has been used in construction materials, friction materials, and industrial products such as cement pipes. Asbestos-related diseases like mesothelioma and lung cancer can take 10-50 years to develop post-exposure, with

mesothelioma having a one-year survival rate of 50% and a five-year survival rate of less than 5%, indicating extremely poor prognosis. Earthquakes can cause asbestos to disperse rapidly due to building damage. Without proper dust control measures for residents or during asbestos material transport and disposal, there is a risk of a surge in asbestos-related health issues among residents and waste handlers in the affected areas in the coming decades. Japan has implemented various regulations on asbestos use, replacement of asbestos buildings, and measures to prevent asbestos dispersion during demolition, along with relief systems for asbestos health victims. For instance, the "Mesothelioma, Lung Cancer, and Asbestos Center" in Japan, where the author is affiliated, has accumulated knowledge on preventing asbestos dispersion and mitigating post-disaster damage, which should be shared with relevant agencies in both countries for effective damage mitigation.

Finally, another issue is addressing the burden of public utility costs (particularly water charges) due to the influx of refugees into disaster-affected areas. Establishing a system where refugees and surrounding migrants bear the same costs for public services as local residents is urgent. If creating such a fair cost-sharing system proves difficult, utilizing international aid funds to offset the costs associated with refugee intake could be a preliminary step.

7. Conclusion

In this paper, we examined the challenges for economic recovery in Turkey, focusing on the financial and insurance systems, based on interviews conducted with OIZs and companies in the disaster-affected areas from October 8 to 15, 2023. The main points discussed are as follows:

First, to mitigate the post-disaster damages suffered by residents and businesses in the affected areas, it is crucial to control inflation through appropriate macroeconomic policies. Inflation control can lead to a reduction in social costs associated with economic recovery. Given the persistent inflation in Turkey, an insurance system that takes expected inflation rates into account is necessary.

Second, we discussed the issues of the compulsory insurance system based on the TCIP's earthquake insurance enrollment rates. The core of the problem lies in the lack of mandatory contract renewal despite the penalties and legal measures in place for non-enrollment. This reduces the incentive for policyholders to continue participating in the compulsory insurance system, necessitating institutional reforms. Additionally, the comprehensive housing compensation in Turkey further decreases the incentive to maintain earthquake insurance. Therefore, to effectively operate the compulsory insurance system, it is necessary to delineate and integrate the mechanisms of both systems.

Third, OIZs are a successful example of disaster countermeasures, and it is necessary to advance the understanding of damage at the level of other industrial districts and citizens. Identifying lost profits is an important effort to clarify the damage structure for businesses and residents in the affected areas.

Fourth, we addressed the employment issues caused by the outflow of human resources post-disaster and the corresponding BCP strategies. Our survey found that some disaster victims did not return to the affected areas, resulting in labor shortages and wage inflation due to the negative synergy with overall inflation. In response, we suggested methods for sharing BCP manuals based on the guidelines of ISO 14001, clause 7.2, which anticipates the outflow of human resources from disaster areas.

In any case, understanding and accumulating knowledge on the common and different elements of the social and economic systems in Japan and Turkey, while considering the differences, will provide a guideline for overcoming the above challenges and advancing economic recovery.

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トルコにおける地震被害の軽減と経済復興に向けた若干の問題提起 － 2023年カフラマンマラシュ地震の被災地調査を踏まえて－

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要 旨

本稿では、2023年10月8日～15日に実施したカフラマンマラシュ地震における主な被災地域におけるOIZや企業等へのヒアリング調査をもとに、BCPの観点から、トルコの経済政策や保険制度が震災後の経済復興に寄与するような仕組みになっているのかどうかについて述べた。そのうえで、トルコの被災地調査を踏まえ積み残した課題について若干の問題提起を行った。第1に、トルコの慢性的なインフレは、保険金支払額の目減りを引き起こすうえに、被災後の住民生活と企業の復旧計画に悪影響を与えることから、経済復興を成し遂げるためには、適切な金融政策にもとづくインフレの抑制が重要になる。第2に、TCIPの強制地震保険への加入率をもとに、同保険に加入義務があるにもかかわらず、契約更新の義務づけがないため、保険加入者は同保険に加入し続けるインセンティブが下がるという構造的な問題について述べた。第3に、OIZは災害対策の成功例であり、その他の産業地区や市民レベルでの被害の実態把握を進めていく必要がある。第4に、被災後の住民流出による雇用の問題と労働流動性の高いなかでのBCPのあり方について考察した。

キーワード：カフラマンマラシュ地震、トルコ、災害復興、BCP、金融政策