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State Comptroller Office

Local Authorities' Preparedness for Earthquakes

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Background

The state of Israel is located between the African and the Arabian Plates, close to an area with considerable tectonic activity. The African Plate split along a line from north to south. The line is known as the Dead Sea Rift and is also known as the "**Syrian-African Rift "** (fault line or great rift valley)[1] that runs from southern Turkey through Syria, Lebanon, the Jordan Valley, the Arava Desert, the Gulf of Eilat, the Red Sea and southward along eastern Africa.

Since the State of Israel is located close to the Great Rift Valley, it is exposed to the risk of a massive earthquake. In 1980, the State of Israel, like other countries, set a binding standard for the construction of buildings increaing their resistance to earthquakes. Construction of buildings not according to the standard (mainly before the date on which the standard was set), the "aging" of buildings, and the difficulties involved in increasing the resistance of populated buildings endanger the safety of those buildings and the population living in them. The risk is exceptionally high in the periphery and in local authorities close to the fault lines, with a high seismic hazard.

Analysis of historical data of the occurrence of earthquakes[2] in our region, especially the strongest ones, considering the distribution of their rate of occurrence along the Great Rift Valley within the boundaries of Israel from the 8th century, indicates that a 6.0 and higher magnitude earthquake strikes every 80 years on average. Given the above, and since the last massive earthquake took place in the area of Eilat in 1995, the prevailing assumption is that there is a high probability that within the next fifty years, there will be another strong earthquake in the region from south Lebanon and the southern part of the Dead Sea.

Coping with emergencies that usually occur without early warning, such as earthquakes and fires due to extreme weather conditions, requires systemic and inter-organizational preparedness of multiple bodies and the pooling of national resources. It requires optimal readiness of the home front for all types of emergencies, and the local authorities have an essential role in the home front's preparedness for emergencies.

This report, added to the previous State Comptroller's reports on Israel's earthquake preparedness, presents a longstanding failure in state preparedness for earthquakes, especially of peripheral communities along the Great Rift Valley.

1 Fault is a term in Structural Geology which describes a crack in the rocks composing the Earth Crust, due to pressures that cause movement of blocs of rocks on both sides of the crack.

2 Massive Earthquakes (at least 6.0 magnitude) which caused relatively great destruction and multiple casualties.

The report's findings emphasize the need for multiple measures based on a long-term perception to optimize the state's preparedness for massive earthquakes.

In early February 2023, we all had a reminder of the destructive outcomes of a massive earthquake that might take place in Israel. Without early warning, a 7.8 magnitude earthquake struck Turkey in the middle of the night. The quake originated in southern Turkey, west of Gaziantep, along the northern part of the Great Rift Valley, and hit many cities in south Turkey and north Syria. The earthquake was also felt in Lebanon, Cyprus, Greece, Russia, Romania, Georgia, Iraq, Jordan, Egypt and Israel. This earthquake and an additional one at a magnitude of 7.7, taking place around noon the following day, led to the collapse of over 12,000 buildings and over 500,000 people lost their homes. By the time the report was completed in mid-February 2023, the number of casualties in Turkey and Syria had reached 50,000, and the number of wounded was estimated at more than 122,500. These numbers are expected to increase or even multiply. It will take a long time to assess the full extent of the damage and many years and billions of euros to rebuild the damaged areas. Since the massive earthquake that struck Turkey and Syria, minor earthquakes, also felt in Israel, continue to strike our region frequently.

Key Figures

80 years

on average, a massive earthquake (6.0 on the Richter scale and higher) takes place in the vicinity of Israel every 80 years. The last 6.0 magnitude earthquake struck the region of Eilat in 1995

about 800,000

the number of people who died in earthquakes around the world between 1990 and 2018

about USD 34.5 billion

the annual average of financial damages caused by earthquakes around the world between 1990 and 2018

about USD 11.3 billion

the extent of financial savings from the damage caused by the Los Angeles earthquake in 1994, about 40% of the financial damages, if the buildings in the region of Los Angeles had been built according to earthquake resistance standards

1,208

the total number of buildings that require immediate reinforcement in Beit Shean, Tiberias, Safed, Kiryat Shmona and Hatzor HaGlilit

about NIS 2.34 billion

the cost of reinforcement plus protection of the buildings in the five local authorities

93%

rate of buildings for which the reinforcement process had not been completed by the Ministry of Housing by the audit end date out of the total number of buildings requiring immediate reinforcement (1,124 out of 1,208) in the five local authorities

70%

rate of schools that had not been reinforced by the audit end date out of the total number of schools designated for reinforcement (38 out of 54 schools) in the five local authorities

about 50,000

number of casualties in the area that was struck in Turkey and Syria as of mid-February 2023

about 122,500

estimated number of wounded in the area that was struck in Turkey and Syria as of mid-February 2023

about 500,000

the number of people who lost their homes in the area struck by the earthquakes in Turkey and Syria in February 2023

about 12,000

the number of buildings that collapsed in the areas that were struck by the earthquakes in Turkey and Syria in February 2023

Audit Actions

From May to December 2022, the State Comptroller's Office examined the local authorities' earthquake preparedness. The audit was conducted in five local authorities: **Beit Shean**, **Tiberias**, **Safed**, **Kiryat Shmona**, **and Hatzor HaGlilit**, located along the Great Rift Valley and are at a high risk of being struck by a massive earthquake. The audit focused on their preparedness for earthquakes in their jurisdictions, particularly on the following: preparedness of municipal infrastructures (public infrastructures, public buildings, private buildings); preparing the population (increasing public awareness, establishing emergency teams) and the authorities' preparedness for the "day after" (setting an emergency unit, pooling of equipment and resources).

Supplementary audits were conducted in the Ministry of Interior – Emergency Services Administration (Emergency Administration); the Ministry of Defense – Home Front Command; The National Emergency Management Authority (NEMA); and the National Steering Committee for Earthquake Preparedness (Steering Committee); in the Ministry of Education; the Ministry of Housing and at the Israel Mapping Center.

Key Findings

- **Implementation of the National Outline Plan 38 (NOP 38) in Peripheral Local Authorities** – NOP 38 was not implemented **in Beit Shean, Tiberias, Safed, and Kiryat Shmona and the local council of Hatzor HaGlilit**, although all of them are located in high-risk areas and even though NOP 38 was the main plan intended for implementing government policy to reinforce buildings because it is based on an economic model, according to which implementation of the plan would increase the value of the properties in areas where the value of land is high.

- **Buildings' Reinforcement by the Ministry of Housing** – although the Ministry of Housing initiates buildings' reinforcement in various ways according to its budget, as of the audit date, only 84 buildings out of the 1,208 buildings designated for reinforcement were reinforced (7%) **in Beit Shean, Tiberias, Safed and Kiryat Shmona and the local council of Hatzor HaGlilit**. If the reinforcement process continues to progress at this rate it will take dozens of years to complete the reinforcement of all the buildings that might not be resistant to a high-intensity earthquake.

- **Mapping Buildings that Require Reinforcement** – even though in 2018, the Home Front Command mapped 1,208 buildings that require reinforcement **in the jurisdictions of Beit Shean, Tiberias, Safed, Kiryat Shmona and Hatzor HaGlilit** and the fact the information was available for these authorities, no evidence was found to indicate that they were using the information to advance reinforcement following the outcomes of mapping.

- **Buildings' Reinforcement Operative Plan** – although the Home Front Command mapped the buildings that require reinforcement in **the jurisdictions of Beit Shean, Tiberias, Safed, Kiryat Shmona, and Hatzor HaGlilit**, as of the audit end date, no operative plan had been developed and no budgetary resources had been allocated to reinforce all the designated buildings so that they would be able to resist earthquakes. It should be noted that cities worldwide have been preparing for earthquakes, for instance, Vancouver in Canada has developed a specified earthquake preparedness plan. The main domains addressed as part of Vancouver's preparedness were water and

sewage systems; fire extinguishing systems, bridges' reinforcement, an action plan regulating bridge access, and emergency transportation.

- **Access Roads and Bridges** – three of the four entrances to **Beit Shean** are through bridges; two of these bridges are expected to collapse if an earthquake hits the city. The master files of **Tiberias, Safed, Kiryat Shmona, and Hatzor HaGlilit** indicate that in the event of an earthquake, they might be disconnected in terms of transportation due to the blocking of the access roads leading to them.

- **The City Halls of Beit Shean, Tiberias, Safed, and Hatzor HaGlilit** – even though **the city halls of Beit Shean, Tiberias, Safed, and Hatzor HaGlilit** are located in buildings built before 1980 and the fact that these buildings had not been reinforced, these local authorities did not advance reinforcement of these buildings.

- **School's Reinforcement** – 70% of the schools that were designated for reinforcement were not, and upon audit end date, only 16 out of the 54 designated schools had been reinforced in the jurisdictions of **Beit Shean, Tiberias, Safed, Kiryat Shmona, and Hatzor HaGlilit**.

- **Insuring Properties Against Earthquakes** – **Beit Shean, Tiberias, Safed, and Kiryat Shmona and the local council of Hatzor HaGlilit** insure their properties through private companies that offer various insurance policies against damages that might be caused in their jurisdictions, including damages due to earthquake. The value of the insured property ranges between NIS 145 million (**in the jurisdiction of Beit Shean,** with 18,700 residents) and NIS 681 million (**in the jurisdiction of Tiberias**, with 45,900 residents). The annual premium paid by the audited authorities ranges between NIS 67,000 (**in the jurisdiction of Hatzor HaGlilit** with 9,500 residents and where the value of the insured property is NIS 152 million) and NIS 857,000 (**in the jurisdiction of Tiberias**). The above differences might indicate gaps in insurance coverage and insurance costs.

- **Insuring Private Apartments Against Earthquakes** – in 2020, the rate of apartments insured by mortgage banks was about 19.3% of all insured apartments, a decrease compared to 2015, when 20.8% of all insured apartments were insured through mortgage banks. It should be noted that in 2020, there were 2.7 million residential apartments in Israel, and 67% of these apartments were insured.

- **Making Information Accessible for the Public** – **Beit Shean and Tiberias** have a data base of ready-for-use notifications (notifications prepared in advance for emergencies). However, no earthquake-related notifications were found in these databases. **Kiryat Shmona's** prepared ready-for-use notifications about earthquakes in Hebrew and Russian. **Beit Shean and Safed and the local council of Hatzor HaGlilit** prepared ready-for-use notifications in Hebrew, and since they were not translated into different languages, the residents who do not speak Hebrew were not addressed as the master files specify.

- **Training Officials for Emergencies at the Israel National Resilience Institute** – 57% of the relevant officials in **Beit Shean and Hatzor HaGlilit** did not participate in designated training programs; 14% of the relevant officials in **Tiberias, Safed, and Kiryat Shmona** did not participate in the designated training programs.

- **Emergency Readiness** – audits about emergency readiness conducted by the Home Front Command from 2021 to the audit end date in December 2022 indicate that the level of emergency readiness in **Beit Shean and Hatzor HaGlilit** is low.

- **Emergency Warehouses in Local Authorities** – emergency bodies such as the Emergency Administration in the Ministry of Interior and the responsible bodies in the Ministry of Defense and IDF (NEMA & Home Front Command) had not set a unified standard regarding the minimal volume of critical equipment needed for each local authority in time of emergency and had not set binding criteria about the type of necessary equipment, its storage in the warehouses and its preparation for emergencies such as earthquakes. **Beit Shean and Safed and the local council of Hatzor HaGlilit** do not adequately manage, equip, and maintain the emergency warehouses. As a result, these authorities might be unable to assist their residents in an emergency such as a massive earthquake.

Emergency Warehouses' Readiness – the State Comptroller Office commends **Tiberias and Kiryat Shmona** for adequately maintaining the equipment stored at the emergency warehouses.

Key Recommendations

- **The Prime Minister, Minister of Defense, Minister of Housing, Minister of Interior, Minister of Finance, and the Inter-ministerial Committee for Earthquake Preparedness** should accelerate the efforts intended to increase Israel's readiness for the immediate, urgent risk of a massive earthquake, especially of peripheral local authorities located along the Great Rift Valley. This need should be reflected in budgetary priorities as part of the state's budget. The **Prime Minister's Office, the Ministry of Defense, the Ministry of Housing, the Ministry of Interior, the Ministry of Finance, and the Inter-ministerial Committee for Earthquake Preparedness** should collaborate with **the local authorities of Beit Shean, Tiberias, Safed, and Kiryat Shmona and the local council of Hatzor HaGlilit** and form an adequate mechanism for buildings' reinforcement and locate sufficient resources. Given the considerable resources and budgets needed to reinforce buildings and infrastructures

in peripheral local authorities, most of which with low socioeconomic status, all relevant entities should get involved, and necessary resources should be allocated adequately.

- It is recommended that **Beit Shean, Tiberias, Safed, and Kiryat Shmona and the local council of Hatzor HaGlilit** cooperate with the mapping performed by the Home Front Command and advance the reinforcement of buildings in their jurisdictions in collaboration with the relevant government bodies.

- It is recommended that **Beit Shean, Tiberias, Safed, and Kiryat Shmona and the local council of Hatzor HaGlilit** comply with the Ministry of Transportation and Road Safety to identify and prepare alternatives for an earthquake scenario in which infrastructure or transportation bridges may be damaged.

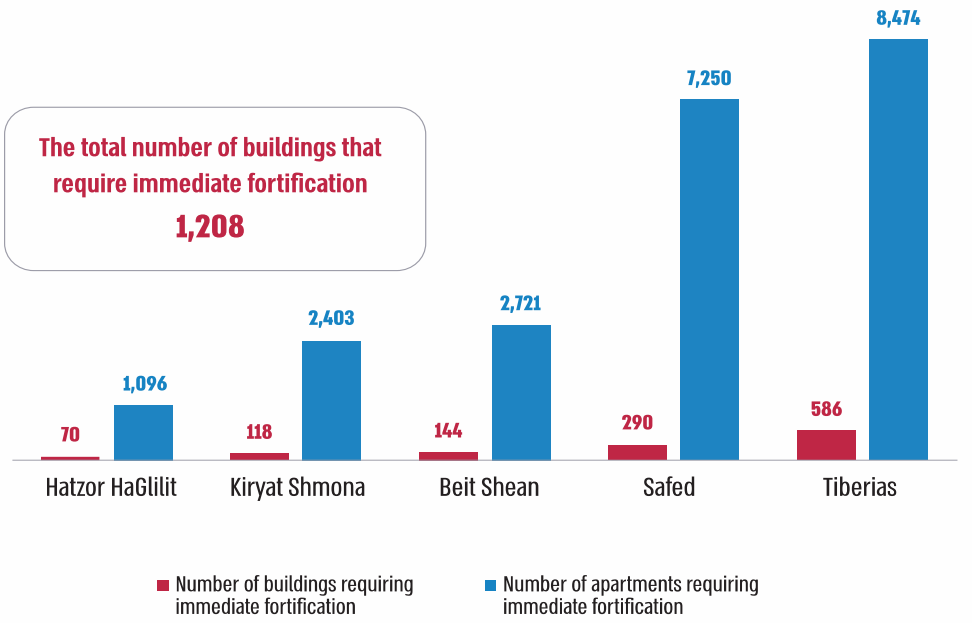
- It is recommended that **Beit Shean, Tiberias, Safed, and Kiryat Shmona and the local council of Hatzor HaGlilit,** which insured their properties against earthquake damages, periodically review the extent to which the insurance coverage is compatible with all the assets of the local authority and the cost of their construction. It would enable them to meet their duty of protecting public property by receiving adequate compensation that would be used for the reconstruction of different buildings and infrastructures that might be damaged in an earthquake. It is further recommended that the aforementioned authorities periodically review the cost of insurance premiums.

- It is recommended that **Beit Shean, Tiberias, Safed, and Kiryat Shmona and the local council of Hatzor HaGlilit** cooperate with the relevant bodies to increase their residents' awareness of the importance of earthquake insurance and encourage them to insure their apartments against this risk.

- It is recommended that **Beit Shean, Tiberias, Safed, and Kiryat Shmona and the local council of Hatzor HaGlilit** cooperate with the Home Front Command and Israel National Resilience Institute to increase the level of competence and the scope of training for all officials that are part of their emergency teams.

- It is recommended that **the Emergency Administration of the Ministry of Interior** collaborate with representatives from local authorities and the Home Front Command to diagnose the type and quantity of the goods that should be stored at the emergency warehouses.

Residential Buildings and Housing Units Requiring Immediate Reinforcement in Local Authorities



According to statistics from the Inter-ministerial Committee for Earthquake Preparedness, processed by the State Comptroller Office.

Summary

Earthquakes are common natural disasters that occur all over the world. Dozens of thousands of earthquakes are felt every year around the world. Most of them are minor and do not cause any damage. However, alongside minor earthquakes, massive earthquakes often strike and cause mass disasters with thousands of casualties, wounded, and vast destruction of buildings and infrastructures. The central and local governments cannot prevent earthquakes but can minimize the damage they inflict.

This report, added to the previous State Comptroller's reports on Israel's preparedness for earthquakes, demonstrates a longstanding failure of the state of Israel to prepare for earthquakes, especially in peripheral communities along the Great Rift Valley. The report's findings emphasize the need for multiple measures based on a long-term perception to optimize the state's preparedness for massive earthquakes.

In early February 2023, we all had a reminder of the destructive outcomes of a massive earthquake that might take place in Israel. Massive earthquakes originating in southern Turkey, along the northern part of the Great Rift Valley, led to the death of dozens of thousands of people, to a more significant number of wounded, and to the destruction of more than 12,000 buildings, which left more than 500,000 homeless.

A study that was carried out in the USA[3] indicated that earthquake preparedness might prevent a considerable part of the expected financial damages resulting from an earthquake. For instance, it was found that it might have been possible to decrease the cost of property damage caused by the earthquake that struck the area of LA in 1994 by USD 11.3 billion had buildings in the area been built following the earthquake standard – 40% of the total cost of damages could have been saved. This fact demonstrates the economic benefits of earthquake preparedness and reinforcement of infrastructures in advance, as opposed to infrastructure rehabilitation following an earthquake[4].

According to the State Comptroller Office, as of the audit end date, 1,124 (93%) of the buildings that require reinforcement in **Beit Shean, Tiberias, Safed, Kiryat Shmona, and Hatzor HaGlilit** had not been reinforced. In addition, 70% of the schools that require reinforcement had not been reinforced, which means that 38 out of 54 schools had not been reinforced.

3 Federal Emergency Management Agency (FEMA), 1997. Federal Emergency Management Agency, Report on the Costs and Benefits of Natural Hazard Mitigation, FEMA 294, Washington, D.C., U.S. Government Printing Office.

4 The study findings include an estimated annual financial loss of USD 6.1 billion due to earthquakes in the countries where the study was conducted. This estimation is an undervaluation since it does not include damages pertaining to life-saving infrastructures or indirect financial losses (long-termed) and does not take into account risks or losses related to residual seismology. For further information see: Eran Feitelson, Maya Negev, Ehud Segal, Eran Razin and Yonat Rein-Sapir, "Residential Seismic Retrofitting: Contextualizing Policy Packages to Local Circumstances" (January 2022), page 11.

Audits carried out by the Home Front Command indicated that the level of emergency readiness in **Beit Shean and the local council of Hatzor HaGlilit** is low, that the level of preparedness in **Tiberias and Safed** is good, and that **Kiryat Shmona's** level of readiness is very good. These audits also indicate that there is no binding standard about the emergency equipment the local authorities must keep and maintain at their emergency warehouses as part of emergency preparedness.

Beit Shean, Tiberias, Safed, and Kiryat Shmona and the local council of Hatzor HaGlilit should rectify the deficiencies following the recommendations noted in this report in collaboration with the relevant government bodies.

The experience gained worldwide proves that earthquake preparedness substantially minimizes the volume of casualties, wounded, and property damage. The best way to prevent a disaster following an earthquake is to improve buildings and infrastructures' resistance and make them earthquake-proof.

The Prime Minister, Minister of Defense, Minister of Housing, Minister of Interior, Minister of Finance, and the Inter-ministerial Committee for Earthquake Preparedness should advance the State of Israel and the local government's readiness for earthquakes, especially of peripheral local authorities located along the Great Rift Valley.

The State Comptroller Office recommends that the relevant ministries: the Ministry of Finance, the Ministry of Defense, the Ministry of Interior, the Ministry of Housing, and the Inter-ministerial Committee for earthquake Preparedness collaborate with **Beit Shean, Tiberias, Safed, and Kiryat Shmona**, as well as the **local council of Hatzor HaGlilit**, and other peripheral local councils located along the Great Rift Valley, to form a designated mechanism for the reinforcement of buildings in the above authorities and allocate the necessary resources. Given the considerable budgetary resources required for buildings and infrastructure reinforcement in peripheral towns, mainly with low socio-economic status, all relevant bodies should get involved, and adequate resources should be allocated.

The government and the local government should act immediately and decisively to improve the situation sooner rather than later.