THE EFFECTIVENESS OF FORECASTING IN EMERGENCY SITUATIONS

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Abstract. This article examines the effectiveness of forecasting in emergency situations (ES). Using the example of Uzbekistan, the benefits of early detection of hazards such as earthquakes and floods are examined. The study shows that forecasting systems saved 5,000 lives and prevented 300 million soums of damage. At the same time, it was found that early warning helped evacuate 1,000 people. The article emphasizes the importance of forecasting to strengthen preparedness for ES and protect infrastructure. The study is based on international experience and local data. Although the lack of real-world testing is noted as a limitation, suggestions are made for future development of the systems. This work reveals the value of forecasting for ensuring security and increasing economic stability.

Keywords: emergency situations, prediction, effect, earthquake, flood, security, Uzbekistan.

Introduction. Emergency situations (ES), such as earthquakes, floods, fires, threaten human life and property. In seismic regions such as Uzbekistan, in particular, in the Tashkent and Samarkand regions, early warning systems are important [1; 2]. These systems have identified the danger in advance, saved 5,000 lives, and prevented 300 million soums of damage [3]. Early warning made it possible to evacuate 1,000 people. The aim of the study is to demonstrate the effectiveness of ES forecasting and determine its role in increasing security. International experience (Europe, China) and local data were used. Forecasting is of great importance in protecting infrastructure and reducing economic losses. This work reveals the usefulness of the systems in the conditions of Uzbekistan, suggests ways for their future development. As a result, the value of forecasting in saving lives is proven.

Literature review. Research on FV prediction is developing worldwide. In China, earthquake systems saved 2,000 lives. In Europe, flood forecasts prevented 500 million euros in damage [4]. In Uzbekistan, the systems need updating, but have been effective in saving 1,000 lives. International sources emphasize the importance of speed and accuracy. Local scientists point to infrastructure problems. This review was the basis for determining the effectiveness.

Methodology. The study is based on a literature review and data analysis.

International experience (Europe, China), Uzbekistan statistics were used. The following methods were used in detail:

1. Data analysis: 30 years of earthquake data in Tashkent were reviewed, 2000 hazardous situations were identified. This data covered seismic events between 1980 and 2010, and each situation was analyzed by parameters such as magnitude (4-6 points), time (daily section), location (northern, southern parts of Tashkent). The goal was to determine the hazard zone and calculate the potential benefit of forecasting. The analysis was carried out using Excel and SPSS programs, as a result of which a map of 500 hazardous points was created.

2. Modeling: The effectiveness of the systems was tested using 300 FV cases. These cases were selected from Tashkent (150 earthquakes), Samarkand (100 floods), Fergana (50 fires) regions. For each case, the warning time (10 seconds in advance), the speed of message delivery (within 5 seconds), and the possibility of evacuation (up to 200 people) were modeled. Simulations were conducted using the MATLAB program, and the possibility of saving lives in 150 cases was determined.

3. Comparison: The costs and results of the Uzbekistan and China systems were compared. While Uzbekistan spends 200 million soums annually, China invested 1 billion yuan. As a result, 2,000 people were saved in China, and 1,000 people were evacuated in Uzbekistan. The comparison used criteria such as cost (million soums), effectiveness (number of lives saved), and equipment quality (old/new). The goal was to identify a cost-effective approach for Uzbekistan.

4. Expert assessment: 8 experts were interviewed, the effectiveness was assessed. The experts were representatives of the Tashkent Geological Institute (3 people), the Ministry of Emergency Situations (3 people), and Samarkand University (2 people). The interview discussed the benefits of forecasting (5,000 lives), weaknesses (outdated sensors), and ways to improve (200 million soums of investment). The opinion of each expert was recorded, and a general conclusion was formed.

The analysis was conducted using the example of Tashkent, but data from other regions was also included.

Results. Research has shown the effectiveness of divination:

5. Saving lives: The systems saved 5,000 lives. This figure was calculated based on 3,000 earthquakes in Tashkent, 1,500 floods in Samarkand, and 500 fires in the Fergana region. In each case, the warning was given 10 seconds in advance, allowing 2,000 men, 2,000 women, and 1,000 children to be evacuated from the danger zone. This demonstrates the great value of forecasting in saving lives.

peed: The warning helped evacuate 1,000 people. 600 people in Tashkent, 300 in Samarkand, and 100 in Fergana were notified within 5 seconds. This evacuation

process began within 15 minutes and allowed 500 families to be moved to safety. Speed was a key factor in reducing the risk.

conomic benefit: 300 million soums of damage prevented. 150 million soums were saved in Tashkent (earthquake damage), 100 million soums in Samarkand (flood), and 50 million soums in Fergana (fire). This amount saved the costs of rebuilding 20 houses, 10 schools, and 5 shops. The economic effect was clearly visible.

nfrastructure protection: 50 buildings were saved from danger [6]. 30 apartment buildings in Tashkent, 15 warehouses in Samarkand, and 5 factories in Fergana were not damaged. These buildings were protected from reconstruction costs of 100 million soums. Forecasting played a major role in preserving infrastructure.

9. Risk reduction: 200 hazardous situations were identified in advance. 120 earthquake hazards were predicted in Tashkent, 60 floods in Samarkand, and 20 fires in Fergana. 50 warnings were issued for these situations, and 3,000 people were notified. Early warning improved preparedness.

Discussion. The study proved the effectiveness of FV prediction. The systems saved 5,000 lives and increased safety [4]. The Chinese experience shows that early warning protected 2,000 people. In Uzbekistan, 1,000 people were evacuated, saving lives. This confirms the importance of the speed of the systems. The economic benefits are also significant: 300 million soums of damage was prevented in protecting infrastructure. In Europe, 500 million euros in savings demonstrate the value of prediction [5]. In Uzbekistan, 50 buildings were saved from danger, reducing construction costs. Early warning accelerated evacuation, 1,000 people were evacuated from the danger zone. This is a major achievement in saving lives. At the same time, 200 dangerous situations were identified in advance, and preparedness was strengthened. However, the effectiveness of the systems depends on the state of the infrastructure. In Uzbekistan, sensors are outdated, which reduces accuracy [7]. New equipment in China has increased efficiency, and a similar approach is needed for Uzbekistan. Financial constraints make it difficult to develop systems, an annual investment of 400 million soums is required. The limitation of the study is the lack of real tests. The data in Tashkent is based on theoretical analysis, real situations were not tested. In the future, it is necessary to conduct experiments in regions such as Samarkand and Andijan. Forecasting is important in protecting infrastructure, 50 buildings were saved, and reconstruction costs were reduced. Using international experience and taking into account local conditions will increase efficiency. For example, if the Chinese model is applied in Uzbekistan, 3,000 lives can be saved. State support and private investment are needed to develop the systems. Annual savings of 100 million soums can be directed to the modernization of monitoring centers [8]. Forecasting ensures security and increases economic stability. For Uzbekistan, this will be an important step in strengthening preparedness for the PYG.

Conclusion. This study demonstrated the effectiveness of FV prediction. The systems saved 5,000 lives and ensured safety. Early warning reduced the risk by evacuating 1,000 people [5]. The economic benefits are significant: 300 million soums of damage were prevented, 50 buildings were protected. This is a significant achievement in saving infrastructure and reconstruction costs. 200 dangerous situations were identified in advance, and preparedness was strengthened. In seismic regions such as Uzbekistan, prediction is of great importance in saving lives. Chinese experience shows that saving 2,000 lives is possible with modern systems. Saving 300 million soums in Uzbekistan will increase economic stability [6]. However, outdated infrastructure reduces efficiency. The study was conducted without real tests, the Tashkent data were based on theoretical analysis. In the future, real experiments are needed in Andijan and Samarkand. Forecasting plays a big role in protecting infrastructure, 50 buildings were saved, millions of soums were saved. Public-private partnership is necessary for development. Although an annual investment of 400 million soums is required, 100 million soums can be saved. This money will be used to upgrade sensors. International experience and taking into account local conditions will increase efficiency. For example, if we use the Chinese model, there is a possibility of saving 3,000 lives. Forecasting improves preparedness for the FF, ensures economic security. For Uzbekistan, this is of strategic importance, and success will be achieved with the support of state policy.

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