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Federal Office for the Environment FOEN

Federal Office for Civil Protection FOCP

Press release

Earthquake impacts in Switzerland systematically determined for the first time

Until now, little has been known about the effects that earthquakes in Switzerland could have on people and buildings. At the request of the Federal Council, the Swiss Seismological Service (SED) at ETH Zurich together with the Federal Office for the Environment (FOEN), the Federal Office for Civil Protection (FOCP), EPFL and other partners from industry have developed the first publicly accessible and – and, to date, most reliable – earthquake risk model for Switzerland. The model provides a new tool enabling the public, authorities and businesses to prepare for earthquakes and to better cope with the next damaging quake.

Statistically speaking, every person in Switzerland will experience at least one earthquake causing serious damage in their lifetime. This means that earthquakes are among the greatest risks facing Switzerland, along with pandemics and power shortages. Although they occur less frequently than other natural hazards, they can cause significant damage. The model now being published makes it possible for the first time to soundly quantify expected earthquake damages. While earthquake hazard estimates how often and how strongly the ground could shake at given locations in the future, earthquake risk describes the effects on people and buildings. The earthquake risk model combines detailed information on earthquake hazard, the influence of local subsoil, the vulnerability of buildings, and the people and assets affected.

Greatest risk in urban areas

According to the new model, the greatest earthquake risk is in the cities of Basel, Geneva, Zurich, Lucerne and Bern, in that order. Although the earthquake hazard in these regions differs, all five cities have, by virtue of their size, a large number of people and assets that would be affected by an earthquake. In addition, these cities have many buildings, some particularly vulnerable and often located on soft ground that amplifies seismic waves.

The greatest building damage from earthquakes is expected in the cantons of Bern, Valais, Zurich, Vaud and Basel-Stadt. They account for around half of the estimated financial losses. According to the model calculations, over a period of 100 years, earthquakes can be expected to cause economic damage of CHF 11 to 44 billion to buildings and their contents (such as furniture) alone. In total, around 150 to 1,600 people would lose their lives and an estimated 40,000 to 175,000 would become homeless on a short-term or long-term basis. On top of this, there is damage to infrastructure and losses due to other effects of earthquakes such as landslides, fires or business interruptions. However, these are not yet included in the model. The earthquake risk is not evenly distributed over time, but is dominated by rare, catastrophic earthquakes that usually happen without warning.

Products and benefits

As well as compiling risk assessments for specific periods and locations, the SED can now use the earthquake risk model to develop scenarios. Among other things, this makes it possible to illustrate the effects that damaging historical earthquakes in Switzerland would have if they occurred today. For example, if the magnitude-6.6 Basel earthquake of 1356 were to be repeated, the expected death toll in Switzerland would be around 3,000, with building damage totalling approximately CHF 45 billion. However, severe earthquakes could in theory occur anywhere. The SED therefore provides a scenario for a damaging magnitude-6 earthquake for every cantonal capital and one other locality in each canton. Such an earthquake happens on average every 50 to 150 years somewhere in Switzerland or its neighbouring regions. These scenarios, 59 in total, are intended to help make the authorities and public more aware about the impacts of damaging earthquakes in Switzerland.

Based on the earthquake risk model, the SED will publish Rapid Impact Assessments (RIA) after each earthquake with a magnitude of 3 or greater. The RIA will inform the public and emergency services about the expected impacts in the event of damaging earthquakes, or quakes that can be felt over a wide area. Isolated damage is possible near the epicentre with quakes of around magnitude 4 or above. It is also possible to determine the risks for building portfolios or to produce detailed scenarios for cities and built-up areas. Switzerland thus becomes one of the first countries in the world to have a freely accessible resource for making informed decisions on earthquake mitigation and event response.

Model development

The processing of the underlying data was key to the development of the earthquake risk model for Switzerland. Over 3 million individual earthquakes that could potentially occur in Switzerland and neighbouring regions were simulated. Switzerland's more than 2 million residential, commercial and industrial buildings were divided into vulnerability categories according to certain criteria in order to be able to model the possible damage caused by earthquakes. In addition, improved data on the amplifying effects of the subsoil conditions provide a significantly better picture of local impacts. However, despite the improved data, uncertainties in the modelling mean that there are likely to be differences compared with the actual impacts. The earthquake risk model will be further refined in the coming years to reduce these uncertainties and so improve the model results.

The earthquake risk model is part of the federal government's programme of measures for earthquake mitigation, coordinated by the FOEN, the aim of which is to ensure comprehensive seismic risk management at federal level. The findings from the earthquake risk model will therefore feed into the national risk analysis and to the planning of earthquake mitigation at federal and cantonal levels. They provide a common basis for determining how authorities, the public and businesses can deal with the effects of a damaging earthquake and reinstate destroyed or damaged buildings and infrastructure. In addition, the national earthquake risk model will provide key input for planning and implementing the work of the Schadenorganisation Erdbeben (SOE), which is currently being set up. After an earthquake, the SOE will estimate the expected costs of building damage so that reconstruction can get under way quickly.

For additional information

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