

AFFECTED  
BY 100-YEAR  
FLOOD

\$2 billion (14%)

500,000 (14%)

AFFECTED  
BY 250-YEAR  
EARTHQUAKE

\$4 billion (24%)

700,000 (19%)

CAPITAL LOSS  
FROM 250-YEAR  
EARTHQUAKE

\$1 billion (7%)

300 (&lt;1%)

\*2015 estimates

# Bosnia and Herzegovina

GDP \$15.3 billion\*

Population 3.8 million\*

**B**osnia and Herzegovina's population and economy are exposed to earthquakes and floods, with floods posing the greater risk. The model results for present-day risk shown in this risk profile are based on population and gross domestic product (GDP) estimates for 2015. The estimated damage caused by historical events is inflated to 2015 US dollars.

Nearly 50 percent of Bosnia and Herzegovina's population lives in urban environments. The country's GDP was approximately US\$15.3 billion in 2015, with about 90 percent derived from services and industry, and agriculture making a small contribution. Bosnia and Herzegovina's per capita GDP was \$4,030.

This map displays GDP by province in Bosnia and Herzegovina, with greater color saturation indicating greater GDP within a province. The blue circles indicate the risk of experiencing floods and the orange circles the risk of earthquakes in terms of normalized annual average of affected GDP. The largest circles represent the greatest normalized risk. The risk is estimated using flood and earthquake risk models.

The table displays the provinces at greatest normalized risk for each peril. In relative terms, as shown in the table, the province at greatest risk of both floods and earthquakes is Republika Srpska. In absolute terms, the province at greatest risk of floods is also Republika Srpska, and the one at greatest risk of earthquakes is Federacija Bosne i Hercegovine.

## TOP AFFECTED PROVINCES



### FLOOD

ANNUAL AVERAGE OF  
AFFECTED GDP (%)

Republika Srpska	6
Federacija Bosna i Hercegovina	2
Brcko	1



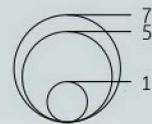
### EARTHQUAKE

ANNUAL AVERAGE OF  
AFFECTED GDP (%)

Republika Srpska	1
Federacija Bosna i Hercegovina	0
Brcko	0

ADRIATIC SEA

Annual Average of Affected GDP (%)

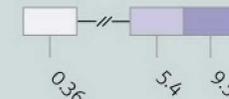


○ Negligible

FLOOD

EARTHQUAKE

GDP (billions of \$)



There is a high correlation ( $r=0.95$ ) between the population and GDP of a province.

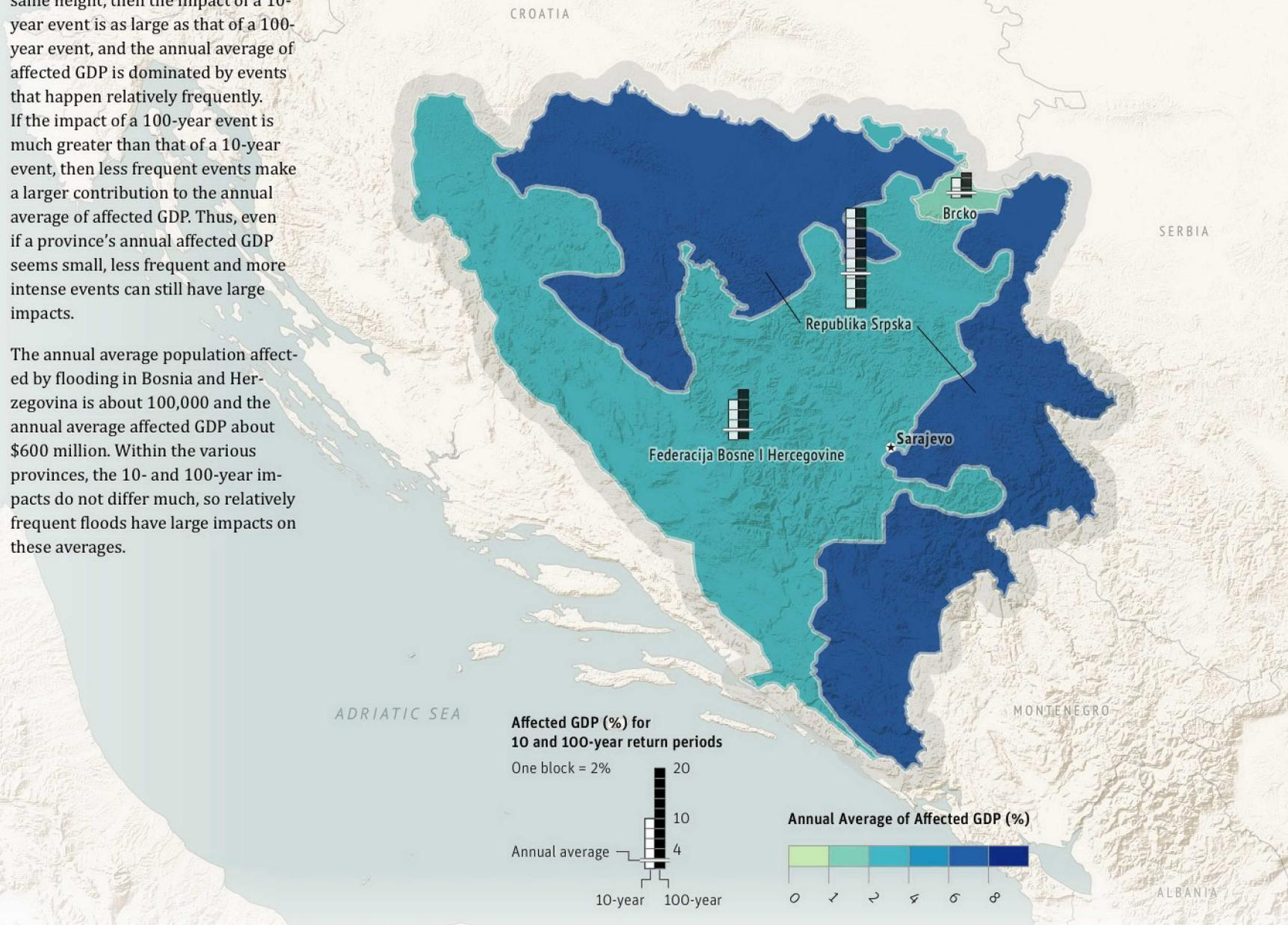
The most deadly and devastating flood in Bosnia and Herzegovina since it gained its independence in 1992 occurred in 2014. It affected 1 million people and caused 25 fatalities and close to \$450 million in damage. Flooding in 2010 caused three deaths and close to \$95 million in damage.

This map depicts the impact of flooding on provinces' GDPs, represented as percentages of their annual average GDPs affected, with greater color saturation indicating higher percentages. The bar graphs represent GDP affected by floods with return periods of 10 years (white) and 100 years (black). The horizontal line across the bars also shows the annual average of GDP affected by floods.

When a flood has a 10-year return period, it means the probability of occurrence of a flood of that magnitude or greater is 10 percent per year. A 100-year flood has a probability of occurrence of 1 percent per year. This means that over a long period of time, a flood of that magnitude will, on average, occur once every 100 years. It does not mean a 100-year flood will occur exactly once every 100 years. In fact, it is possible for a flood of any return period to occur more than once in the same year, or to appear in consecutive years, or not to happen at all over a long period of time.

If the 10- and 100-year bars are the same height, then the impact of a 10-year event is as large as that of a 100-year event, and the annual average of affected GDP is dominated by events that happen relatively frequently. If the impact of a 100-year event is much greater than that of a 10-year event, then less frequent events make a larger contribution to the annual average of affected GDP. Thus, even if a province's annual affected GDP seems small, less frequent and more intense events can still have large impacts.

The annual average population affected by flooding in Bosnia and Herzegovina is about 100,000 and the annual average affected GDP about \$600 million. Within the various provinces, the 10- and 100-year impacts do not differ much, so relatively frequent floods have large impacts on these averages.



**B**osnia and Herzegovina's worst earthquake since 1900 took place in 1969 in Banja Luka, with a magnitude of 6. It caused 14 fatalities and over \$300 million in damage. If the same earthquake were to occur today, it would cause an estimated death toll over 400 and more than \$4 billion in damage, based on present-day exposures.

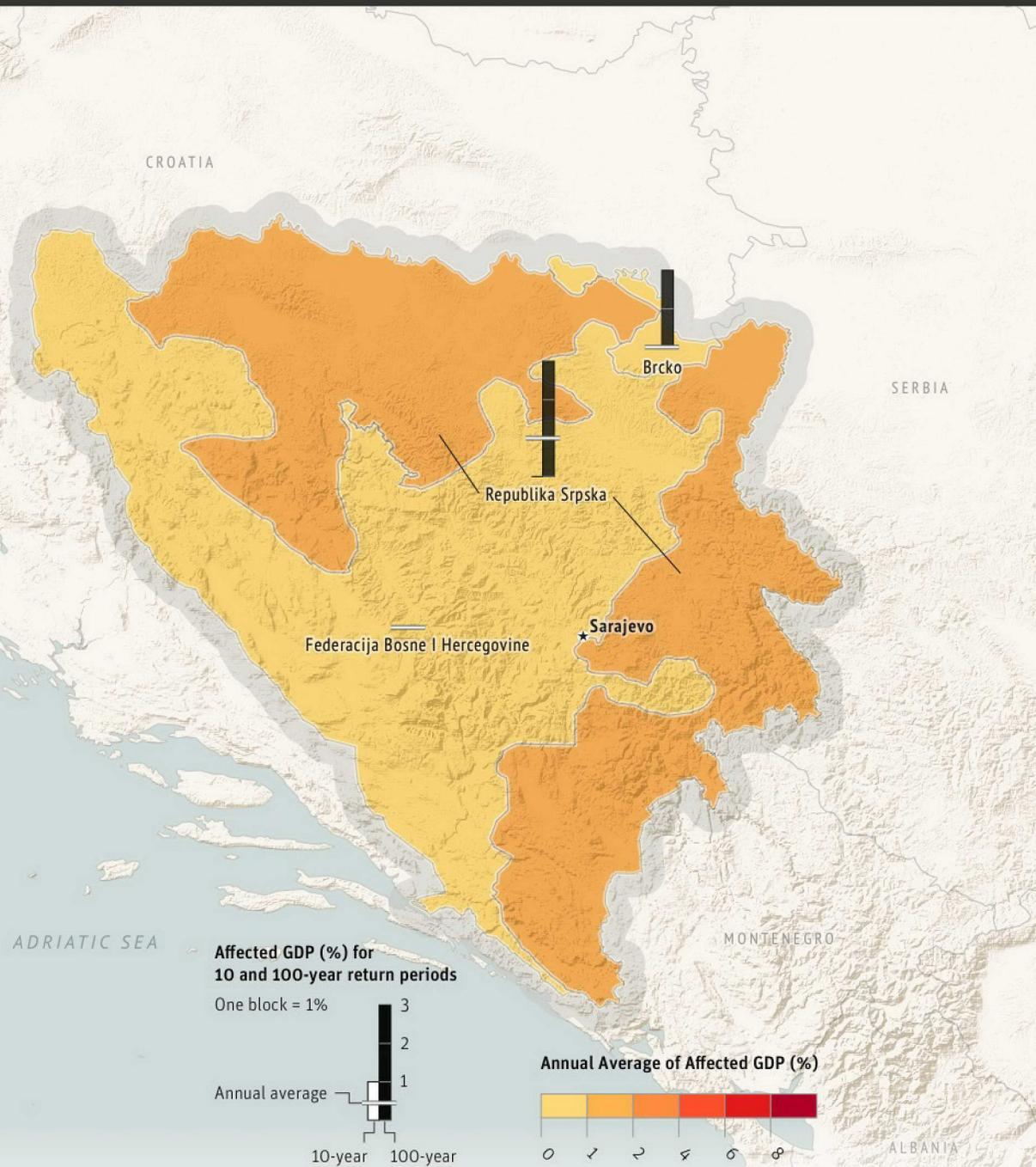
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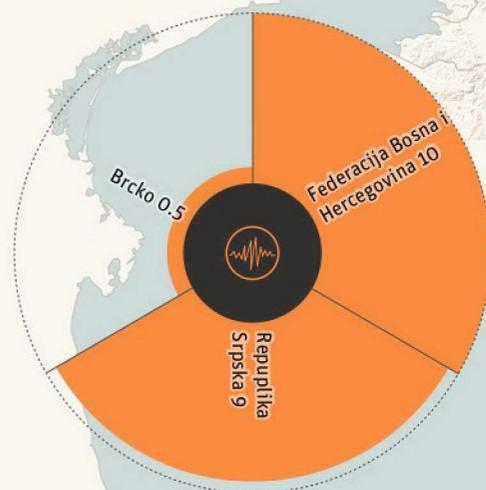
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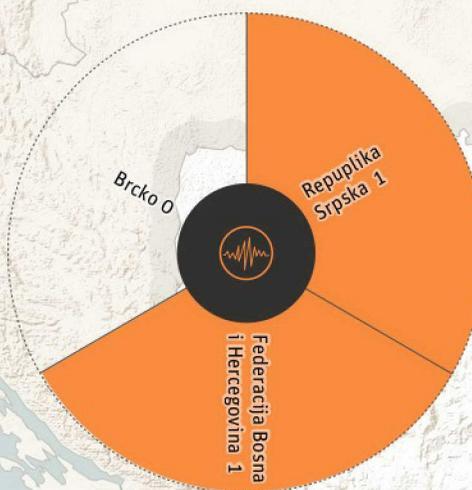
The annual average population affected by earthquakes in Bosnia and Herzegovina is about 40,000 and the annual average affected GDP about \$200 million. The annual averages of fatalities and capital losses caused by earthquakes are about five and about \$50 million, respectively. The fatalities and capital losses caused by more intense, less frequent events can be substantially larger than the annual averages. For example, an earthquake with a 0.4 percent annual probability of occurrence (a 250-year return period event) could cause nearly \$1 billion in capital loss (about 7 percent of GDP).



**EARTHQUAKE**  
ANNUAL AVERAGE CAPITAL LOSS (MILLIONS \$)

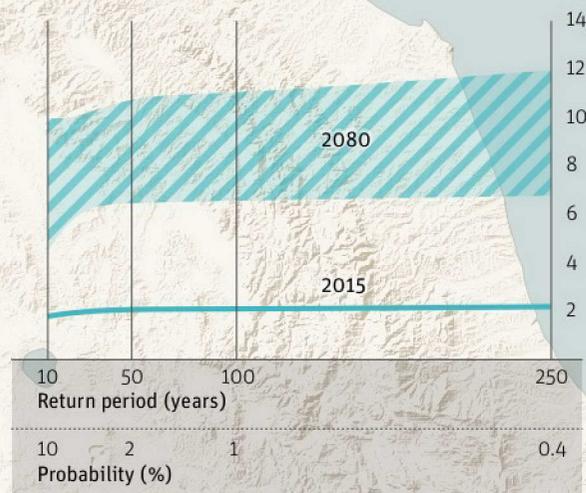


**EARTHQUAKE**  
ANNUAL AVERAGE FATALITIES

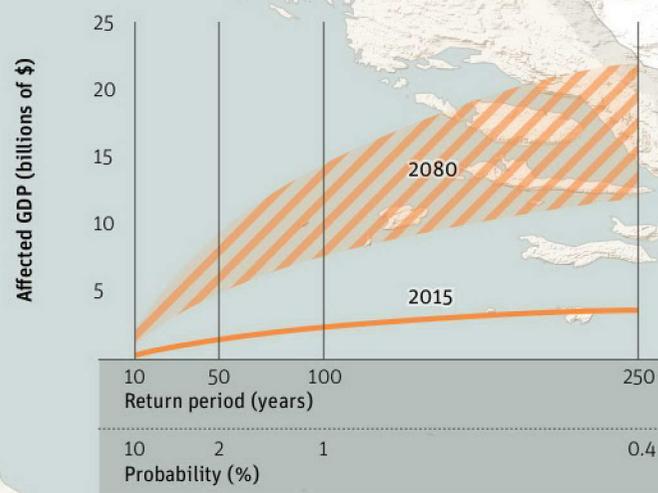


The rose diagrams show the provinces with the potential for greatest annual average capital losses and highest annual average numbers of fatalities, as determined using an earthquake risk model. The potential for greatest capital loss occurs in Federacija Bosne i Hercegovine, which is not surprising, given the economic importance of the province.

**FLOOD**  
EXCEEDANCE PROBABILITY CURVE, 2015 AND 2080



**EARTHQUAKE**  
EXCEEDANCE PROBABILITY CURVE, 2015 AND 2080



The exceedance probability curves display the GDP affected by, respectively, floods and earthquakes for varying probabilities of occurrence. Values for two different time periods are shown. A solid line depicts the affected GDP for 2015 conditions. A diagonally striped band depicts the range of affected GDP based on a selection of climate and socioeconomic scenarios for 2080. For example, if Bosnia and Herzegovina had experienced a 100-year return period flood event in 2015, the affected GDP would have been an estimated \$2 billion. In 2080, however, the affected GDP from the same type of event would range from about \$7 billion to about \$10 billion. If Bosnia and Herzegovina had experienced a 250-year earthquake event in 2015, the affected GDP would have been about \$4 billion. In 2080, the affected GDP from the same type of event would range from about \$10 billion to about \$20 billion, due to population growth, urbanization, and the increase in exposed assets.

All historical data on floods and earthquakes are from D. Guha-Sapir, R. Below, and Ph. Hoyois, EM-DAT: International Disaster Database (Université Catholique de Louvain, Brussels, Belgium), [www.emdat.be](http://www.emdat.be); the National Geophysical Data Center/World Data Service (NGDC/WDS), Significant Earthquake Database (National Geophysical Data Center, NOAA), doi:10.7289/V5TD9V7K; and J. Daniell and A. Schaefer, "Eastern Europe and Central Asia Region Earthquake Risk Assessment Country and Province Profiling," final report to GFDRR, 2014. Damage estimates for all historical events have been inflated to 2015 US\$.