

Kyrgyz Republic

The Kyrgyz Republic's population and economy are exposed to earthquakes and floods, with earthquakes posing the greater risk of a high impact, lower probability event. 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.

Over 60 percent of the Kyrgyz Republic's population lives in rural environments. The country's GDP was approximately US\$5.5 billion in 2015, with nearly 50 percent derived from services, most of the remainder generated by industry, and agricul-

AFFECTED BY 100-YEAR FLOOD	AFFECTED BY 250-YEAR EARTHQUAKE	CAPITAL LOSS FROM 250-YEAR EARTHQUAKE
\$400 million (7%)	\$3 billion (61%)	\$4 billion (64%)
500,000 (8%)	3 million (45%)	8,000 (<1%)

*2015 estimates



ture contributing 20 percent. The Kyrgyz Republic's per capita GDP was \$970.

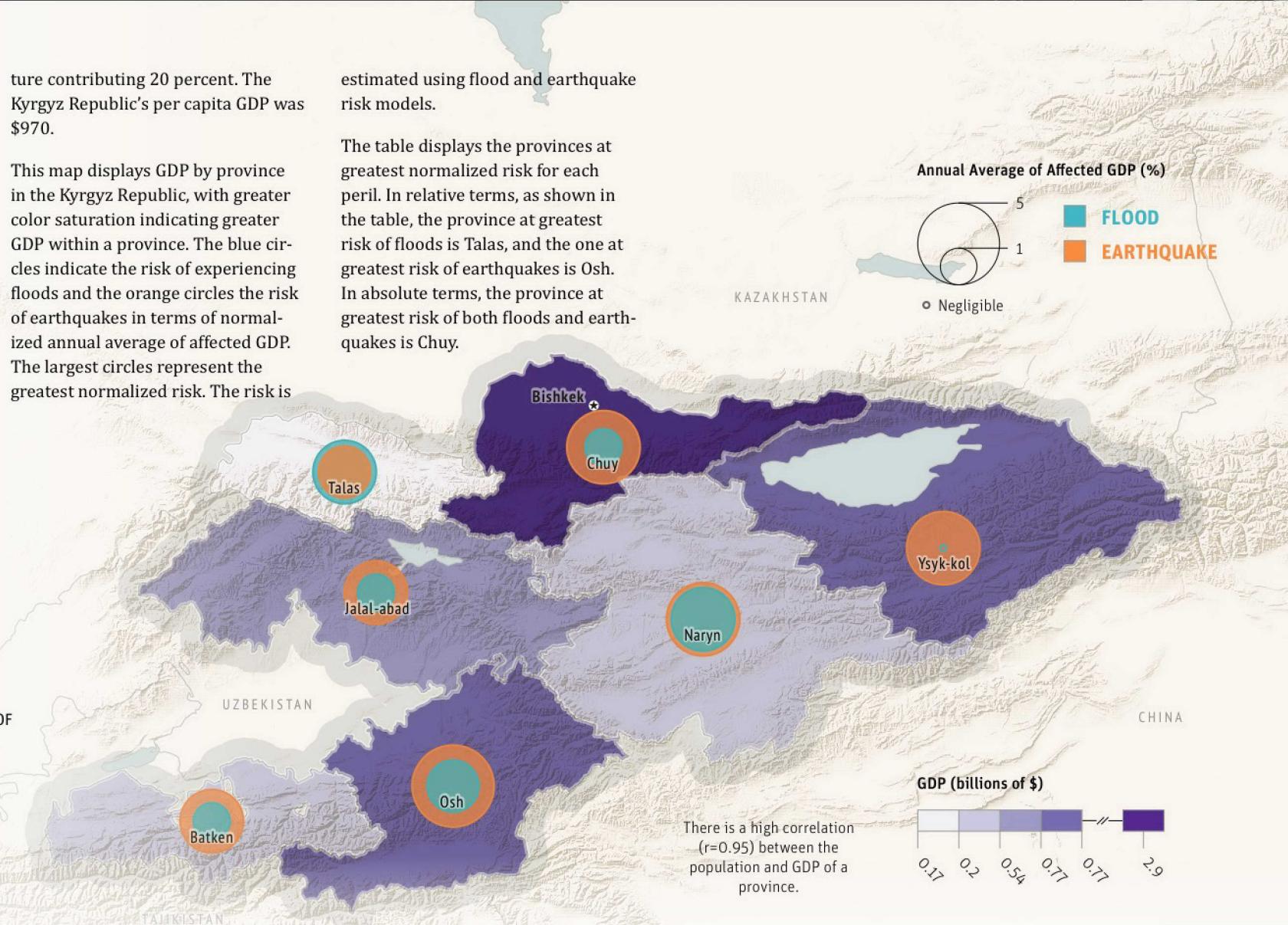
This map displays GDP by province in the Kyrgyz Republic, with greater color saturation indicating greater GDP within a province. The blue circles indicate the risk of experiencing floods and the orange circles the risk of earthquakes in terms of normalized annual average of affected GDP. The largest 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 floods is Talas, and the one at greatest risk of earthquakes is Osh. In absolute terms, the province at greatest risk of both floods and earthquakes is Chuy.

TOP AFFECTED PROVINCES

FLOOD	ANNUAL AVERAGE OF AFFECTED GDP (%)	EARTHQUAKE	ANNUAL AVERAGE OF AFFECTED GDP (%)
Talas	3	Osh	5
Naryn	3	Chuy	4
Osh	2	Ysyk-kol	4
Jalal-abad	1	Naryn	4
Chuy	1	Batken	3
Batken	1	Jalal-abad	3
Ysyk-kol	0	Talas	2



The Kyrgyz Republic has experienced some floods since gaining its independence in 1991. Floods in 1998 and 2005 each caused over \$3 million in damage. More recently, in 2012, flooding in Osh, Batken and Jalalbad affected about 11,000 people.

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.

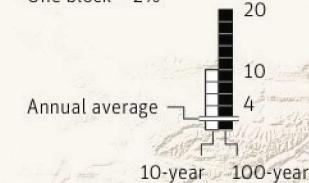
If the 10- and 100-year bars are the same height, then the impact of a 10-year event is as large as that of a 100-year event, and the annual average of affected GDP is dominated by events that happen relatively frequently. If the impact of a 100-year event is much greater than that of a 10-year event, 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 the Kyrgyz Republic is about 80,000 and the annual

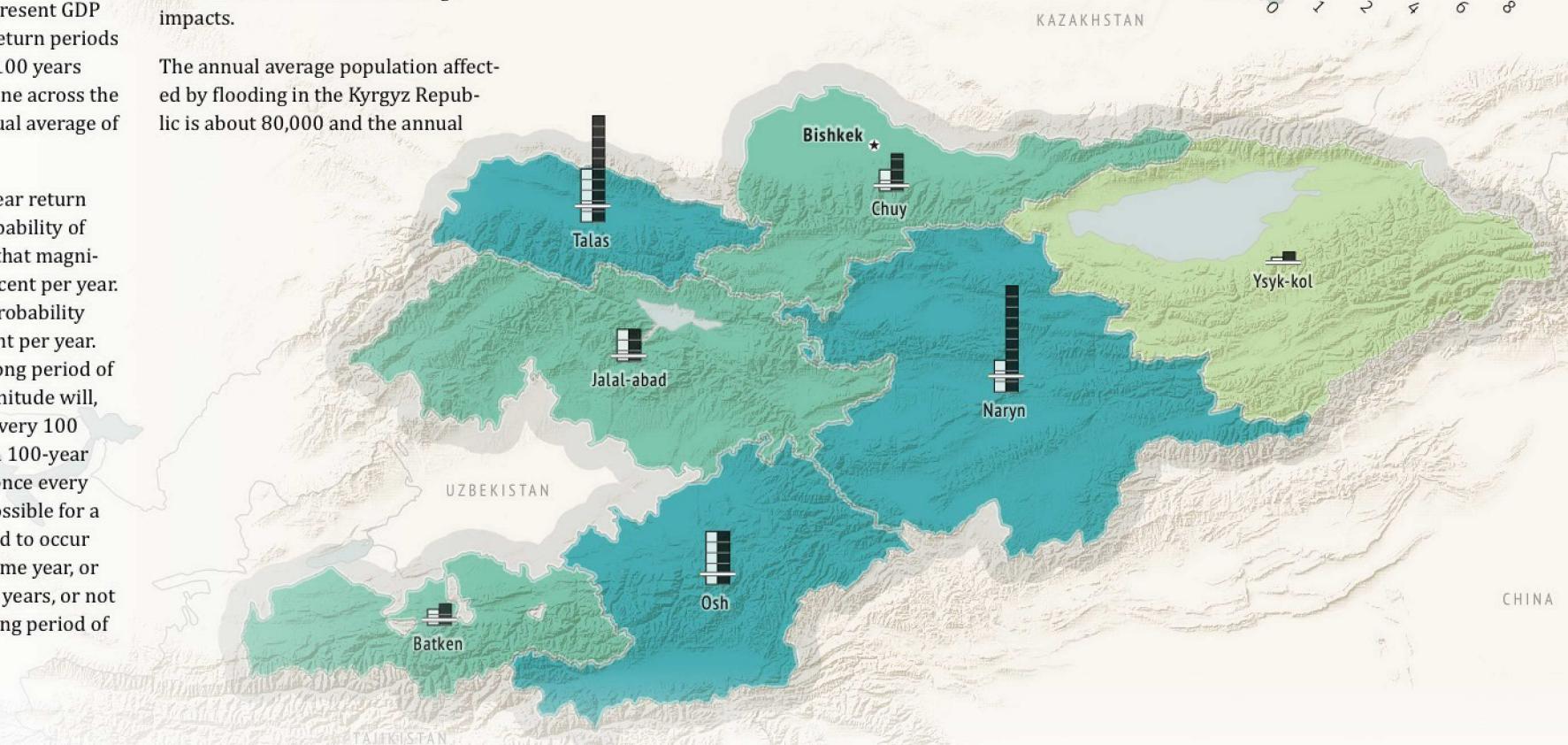
average affected GDP about \$70 million. For most provinces, the 10- and 100-year impacts do not differ much, so relatively frequent floods have large impacts on these averages. For the few in which the 100-year impacts are greater than the 10-year impacts, less frequent events make a significant contribution to the annual average of affected GDP.

Affected GDP (%) for 10 and 100-year return periods

One block = 2%



Annual Average of Affected GDP (%)





The Kyrgyz Republic's worst earthquake since 1900 occurred in 1911 in Pamir, causing over 90 fatalities. Earthquakes in 1992 caused over 50 fatalities and close to \$300 million in damage. More recently, in 2008, an earthquake killed over 70 people.

This map depicts the impact of earthquakes 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 earthquakes 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 earthquakes.

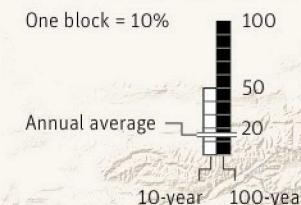
When an earthquake has a 10-year return period, it means the probability of occurrence of an earthquake of that magnitude or greater is 10 percent per year. A 100-year earthquake has a probability of occurrence of 1 percent per year. This means that over a long period of time, an earthquake of that magnitude will, on average, occur once every 100 years. It does not mean a 100-year earthquake will occur exactly once every 100 years. In fact, it is possible for an earthquake 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 larger contributions 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.

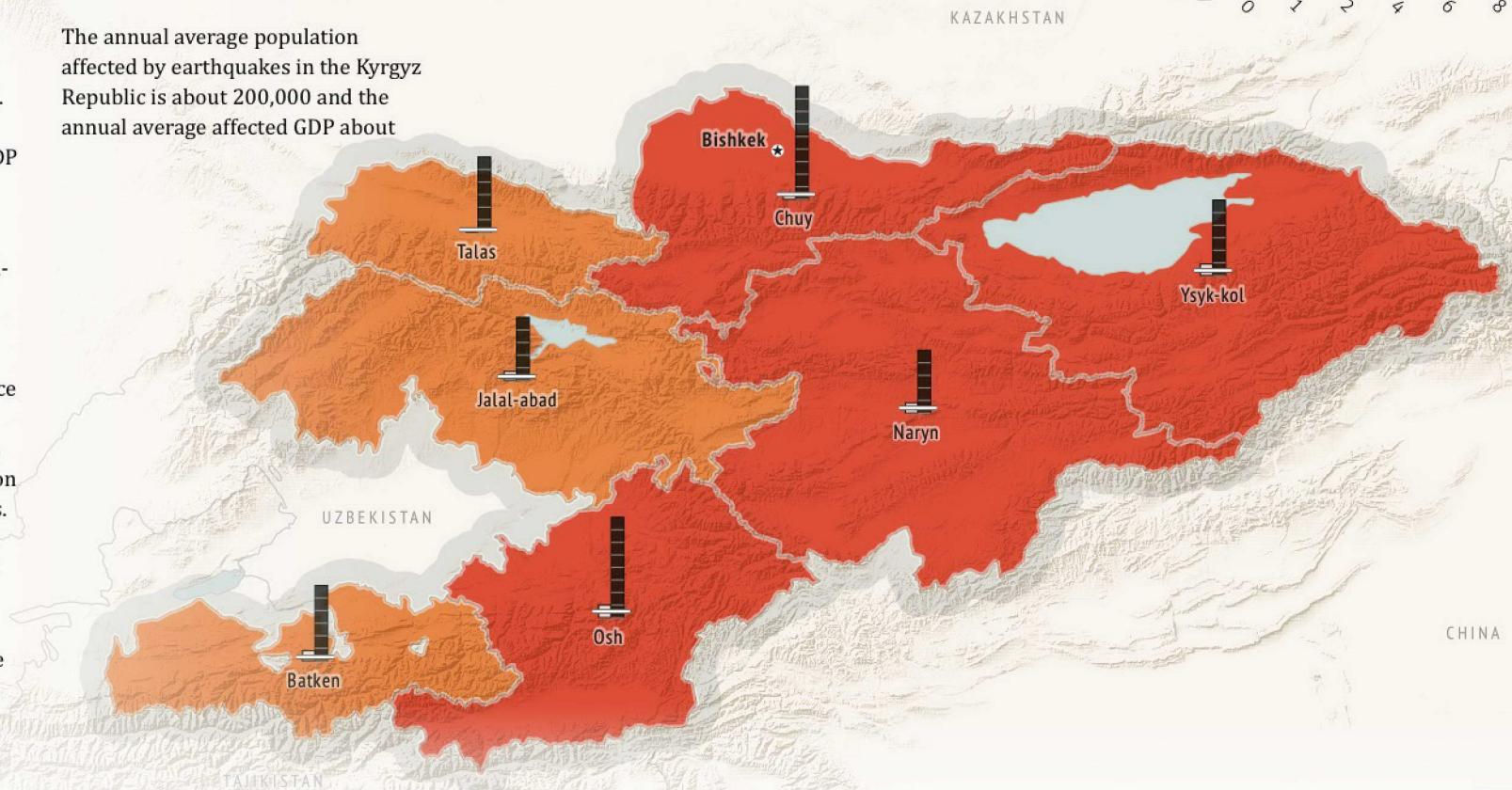
The annual average population affected by earthquakes in the Kyrgyz Republic is about 200,000 and the annual average affected GDP about

\$200 million. The annual averages of fatalities and capital losses caused by earthquakes are about 200 and about \$100 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 8,000 fatalities and \$4 billion in capital loss (about 60 percent of GDP).

Affected GDP (%) for 10 and 100-year return periods



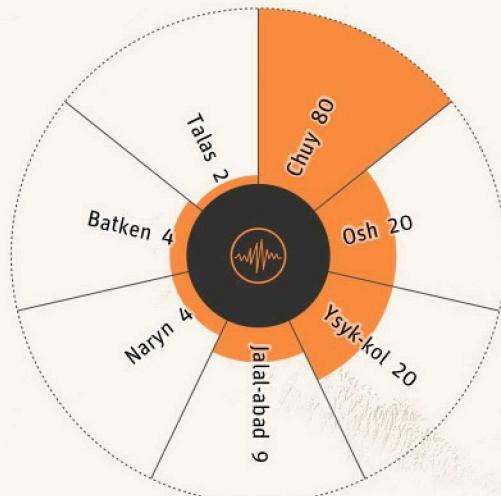
Annual Average of Affected GDP (%)





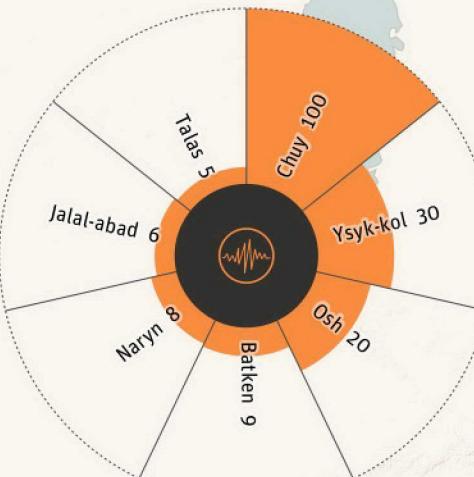
EARTHQUAKE

ANNUAL AVERAGE CAPITAL LOSS (MILLIONS \$)



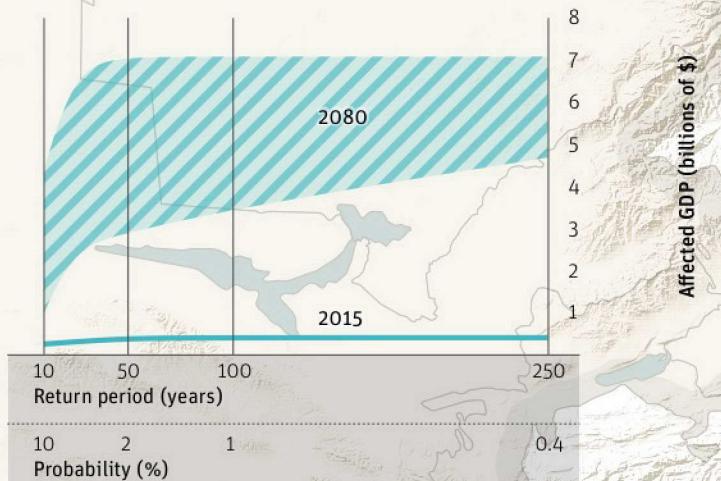
EARTHQUAKE

ANNUAL AVERAGE FATALITIES



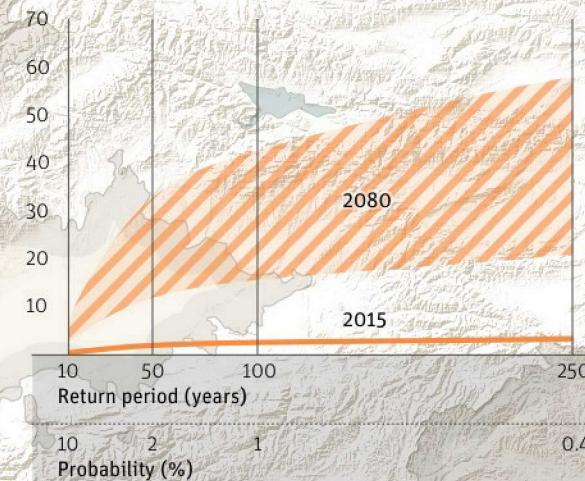
FLOOD

EXCEEDANCE PROBABILITY CURVE, 2015 AND 2080



EARTHQUAKE

EXCEEDANCE PROBABILITY CURVE, 2015 AND 2080



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 Chuy, which is not surprising, given the economic importance of the province.

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 the Kyrgyz Republic had experienced a 100-year return period flood event in 2015, affected GDP would have been an estimated \$400 million. In 2080, however, the affected GDP from the same type of event would range from about \$4 billion to about \$7 billion. If the Kyrgyz Republic had experienced a 250-year earthquake event in 2015, the affected GDP would have been an estimated \$4 billion. In 2080, the affected GDP from the same type of event would range from about \$20 billion to about \$60 billion, due to population growth, urbanization, and the increase in exposed assets.