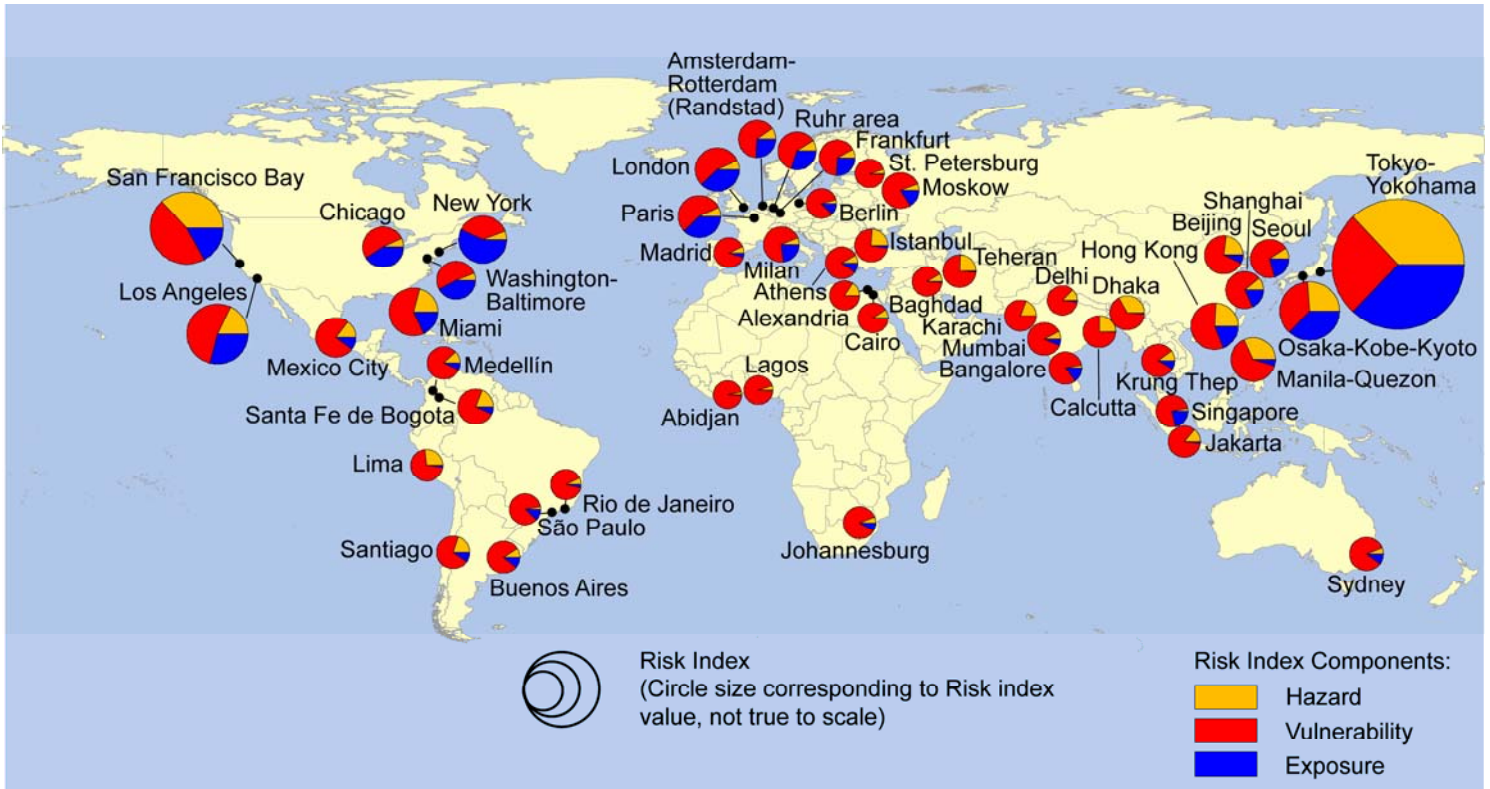


Natural Hazard Risk Index for Megacities

The loss potential from natural catastrophes is increasingly dominated by megacities. The two main aims of the index are to make risks and loss potentials transparent and to allow a comparison between megacities.



The Munich Re risk index is geared to the risk of material losses, without including the insurance density or the insurance terms and conditions, which vary by region and hazard. As the index is intended to be a measure of loss potential, it embraces all three components: hazard, vulnerability and exposed values. The hazards considered in the calculation were earthquake, windstorm, and flood as the main hazards, and volcanic eruption, bush fires, and winter damage (frost) as the most important secondary hazards. The index both includes rare and frequent occurrences of events. In order to produce a total index, the three main components of hazard, vulnerability and exposed values are normalized. For this purpose, the maximum values in each case were set to 10 and the other values calculated proportionally based on this. The last step is combining the components. The most meaningful and practicable results are obtained by multiplying the main components.

Megacity*	Population* (millions)	Total risk index	Risk index components		
			Hazard	Vulnerability	Exposed values
Tokyo-Yokohama	34.9	710.0	10.0	7.1	10.0
San Francisco Bay	7.3	167.0	6.7	8.3	3.0
Los Angeles	16.8	100.0	2.7	8.2	4.5
Osaka-Kobe-Kyoto	18.0	92.0	3.6	5.0	5.0
Miami	4.1	45.0	2.7	7.7	2.2
New York	21.6	42.0	0.9	5.5	8.3
Hong Kong-Pearl River	14.0	41.0	2.8	6.6	2.2
Manila-Quezon	14.2	31.0	4.8	9.5	0.7
London	12.1	30.0	0.9	7.1	4.8
Paris	11.0	25.0	0.8	6.6	4.6
Chicago	9.4	20.0	0.8	5.6	4.4
Mexico City	25.8	19.0	1.8	8.9	1.2
Washington-Baltimore	7.9	16.0	0.6	5.4	4.4
Beijing	13.2	15.0	2.7	8.1	0.7
Seoul	21.2	15.0	0.9	7.2	2.2
Ruhr area	9.6	14.0	0.9	5.8	2.8
Shanghai	14.2	13.0	1.1	7.0	1.7
Randstad	8.0	12.0	0.9	5.6	2.3
Moscow	13.2	11.0	0.7	8.7	1.8
Frankfurt am Main	5.0	9.5	0.7	5.9	2.3
Milan	4.0	8.9	0.6	6.7	2.2
Santa Fe de Bogotá	7.7	8.8	1.9	7.3	0.6
Dhaka	11.3	7.3	4.8	9.6	0.2
Sydney	5.0	6.0	0.6	9.1	1.1
Mumbai	18.2	5.1	0.8	8.6	0.7
Sydney	5.0	6.0	0.6	9.1	1.1

Megacity*	Population* (millions)	Total risk index	Risk index components		
			Hazard	Vulnerability	Exposed values
Mumbai	18.2	5.1	0.8	8.6	0.7
Krung Thep (Bangkok)	10.3	5.0	0.9	7.4	0.8
Santiago	5.5	4.9	1.5	5.2	0.7
Medellin	4.0	4.8	1.1	7.2	0.6
Istanbul	16.0	4.8	2.4	7.2	0.3
Teheran	14.0	4.7	3.0	9.4	0.2
Bangalore	8.0	4.5	0.3	8.4	1.6
Calcutta	15.9	4.2	3.2	9.5	0.1
Buenos Aires	13.7	4.2	0.7	6.3	0.9
Johannesburg	7.5	3.9	0.6	8.2	0.7
Lima	9.0	3.7	2.8	7.3	0.2
Athens	4.0	3.7	0.7	6.9	0.8
Jakarta	17.1	3.6	1.7	9.9	0.2
Singapore	4.0	3.5	0.3	7.1	1.9
Karachi	12.3	3.1	2.3	10.0	0.1
São Paulo	20.3	2.5	0.3	8.0	1.1
Rio de Janeiro	12.3	1.8	0.6	8.2	0.4
Berlin	4.2	1.8	0.3	5.9	0.9
Cairo	16.5	1.8	0.9	8.7	0.2
Madrid	5.2	1.5	0.5	6.7	0.4
Delhi	17.2	1.5	1.2	7.8	0.2
Alexandria	5.0	1.4	1.4	7.5	0.1
Baghdad	8.0	1.3	0.9	9.2	0.1
St. Petersburg	6.0	0.7	0.5	8.7	0.1
Lagos	13.5	0.7	0.5	9.4	0.1
Abidjan	3.9	0.3	0.3	8.7	0.1

*Relates to the entire agglomeration in each case (i.e. includes adjacent towns and cities)