



Annual Report
2015



Resilience Index 



The 2015 FM Global Resilience Index

Annual Report

FOREWORD

Effective supply chain risk management is critical for swift recovery from unexpected, adverse events that disrupt business operations. The 2015 FM Global Resilience Index offers powerful insights to help business executives target their investments towards more reliable returns and to protect their customers from unforeseen disruption; www.fmglobal.com/resilienceindex.

The index provides an annual ranking of 130 countries and territories according to their business resilience to supply chain disruption. The scores that generate the ranking are calculated as an equally-weighted composite of nine core drivers that affect resilience significantly and directly. This year's index captures a fascinating mix of change and stability. The key results are summarised below.

Key results

1. Norway retains its top position in the index from last year, with strong results for economic productivity, control of corruption, political risk and resilience to an oil shock. The country's management of fire risk offers opportunity to improve still further.
2. Despite its massive oil reserves, Venezuela ranks 130, placing it at the bottom of the index, and reflecting the many challenges South America faces, ranging from economic and political to geological, with its west coast on the Pacific 'Ring of Fire'.
3. Taiwan has jumped the most in the index – 52 places in the annual ranking to 37; more than any other country. Its rise is due mainly to a substantial improvement in the country's commitment to risk management, as it relates both to natural hazard risk and fire risk. Given the country's location at the western edge of the Philippine sea plate, this is a welcome development.
4. Ukraine, ranked 107, and Kazakhstan, ranked 102, dropped more places this year than any other country; a fall of 31 places each. Unsurprisingly, for Ukraine, the worsening political risk, combined with poorer infrastructure, was to blame. The fall for Kazakhstan this year reflects a poorer commitment to natural hazard risk management in the region.
5. In the European Union (EU), Greece fell from position 54 to 65. The recent victory of the anti-austerity Syriza party almost certainly will usher in a period of greater friction and turbulence with its EU partners.
6. France, ranked 19, trails Germany at 6. France has slid down the index in recent years reflecting a rising risk of terrorism – evidenced tragically in Paris – and deteriorating perceptions of both infrastructure and local suppliers. Also exposed to terrorism risk is the United Kingdom, which nevertheless held steady at 20 for the third year running, aided by its relative resistance to oil shocks.

Independent analytics and advisory firm, Oxford Metrica, is delighted to be FM Global's partner in developing the index.



Dr Rory Knight
Chairman

Dr Rory Knight is Chairman of Oxford Metrica. He was previously Dean of Templeton College, Oxford University's business College. Prior to that he served as vice Direktor in the Schweizerische Nationalbank, the Swiss central bank.

INTRODUCTION

The world in 2014: the hottest on record, with prolonged droughts in California, Australia and Brazil, Cyclone Hudhud in India and Nepal, winter storms in Japan, severe blizzards in North America, thunderstorms in Europe, floods in the United Kingdom, and twice the average number of big earthquakes in the first quarter of the year.

In Syria, the rebellion gave rise to a fully formed and brutal Islamic State, resulting in a paradoxical realignment of the West with its former foe, Syria's President Assad. In West Africa, as well as an unforeseen and lethal outbreak of Ebola virus disease, there was an explosion of terrorism in the shape of Boko Haram. Terrorism has since spread into the capitals of the West, most notably Paris, executed by cadres hardened by exposure to conflict in Iraq, Syria and beyond.

In Ukraine, Russia's unexpected and aggressive military intervention provoked a wave of sanctions that hit hard at Russia's economy. Meanwhile, the shale boom in the United States (US), combined with the decision of the Organisation of the Petroleum Exporting Countries (OPEC) not to cut output, prompted a dramatic fall in oil prices, threatening the economics of fracking (funded largely by debt) and dealing a far more grievous blow to Russia's commodity-dependent economy than any Western sanction.

So what do these unforeseen events mean for business executives and the security of their global supply chains? The 2015 FM Global Resilience Index responds to this question, defining resilience as a combination of the vulnerability of a country to supply chain disruption and the country's ability to recover from such disruption. The index identifies nine key drivers of resilience including, for example, political risk, the quality of infrastructure, exposure to natural hazard and commitment to risk management. These drivers are aggregated into three broad factors – economic, risk quality and supply chain – which, in turn, combine to form the index. The index provides ranked scores for 130 countries and territories around the world.

The FM Global Resilience Index offers a resource for business executives to guide safer and sounder choices when positioning investments and developing networks, as well as a tool for progress and improvement. Overall, the index exhibits a core stability from year to year while demonstrating some interesting changes for discussion.

LEADERS AND LAGGARDS

Tables 1 and 2 present the countries and territories that ranked highest and lowest for their business resilience to supply chain disruption; the top and bottom 10 in the index.

Norway, ranked 1, and Switzerland, ranked 2, achieve the top two places in the index again this year. Norway achieves this with consistently high scores across the three core factors: economic, risk quality and supply chain. Norway ranks in the top 10 in the world for economic productivity, control of corruption, political risk and oil intensity (a driver that reflects vulnerability to an oil shock). Norway's high score for risk quality depends strongly on minimal natural hazard exposure and excellent management of natural hazard risk at exposed locations. Even for Norway, however, there is scope to improve in absolute terms, especially in the management of fire risk.

Switzerland scores very highly on economic and supply chain factors (where the country leads). In particular, Switzerland scores best in the world for an extensive and efficient infrastructure.

Table 1 The Top 10 in 2015

Country/Region	Factors							
	Composite		Economic		Risk quality		Supply chain	
	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Norway	1	100.0	2	97.8	9	77.2	13	84.4
Switzerland	2	94.9	3	93.2	100	49.9	1	100.0
Netherlands	3	93.3	14	70.9	5	81.2	3	92.4
Ireland	4	92.7	11	73.9	1	100.0	25	73.3
Luxembourg	5	91.7	1	100.0	84	50.5	10	86.4
Germany	6	91.1	12	72.2	12	75.4	5	91.4
Qatar	7	90.7	4	89.6	15	73.7	24	75.5
Canada	8	90.1	15	68.6	2	87.0	16	83.3
Finland	9	88.8	9	77.1	35	62.7	4	92.0
United States Region 3	10	88.3	17	67.7	3	86.0	19	81.2

New to the top 10 this year, are Qatar, ranked 7, and Finland, ranked 9. Qatar benefits from its macroeconomic stability, efficient goods and labour markets and high degree of security. The country owes its rise of 8 places to a considerable improvement in commitment to fire risk management in the region. Finland's strengths spring particularly from its innovative capabilities which are the fruit of high public and private investment in research and development, strong links between academe and private sector companies, and an excellent record in education and training.

In tenth place is US Region 3: the central region of the US that is subject to a variety of natural hazards, but with less exposure than states in the east or west of the country. The geographic spread of the US exposes it to a range of natural hazards, requiring the index to categorise the country as three distinct regions.

Belgium, ranked 11, and Australia, ranked 14, drop out of the top 10 but only just, and both countries retain high positions in the 2015 index.

Table 2 The Bottom 10 in 2015

Country/Region	Factors							
	Composite		Economic		Risk quality		Supply chain	
	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Tajikistan	121	25.0	113	24.2	111	33.6	99	31.1
Egypt	122	22.9	125	11.8	73	51.6	110	24.1
Pakistan	123	22.2	128	7.7	76	51.4	105	26.7
Jamaica	124	21.8	126	8.8	116	30.3	71	41.7
Honduras	125	21.7	121	19.3	116	30.3	97	31.6
Dominican Republic	126	19.0	74	36.6	130	0.0	90	33.9
Nicaragua	127	18.8	117	22.5	116	30.3	116	22.6
Mauritania	128	15.2	129	2.7	37	61.7	129	8.4
Kyrgyz Republic	129	10.7	130	0.0	111	33.6	111	24.0
Venezuela	130	0.0	127	8.1	127	14.4	128	9.3

The majority of countries in the bottom 10 score very poorly on economic factors: GDP per capita, political risk and oil intensity. The Dominican Republic, ranked 126, is an exception, where its score is brought down by risk quality factors. More specifically, the country is entirely exposed to windstorms, and its geophysical location, near the boundary between the Caribbean and North American tectonic plates, renders the country completely exposed also to earthquake risk.

Despite its massive oil reserves and high urbanisation, Venezuela ranked 130, placing it last in the 2015 index, and is the victim of a challenging mix of an unstable macroeconomic environment, high inflation and public debt, and malfunctioning markets. Beyond economic factors, the country scores poorly in terms of risk quality and supply chain factors – little changed in those respects from 2014.

There is nothing one can do about a country's geophysical position and characteristics. However, there are many opportunities for both regulators and business executives to improve a country's resilience through greater awareness of where the exposures lie, and well-targeted investments in improved risk management procedures.

THE BIGGEST MOVERS 2015

Table 3 presents the top 10 risers for 2015. These countries have jumped at least 15 places in the index since last year.

Table 3 Top 10 Risers 2015

Country/Region	Composite		Factors					
	Rank	Change	Economic		Risk quality		Supply chain	
	Rank	Change	Rank	Change	Rank	Change	Rank	Change
Taiwan	37	52	41	5	103	27	26	2
Guyana	81	42	96	28	67	49	76	0
Romania	86	25	50	8	110	13	85	26
Bolivia	103	23	101	4	67	49	104	14
Peru	73	23	69	1	67	49	80	0
Armenia	83	22	124	1	15	39	74	8
Ecuador	97	21	106	5	67	49	91	1
Azerbaijan	55	17	67	11	15	39	78	9
Kenya	74	17	107	10	37	-9	72	16
Uruguay	41	15	31	2	67	49	53	0

Taiwan, ranked 37, has jumped 52 places in the annual ranking; more than any other country. Its strong capacity for innovation is underpinned by world-class infrastructure, a highly efficient goods market and a strong higher education sector. Its rise in the 2015 FM Global Resilience Index is due mainly to a substantial improvement in the country's commitment to risk management, as it relates both to natural hazard risk and fire risk. Given the country's location at the western edge of the Philippine sea plate, this is a welcome development.

Guyana, ranked 81, and Bolivia, ranked 103, both escaped the clutches of the bottom 10 this year and rose significantly in the index; 42 and 23 places, respectively. Prompting these rise in rankings is an improved commitment to natural hazard risk management, shared by other South American countries: Peru, ranked 73, Ecuador, ranked 97, and Uruguay, ranked 41.

Romania, ranked 86, one of the most popular destinations for outsourcing by German enterprises, has improved its standing in the index considerably. This has been achieved through better quality infrastructure and an improved perception of local suppliers, resulting in a gain of 25 places in this year's ranking.

Presented in Table 4 are the 10 biggest fallers for 2015; each dropped more than 10 places since 2014.

Table 4 Top 10 Fallers 2015

Country/Region	Factors							
	Composite		Economic		Risk quality		Supply chain	
	Rank	Change	Rank	Change	Rank	Change	Rank	Change
Ukraine	107	-31	116	-36	84	-8	93	-16
Kazakhstan	102	-31	59	3	111	-44	92	-1
Turkey	85	-27	86	-7	126	-26	44	-1
Chad	118	-20	66	-1	37	-9	130	-2
Tajikistan	121	-20	113	1	111	-44	99	-4
Thailand	82	-20	123	0	33	-12	70	-21
Malawi	111	-16	119	-11	37	-9	114	-10
El Salvador	92	-14	82	-15	116	-11	60	5
Ghana	78	-14	88	-22	37	-9	95	-11
Mongolia	117	-13	72	-1	111	-44	109	18

Ukraine, ranked 107, and Kazakhstan, ranked 102, both fell 31 places in this year's index; more than any other country. For Ukraine, this is due directly to the ongoing crisis in the southern and eastern parts of the country. The fall in Ukraine's position in the index has been most marked with respect to an intensified political risk and deteriorating infrastructure: transport, telephony and energy. The available data underpinning the 2015 index were sourced before the most recent outbreak of fighting. Since then, Ukraine's situation has continued to deteriorate.

For Kazakhstan, the cause of its fall is different, and relates to a poorer commitment to natural hazard risk management in the region than last year, a deterioration shared by Tajikistan, ranked 121, and Mongolia, ranked 117. Turkey's fall of 27 places to its current position at 85 is traceable to a decline in risk quality, specifically its risk management commitment with regard to both natural hazards and fire risk.

Thailand, ranked 82, has dropped 20 places in this year's index due to supply chain factors; in particular, a poorer perception of both the quality of its overall infrastructure and the quality of its local suppliers.

A REGIONAL PERSPECTIVE

These observations of individual countries in the 2015 FM Global Resilience Index may be viewed in a regional framework that remains broadly stable. Globally, the index reflects not only questions of risk and supply chains but also issues of economic policy and growth. It is the advanced economies of the G7 and Australasia that dominate the higher rankings.

The European Union

Reflecting the span of its membership, the European Union (EU) straddles both east and west. This region embraces clear differences in both economic productivity and progress in implementing reforms. On one side is Ireland which keeps its place in the top 10, and indeed moves up one place from 5 to 4, reflecting both its low exposure to natural hazards and the fruits of its austerity and fiscal regimes.

By contrast, Greece drops from 54 to 65. The country still suffers from extremely high levels of debt, and the success of the anti-austerity Syriza party in the elections at the start of 2015 generates further uncertainty. A period of increased turbulence and friction with its EU partners seems almost inevitable. The biggest drag on Greece's performance in the index, of course, is simply its geological location, heavily exposed as it is to earthquake risk.

In the EU, Germany ranks 6, with its excellent infrastructure and local suppliers. The country is trailed by France at 19 and Italy at 47. France has fallen slightly down the index in each of the past three years – from 12 to 16 and then down to its present position at 19. This is due to a rising risk of terrorism, as tragically witnessed at the recent massacre at satirical newspaper *Charlie Hebdo's* offices in Paris. In addition, France has experienced worsening perceptions both of the country's infrastructure and the quality of local suppliers. Italy suffers from poor risk quality and a range of structural problems including large public debt, a rigid labour market, high taxes and weak access to financing.

For the third year running, the United Kingdom (UK) has held on to its rank of 20. Its ranking reflects its resistance to oil shocks as its consumption of oil relative to GDP is comparatively low. The UK scores well on other key drivers such as its control of corruption and the quality of local suppliers but there is scope for improvement in risk quality, particularly as it relates to fire risk management. In addition, the risk of terrorism continues to threaten supply chain security.

The Middle East

Strong performers in the Middle East region include Qatar, ranked 7, and the nations of the United Arab Emirates (UAE), Israel, Oman and Bahrain, all ranking between 29 and 36 in this year's index. Israel owes the strength of its ranking to its commitment to risk management, while the latter two also benefit from a strong commitment to risk management in the region. The UAE owes its showing to a particularly strong infrastructure, behind only Switzerland, ranked 2, and Hong Kong, ranked 18, and equal with Finland, ranked 9, with respect to this driver.

Asia

At first sight, the index produces a few surprises, especially in Asia. The Republic of Korea, often deemed one of the most dynamic 'Asian tigers', is ranked 70, a position around which it has hovered for the past three years. Despite its clear strengths in the economic and supply chain factors, Korea's position in the index is hindered significantly by its exposure to natural hazards, and by its relatively low ability to respond effectively to them.

The position of Vietnam in the index is also a curiosity, occupying a position of 96 this year, below Uganda, ranked 95, Tanzania, ranked 87, and several other African countries. The Vietnamese have made massive investments in infrastructure,

ranging from financial systems to roads in the past 15 years. All the indications are that Vietnam is growing rapidly and, in some cases, replacing the emerging BRIC nations (Brazil, ranked 59, Russia, ranked 68, India, ranked 119, and China, whose three regions within the index ranked in the 60s) as a destination for corporate offshoring investment. Exposure to natural hazards and poor risk management in the region, especially fire risk management, pulls Vietnam down the rankings. However, it is worth noting that the country is at its highest position in the index for five years. The positive trend is evident.

Latin America

The west coast of South America will struggle to perform strongly in the Resilience Index, owing simply to its geological position in the so-called Pacific 'Ring of Fire'. This makes Chile's position at 45 particularly impressive, and credit is due to its government for the country's relative stability and control of corruption. Similarly, Uruguay, ranked 41, is one of this year's top risers and has demonstrated impressive political stability and control of corruption. Generally, the continent of South America suffers politically and economically, with poor infrastructure and challenges in controlling corruption.

Africa

Africa is a continent of enormous resources and equally great contrasts. South Africa, ranked 46, and Nigeria, ranked 112, are its two heaviest hitters but even they suffer from serious drawbacks. Economically, Nigeria is held back by weak public finances and institutions, corruption and inadequately protected property rights. Plummeting oil prices and the dire security situation as the country confronts Boko Haram can only undermine Nigeria's position. South Africa's key risks to the supply chain lie in a poor commitment to fire risk management and vulnerability to oil shock.

Africa has minimal natural hazard risk and, with its young population and wealth of natural and agricultural resources, holds enormous potential. Some say that Africa, in terms of corporate and investor interest, may be the new South America.

The BRIC nations: Brazil, Russia, India and China

The fifth largest country in the world (by both geographical area and population), Brazil, ranked 59, is the largest national economy in Latin America. In contrast to Chile, ranked 45, for example, Brazil is blessed with lower natural hazard risk but, economically and politically, the country faces significant challenges. Brazil's progress in the index is hindered also by the relatively poor quality of its infrastructure.

Perhaps surprisingly, Russia improved its overall position in the 2015 index (up from 79 to 68) due largely to improvements in its infrastructure and the perceived quality of local suppliers. On both economic productivity and vulnerability to an oil shock, however, the country's position deteriorated from last year. Russia's ranking was calculated before the combination of Western sanctions and the fall in oil prices had bitten fully. Their continuing impact can only further undermine an already unbalanced commodity-based economy.

India, despite its scope and global potential, ranks 119 of 130 countries and territories. Economically, it suffers from a formidable tangle of problems. A third of its population still live in extreme poverty – one of the highest incidences outside sub-Saharan Africa. The implementation of economic reforms has been identified as a priority by India's new government. India ranks poorly across eight of the nine drivers of resilience. The exception is the country's relatively low exposure to natural hazards, which suggests that India's destiny, to an encouraging extent, lies in its own hands.

China, like the US, is divided into three regions according to its widely varying exposure to natural hazard. China Region 1, ranked 64, which includes

Shanghai, has significant wind and earthquake exposure. China Region 2, ranked 69, is prone to earthquake risk while China Region 3, ranked 63, faces a variety of natural hazard exposures. China's other challenges range from poor accountability and transparency, high levels of corruption and growing security concerns to problems in its financial sector, especially with regard to the fragile position of its banks.

CONCLUSION

There is growing awareness among business executives of the importance of effective supply chain risk management. Common threats to the supply chain often have a territorial aspect and involve the concentration of resources and activities in vulnerable locations, combined with insufficient redundancy and spare capacity.

As globalisation accelerates, business increasingly is conducted in a borderless, interconnected and almost invisible way, leading to a potential loss of strategic control. This emphasises the need for a much more tangible, strategic and proactive approach to supply chain risk management. A long-term strategic approach can conflict at times with the short-term pressures upon operational managers in their relentless pursuit of low-cost, 'lean' supply chains. Yet supply chains are no longer the sole purview of operational managers. Increasingly, they are (and need to be) a 'C-suite' concern and are being centralised and supported at higher corporate levels.

It is here that the FM Global Resilience Index can make its most powerful contribution. The index offers business executives an additional resource to help in prioritising supply chain risk management and guiding strategy in four key areas:

1. Selecting suppliers based on the supply chain risk/resilience of the countries in which they are located,
2. Deciding where to locate facilities,
3. Evaluating the resilience of the countries hosting existing facilities, and
4. Assessing the resilience of the countries where customers' facilities are based.

In summary, the index provides a robust, composite view of business resilience to supply chain disruption around the world. Independently constructed, annually updated, and facilitating deeper analysis of the key drivers of resilience, the index aims to bring a fresh perspective to strategic dialogue and informed decision-making.

THE 2015 FM GLOBAL RESILIENCE INDEX

Presented next is the 2015 FM Global Resilience Index. Complete rankings are provided for the overall composite index and for each of its component factors: economic, risk quality and supply chain. Adjacent to each rank is presented a score, bounded on a scale of 0 to 100. A score of 100 does not imply a perfect score but, rather, that the territory ranks top in that particular dimension. The scores, therefore, are a relative measure of resilience across countries, rather than an absolute measure.

The index is produced for 130 countries and territories: 126 countries and three regions each for China and the US. China and the US are sub-divided into regions because their geographical spread encompasses such disparate exposures to natural hazards: wind, flood and earthquake. Regions in the US are based on states, and regions in China are based on provinces, municipalities and autonomous regions. The composition of each region is provided in Appendix 5.

THE 2015 FM GLOBAL RESILIENCE INDEX

Country/Region	Factors							
	Composite		Economic		Risk quality		Supply chain	
	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Norway	1	100.0	2	97.8	9	77.2	13	84.4
Switzerland	2	94.9	3	93.2	100	49.9	1	100.0
Netherlands	3	93.3	14	70.9	5	81.2	3	92.4
Ireland	4	92.7	11	73.9	1	100.0	25	73.3
Luxembourg	5	91.7	1	100.0	84	50.5	10	86.4
Germany	6	91.1	12	72.2	12	75.4	5	91.4
Qatar	7	90.7	4	89.6	15	73.7	24	75.5
Canada	8	90.1	15	68.6	2	87.0	16	83.3
Finland	9	88.8	9	77.1	35	62.7	4	92.0
United States Region 3	10	88.3	17	67.7	3	86.0	19	81.2
Belgium	11	87.7	21	66.9	7	78.9	11	86.3
Denmark	12	87.4	5	79.7	63	58.1	7	90.4
New Zealand	13	87.2	10	75.2	25	71.5	15	83.4
Australia	14	86.9	8	77.8	10	76.6	23	76.3
Sweden	15	86.2	6	78.9	62	59.5	8	87.5
United States Region 1	16	85.6	17	67.7	8	78.8	19	81.2
Austria	17	85.6	7	78.1	64	54.7	6	90.7
Hong Kong SAR	18	84.1	25	63.6	23	72.6	9	87.1
France	19	83.8	22	66.7	13	75.3	18	81.3
United Kingdom	20	80.7	20	67.4	30	68.6	22	79.5
United States Region 2	21	79.1	17	67.7	36	61.9	19	81.2
Portugal	22	77.8	32	56.5	4	82.0	27	72.8
Iceland	23	77.4	13	71.2	84	50.5	14	83.5
Singapore	24	74.1	48	47.1	32	67.3	12	85.7
Spain	25	73.1	35	54.3	14	74.2	29	71.2
Czech Republic	26	69.3	28	59.7	29	68.7	36	62.7
Poland	27	67.9	30	57.2	6	81.0	51	52.2
Malaysia	28	64.9	68	38.4	11	75.6	32	67.9
United Arab Emirates	29	64.3	27	61.6	124	28.8	17	82.4
Brunei Darussalam	30	63.9	16	68.2	76	51.4	42	57.4
Estonia	31	63.7	33	55.7	84	50.5	30	69.4
Israel	32	62.5	49	46.8	24	72.4	41	57.7
Slovenia	33	62.3	29	59.3	84	50.5	35	63.0
Japan	34	61.9	23	66.0	129	2.8	2	94.2
Oman	35	61.8	51	46.2	15	73.7	46	55.6
Bahrain	36	59.4	84	34.8	15	73.7	37	61.3
Taiwan	37	59.3	41	49.9	103	41.6	26	72.8
Costa Rica	38	58.1	40	51.5	34	66.8	59	48.4
Lithuania	39	57.5	39	52.0	84	50.5	39	59.9
Latvia	40	57.5	37	53.1	84	50.5	40	58.7
Uruguay	41	56.5	31	56.8	67	52.3	53	51.7
Cyprus	42	56.1	60	40.1	84	50.5	31	68.1

Country/Region	Factors							
	Composite		Economic		Risk quality		Supply chain	
	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Mauritius	43	55.7	54	45.4	37	61.7	48	53.2
Barbados	44	55.7	38	52.4	116	30.3	28	71.9
Chile	45	54.7	45	47.6	104	41.4	34	65.5
South Africa	46	54.0	76	36.2	28	69.7	52	51.7
Italy	47	53.5	24	63.7	115	30.3	43	56.7
Hungary	48	53.4	36	53.9	101	45.7	50	53.1
Botswana	49	53.3	34	55.4	37	61.7	75	38.7
Kuwait	50	53.2	55	45.4	15	73.7	79	38.4
Croatia	51	52.9	44	48.8	84	50.5	49	53.2
Namibia	52	52.9	58	41.5	37	61.7	54	50.8
Slovak Republic	53	52.0	26	62.1	108	36.9	56	49.8
Georgia	54	51.7	70	37.7	15	73.7	69	42.5
Azerbaijan	55	50.2	67	38.6	15	73.7	78	38.4
Malta	56	50.1	80	34.9	84	50.5	38	60.4
Saudi Arabia	57	48.6	118	21.8	27	70.6	47	53.4
Zambia	58	48.2	46	47.5	37	61.7	86	35.4
Brazil	59	47.8	62	39.3	31	67.5	83	37.6
Sri Lanka	60	47.7	91	33.7	76	51.4	45	55.8
Jordan	61	46.8	122	18.8	15	73.7	55	49.9
Lesotho	62	46.3	47	47.5	37	61.7	98	31.5
China Region 3	63	45.8	63	39.0	65	54.1	63	44.4
China Region 1	64	45.3	63	39.0	66	53.0	63	44.4
Greece	65	45.0	52	46.2	105	40.9	61	46.8
Mexico	66	44.8	94	32.4	61	59.7	66	44.2
Montenegro	67	44.7	42	49.5	84	50.5	87	35.3
Russian Federation	68	44.1	90	33.7	26	71.1	94	32.3
China Region 2	69	42.5	63	39.0	102	45.6	63	44.4
Korea, Republic of	70	42.1	43	49.4	128	5.6	33	66.0
Côte d'Ivoire	71	41.8	85	34.3	37	61.7	88	34.4
Macedonia, FYR	72	41.6	81	34.8	84	50.5	68	42.5
Peru	73	41.5	69	37.7	67	52.3	80	38.1
Kenya	74	41.4	107	27.3	37	61.7	72	40.2
Bulgaria	75	41.4	61	39.6	84	50.5	82	37.7
Morocco	76	40.9	102	29.8	73	51.6	62	44.8
Argentina	77	40.7	57	43.1	60	60.5	108	24.8
Ghana	78	40.6	88	34.1	37	61.7	95	32.2
Trinidad and Tobago	79	39.2	53	45.6	116	30.3	67	43.7
Senegal	80	39.2	112	24.9	37	61.7	81	37.8
Guyana	81	39.0	96	31.6	67	52.3	76	38.7
Thailand	82	39.0	123	15.2	33	66.8	70	42.4
Armenia	83	38.5	124	12.1	15	73.7	74	38.9
Mali	84	38.5	103	29.7	37	61.7	96	31.8
Turkey	85	38.4	86	34.3	126	26.2	44	55.9
Romania	86	37.5	50	46.2	110	33.9	85	36.5
Tanzania	87	37.4	77	36.2	37	61.7	113	23.4

Country/Region	Factors							
	Composite		Economic		Risk quality		Supply chain	
	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Burkina Faso	88	37.1	75	36.2	37	61.7	115	22.7
Cameroon	89	37.1	73	37.4	37	61.7	118	21.5
Serbia	90	36.3	79	35.3	84	50.5	101	30.9
Panama	91	36.1	93	33.0	116	30.3	58	49.0
El Salvador	92	36.1	82	34.8	116	30.3	60	47.2
Guatemala	93	35.9	95	32.3	116	30.3	57	49.2
Albania	94	35.9	87	34.2	84	50.5	100	31.1
Uganda	95	35.8	78	35.9	37	61.7	120	20.3
Vietnam	96	35.3	92	33.5	76	51.4	103	30.0
Ecuador	97	35.0	106	27.8	67	52.3	91	33.9
Mozambique	98	34.5	83	34.8	37	61.7	124	18.6
Bosnia & Herzegovina	99	34.2	98	31.4	84	50.5	102	30.2
Madagascar	100	34.0	108	27.1	37	61.7	106	24.9
Ethiopia	101	33.6	109	26.2	37	61.7	107	24.8
Kazakhstan	102	33.5	59	41.2	111	33.6	92	33.1
Bolivia	103	33.3	101	30.0	67	52.3	104	28.3
Philippines	104	33.1	97	31.5	106	38.3	84	37.6
Paraguay	105	32.8	71	37.6	67	52.3	121	20.1
Indonesia	106	32.3	104	29.1	107	38.0	77	38.4
Ukraine	107	31.4	116	22.5	84	50.5	93	32.7
Timor-Leste	108	31.3	56	44.0	76	51.4	127	11.6
Zimbabwe	109	31.1	99	31.3	37	61.7	126	14.7
Colombia	110	30.6	89	34.0	125	26.3	73	39.6
Malawi	111	30.6	119	21.4	37	61.7	114	23.0
Nigeria	112	30.2	110	26.2	37	61.7	125	17.7
Benin	113	29.4	120	19.7	37	61.7	117	22.2
Nepal	114	29.2	100	30.3	76	51.4	122	19.9
Bangladesh	115	29.0	105	28.9	76	51.4	119	20.9
Algeria	116	28.9	111	25.8	73	51.6	112	23.4
Mongolia	117	27.7	72	37.5	111	33.6	109	24.4
Chad	118	27.5	66	38.9	37	61.7	130	0.0
India	119	27.1	115	23.5	109	36.6	89	34.0
Cambodia	120	26.2	114	23.7	76	51.4	123	19.9
Tajikistan	121	25.0	113	24.2	111	33.6	99	31.1
Egypt	122	22.9	125	11.8	73	51.6	110	24.1
Pakistan	123	22.2	128	7.7	76	51.4	105	26.7
Jamaica	124	21.8	126	8.8	116	30.3	71	41.7
Honduras	125	21.7	121	19.3	116	30.3	97	31.6
Dominican Republic	126	19.0	74	36.6	130	0.0	90	33.9
Nicaragua	127	18.8	117	22.5	116	30.3	116	22.6
Mauritania	128	15.2	129	2.7	37	61.7	129	8.4
Kyrgyz Republic	129	10.7	130	0.0	111	33.6	111	24.0
Venezuela	130	0.0	127	8.1	127	14.4	128	9.3

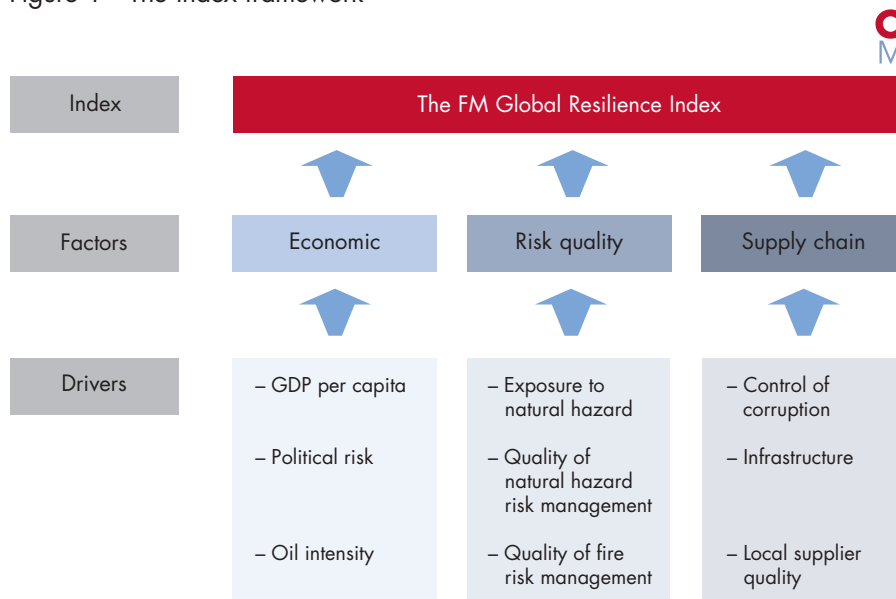
APPENDIX 1: THE INDEX FRAMEWORK

Provided in this Appendix is an overview of the framework and construction of the FM Global Resilience Index. A more detailed description of the construction methodology is available in Appendix 3. Figure 1 provides the framework for the index. There are three levels to the index:

1. Level I of the index provides a country ranking of business resilience to supply chain disruption. Level I is an equally-weighted composite measure of the three factors in Level II.
2. Level II comprises three factors, the core elements of resilience: economic, risk quality and supply chain. Each factor in Level II is an equally-weighted composite of its respective drivers in Level III.
3. Level III includes a set of nine drivers that determine the business resilience to supply chain disruption for a country. Each driver measures a different aspect of resilience.

Many simulations were carried out to determine the most appropriate weighting scheme. There emerged very little difference in ultimate rankings from the adoption of very different weighting structures so, rather than impose a subjective system of aggregation without very good reason to do so, it is right to remain with equal weights across the nine core drivers of resilience.

Figure 1 The index framework



The overall composite index is, by design, a simplified, summary measure of resilience. The FM Global Resilience Index provides an indication of relative business resilience to supply chain disruption across countries. In combination with additional information, this provides executives with a source of guidance on supply chain risk when making decisions over the destination of physical investments.

The structure of the index enables business executives to identify the sources of strength and vulnerability in a country's supply chain risk, both broadly across factors (economic, risk quality or supply chain), and more precisely across the nine drivers. Such analysis offers opportunities to managers seeking to improve their company's supply chain risk profile.

Defined in Appendix 2 are the nine core drivers of resilience that underpin the index and the rationale for their selection.

APPENDIX 2: THE DRIVERS OF RESILIENCE

Supply chain risk is a complex exposure, subject to many different influences. The process of identifying for an index a set of core drivers with significant impact on resilience to supply chain disruption is partly heuristic, partly statistical and partly practical.

Research into the causes of supply chain disruption highlights common triggers of disruption to global supply chains¹. Conflict and political unrest, terrorism, corruption, vulnerability to oil shortages and price shocks, natural disasters, extreme weather, maturity in risk management capabilities, investment in risk management, infrastructure, and the quality of local suppliers all appear regularly.

To meet statistical criteria, the drivers of the index must: demonstrably have an impact on resilience; represent faithfully the intended property; have sufficient sensitivity to detect changes in resilience, but not so much volatility as to disrupt the index; exhibit minimal correlation across drivers; and be consistently calculated (over a period of time to allow back-testing).

Practical considerations require that the data are available, quantitative (or quantifiable), global, annual and from credible sources.

From an initial test-bed of 38 variables, nine core drivers of resilience have been selected for inclusion in the FM Global Resilience Index. These drivers are categorised as pertaining to economic, risk quality or supply chain factors, and are detailed below.

1. **Economic** – This factor represents political and macroeconomic influences on resilience. Combining to form the factor, economic, are three drivers: productivity (GDP per capita), political risk and oil intensity. Terrorism was found to be highly correlated with political instability, so these variables are combined into a single driver: political risk. Oil intensity captures the vulnerability a country has to an oil shock – oil shortage, disruption or sudden price hike – measured as oil consumption divided by GDP.
2. **Risk quality** – A unique attribute of the index is its ability to draw upon the wealth of data gathered over many years by FM Global's team of property risk engineers who visit and assess over 100,000 locations annually across the world. The data, which resides in FM Global's proprietary RiskMark database, has the advantage of being applied consistently across all industry sectors and regions. The factor, risk quality, comprises three drivers drawn from the RiskMark database: exposure to natural hazard, quality of natural hazard risk management and quality of fire risk management.
3. **Supply chain** – This factor relates to the supply chain itself and comprises three drivers: control of corruption, infrastructure and the quality of local suppliers.

Comprehensive technical definitions and data sources are provided in Appendix 4.

Data for the nine drivers of resilience have been collected for 130 countries and territories. The nine drivers are assigned equal weights and combine to form the composite index.

¹ For example, *Building Resilience in Supply Chains*, World Economic Forum, 2013
Supply Chain and Risk Management, MIT Forum for Supply Chain Innovation, 2013
New Models for Addressing Supply Chain and Transport Risk, World Economic Forum, 2012
Measures of Oil Import Dependence by James M. Kendell, Energy Information Administration, 1998.

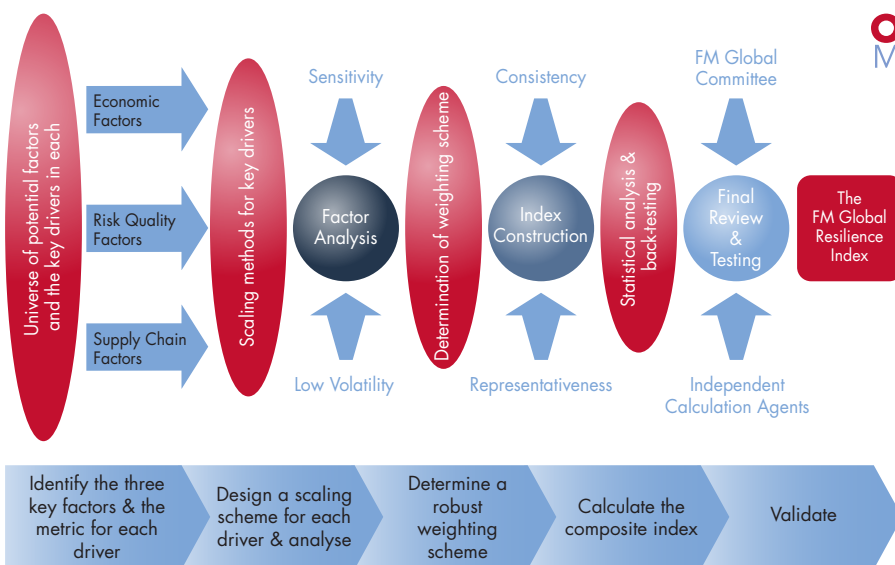
APPENDIX 3: INDEX CONSTRUCTION METHODOLOGY

There are five steps in the process of index construction:

1. Define the property of interest (resilience to supply chain disruption)
2. Identify the factors (economic, risk quality and supply chain) and drivers
3. Measure and analyse the drivers within each factor
4. Develop the scheme of aggregation in the construction of the index
5. Validate the index by back-testing over several years

This process of index construction is presented diagrammatically in Figure 2.

Figure 2 The index construction process



Described below are the key procedures applied to the data defined in the previous section, prior to their combination into the FM Global Resilience Index.

1. Annual data, for the most recent five years, were collected for the maximum number of territories for each of the nine drivers.
2. A common set of territories with complete data availability across the nine drivers was identified and aligned into a consistent data set.
3. Correlation coefficients were calculated across all drivers to assess for significance in correlation: parametric (Pearson) and non-parametric (Spearman).
4. Each data series was standardised through the calculation of z-scores to enable comparison and combination of drivers with different units. Where necessary, z-scores were inverted for consistency across variables.
5. The z-scores were converted into scores on a scale of 0-100 for presentation purposes.
6. The scores of the nine drivers then were combined with equal weightings to form the index.

7. The index comprises the rankings for the top 130 countries and territories for which data were available. Three regions are provided for each of China and the US because their geographical spread includes such disparate exposures to natural hazards: wind, flood and earthquake.

Based on data availability, new entrants to the index, and exits from the index, may emerge. In order to maintain consistency in the interpretation of results, the index is restricted to the top 130 countries and territories in any given year.

APPENDIX 4: DATA DEFINITIONS AND SOURCES

Table 5 Data definitions

Economic	Definition
GDP per capita	Gross domestic product in national currency converted to US dollars using market exchange rates (yearly average), divided by total population
Political risk	Reflects perceptions of the likelihood that the government will be destabilised or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism
Oil intensity	Vulnerability to an oil shock (shortage, disruption, price hike); oil consumption divided by GDP
Risk quality	
Exposure to natural hazard	The percentage of locations in the country that are exposed to at least one natural hazard: earthquake, wind or flood
Quality of natural hazard risk management	The level of natural hazard risk improvement achieved given the inherent natural hazard risks in a country
Quality of fire risk management	The level of fire risk improvement achieved given the inherent fire risks in a country
Supply chain	
Control of corruption	Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as capture of the state by elites and private interests
Infrastructure	Reflects perceptions of general infrastructure: transport, telephony and energy
Local supplier quality	Reflects perceptions of the quality of local suppliers

The data for the three drivers of risk quality are provided by FM Global, one of the world's largest commercial and industrial property insurers. Further detail on their compilation is provided below.

1. **Exposure to natural hazard** - FM Global property risk engineers determine whether any natural hazard exposures are present at the locations they visit. The determination is based on wind, flood and earthquake maps that are available as well as other information acquired by the engineer. The percentage of locations that are exposed to wind, flood or earthquake are summarised for each country (or group of countries). The United States of America and China are each divided into three regions to accommodate for a significantly different dominant natural hazard exposure within these countries. Regions in the US are based on states, and regions in China are based on provinces, municipalities and autonomous regions. The composition of each region is provided in Appendix 5.
2. **Quality of natural hazard risk management** - RiskMark is a benchmarking algorithm that calculates the risk quality of FM Global's insured locations. It uses a 100-point scale (100 representing the best managed, highest quality risk), and the scale consists of the following four components:
 - a. Fire Hazards & Equipment Hazards: 36 points
 - b. Natural Hazards: 30 points
 - c. Human Element & Other Factors: 19 points
 - d. Inherent Occupancy Hazards: 15 points

The RiskMark score of a location includes a measure of both inherent risks and risks where there are recommendations for improvement. The potential RiskMark score represents the highest possible score achievable by that location, given those inherent risks. The percentage potential RiskMark score provides a way to measure risk improvement opportunities given the inherent risks. It is calculated by dividing the RiskMark score by the potential RiskMark score. For the driver, quality of natural hazard risk management, the weighted average (by total insured value) percentage potential RiskMark score for the natural hazard component is provided for each country or region (or group of countries). For each year, RiskMark scores as of July of that year are used.

3. **Quality of fire risk management** - The weighted average (by total insured value) percentage potential RiskMark score for the fire subcomponent of the fire and equipment hazards component is provided for each country or region (or group of countries). For each year, RiskMark scores as of July of that year are used.

Data on political risk (or, more fully, political stability and absence of violence or terrorism) and control of corruption are obtained from the Worldwide Governance Indicators (WGI) data set from the World Bank. The WGI comprise information from 31 existing data sources that report the views and experiences of citizens, entrepreneurs, and experts in the public, private and non-governmental organisation (NGO) sectors from around the world, on the quality of various aspects of governance.

Data on infrastructure and local supplier quality are obtained from the Global Competitiveness Report produced annually by the World Economic Forum (WEF). The data is based on the WEF's annual Executive Opinion Survey which garnered over 14,000 responses in its latest edition (2013 - 2014); an average of over 100 respondents per country.

Table 6 captures the sources of the nine drivers which underpin the index, the units in which they are provided and the respective months in which the data become available.

Table 6 Data sources

Economic	Unit	Source	Date
GDP per capita	USD	IMF	October
Political risk	Scale	World Bank	September
Oil intensity	Bpd	US EIA	April
Risk quality			
Exposure to natural hazard	%	FM Global	September
Quality of natural hazard risk management	%	FM Global	September
Quality of fire risk management	%	FM Global	September
Supply chain			
Control of corruption	Scale	World Bank	September
Infrastructure	Scale	WEF	October
Local supplier quality	Scale	WEF	October

APPENDIX 5: COUNTRY REGIONS BY DOMINANT NATURAL HAZARD

China Region 1	China Region 2	China Region 3	US Region 1	US Region 2	US Region 3
Wind	Earthquake	Miscellaneous	Wind	Earthquake	Miscellaneous
Fujian	Hebei	Anhui	Alabama	Alaska	Arizona
Guangdong	Jiangsu	Beijing	Connecticut	California	Arkansas
Hainan	Neimenggu	Chongqing	Delaware	Hawaii	Colorado
Jilin	Ningxia	Gansu	Florida	Nevada	District of Columbia
Liaoning	Sichuan	Guangxi	Georgia	Oregon	Idaho
Shandong	Tianjin	Guizhou	Louisiana	Puerto Rico	Illinois
Shanghai	Yunnan	Heilongjiang	Maine	Utah	Indiana
Zhejiang		Henan	Maryland	Washington	Iowa
		Hubei	Massachusetts		Kansas
		Hunan	Mississippi		Kentucky
		Jiangxi	New Hampshire		Michigan
		Qinghai	New Jersey		Minnesota
		Shaanxi (Shanxi)	New York		Missouri
		Xinjiang	North Carolina		Montana
			Rhode Island		Nebraska
			South Carolina		New Mexico
			Texas		North Dakota
			Virgin Islands		Ohio
			Virginia		Oklahoma
					Pennsylvania
					South Dakota
					Tennessee
					Vermont
					West Virginia
					Wisconsin
					Wyoming

APPENDIX 6: ALPHABETIC RANKINGS 2015 AND 2014

Country/Region	Factors							
	Composite		Economic		Risk quality		Supply chain	
	2015	2014	2015	2014	2015	2014	2015	2014
Albania	94	92	87	92	84	76	100	94
Algeria	116	114	111	107	73	72	112	119
Argentina	77	65	57	59	60	26	108	97
Armenia	83	105	124	125	15	54	74	82
Australia	14	4	8	5	10	6	23	18
Austria	17	17	7	8	64	75	6	6
Azerbaijan	55	72	67	78	15	54	78	87
Bahrain	36	45	84	89	15	54	37	36
Bangladesh	115	107	105	99	76	92	119	110
Barbados	44	35	38	36	116	105	28	24
Belgium	11	9	21	23	7	5	11	12
Benin	113	115	120	121	37	28	117	121
Bolivia	103	126	101	105	67	116	104	118
Bosnia & Herzegovina	99	94	98	88	84	76	102	99
Botswana	49	37	34	30	37	28	75	61
Brazil	59	49	62	51	31	24	83	66
Brunei Darussalam	30	33	16	17	76	92	42	44
Bulgaria	75	81	61	69	84	76	82	89
Burkina Faso	88	85	75	76	37	28	115	113
Cambodia	120	108	114	113	76	92	123	96
Cameroon	89	88	73	81	37	28	118	116
Canada	8	3	15	13	2	3	16	9
Chad	118	98	66	65	37	28	130	128
Chile	45	40	45	42	104	114	34	30
China Region 1	64	75	63	72	66	101	63	69
China Region 2	69	61	63	72	102	62	63	69
China Region 3	63	66	63	72	65	71	63	69
Colombia	110	109	89	86	125	124	73	75
Costa Rica	38	38	40	39	34	27	59	51
Côte d'Ivoire	71	84	85	96	37	28	88	98
Croatia	51	53	44	48	84	76	49	59
Cyprus	42	39	60	54	84	76	31	39
Czech Republic	26	26	28	28	29	22	36	34
Denmark	12	14	5	7	63	64	7	5
Dominican Republic	126	130	74	68	130	129	90	93
Ecuador	97	118	106	111	67	116	91	92
Egypt	122	121	125	126	73	72	110	100
El Salvador	92	78	82	67	116	105	60	65
Estonia	31	34	33	37	84	76	30	32
Ethiopia	101	103	109	110	37	28	107	114
Finland	9	11	9	9	35	52	4	2
France	19	16	22	18	13	14	18	13
Georgia	54	68	70	77	15	54	69	74

Country/Region	Factors							
	Composite		Economic		Risk quality		Supply chain	
	2015	2014	2015	2014	2015	2014	2015	2014
Germany	6	6	12	16	12	12	5	3
Ghana	78	64	88	66	37	28	95	84
Greece	65	54	52	50	105	66	61	62
Guatemala	93	86	95	93	116	105	57	63
Guyana	81	123	96	124	67	116	76	76
Honduras	125	120	121	122	116	105	97	90
Hong Kong SAR	18	19	25	24	23	63	9	10
Hungary	48	51	36	35	101	103	50	47
Iceland	23	23	13	22	84	76	14	15
India	119	112	115	115	109	113	89	78
Indonesia	106	106	104	85	107	122	77	79
Ireland	4	5	11	10	1	1	25	27
Israel	32	29	49	60	24	10	41	35
Italy	47	44	24	26	115	102	43	57
Jamaica	124	122	126	127	116	105	71	73
Japan	34	32	23	11	129	128	2	8
Jordan	61	74	122	120	15	54	55	56
Kazakhstan	102	71	59	62	111	67	92	91
Kenya	74	91	107	117	37	28	72	88
Korea, Republic of	70	69	43	56	128	127	33	31
Kuwait	50	52	55	38	15	54	79	68
Kyrgyz Republic	129	128	130	130	111	67	111	112
Latvia	40	48	37	40	84	76	40	54
Lesotho	62	67	47	49	37	28	98	106
Lithuania	39	41	39	43	84	76	39	42
Luxembourg	5	7	1	2	84	76	10	14
Macedonia, FYR	72	82	81	87	84	76	68	86
Madagascar	100	99	108	102	37	28	106	117
Malawi	111	95	119	108	37	28	114	104
Malaysia	28	28	68	64	11	4	32	37
Mali	84	93	103	106	37	28	96	101
Malta	56	55	80	95	84	76	38	40
Mauritania	128	127	129	129	37	28	129	123
Mauritius	43	43	54	53	37	28	48	45
Mexico	66	59	94	90	61	51	66	60
Mongolia	117	104	72	71	111	67	109	127
Montenegro	67	60	42	41	84	76	87	81
Morocco	76	73	102	101	73	72	62	64
Mozambique	98	87	83	61	37	28	124	124
Namibia	52	46	58	55	37	28	54	58
Nepal	114	116	100	104	76	92	122	125
Netherlands	3	8	14	15	5	19	3	4
New Zealand	13	12	10	12	25	7	15	16
Nicaragua	127	124	117	119	116	105	116	108

Country/Region	Factors							
	Composite		Economic		Risk quality		Supply chain	
	2015	2014	2015	2014	2015	2014	2015	2014
Nigeria	112	102	110	116	37	28	125	107
Norway	1	1	2	1	9	8	13	17
Oman	35	36	51	45	15	54	46	41
Pakistan	123	125	128	128	76	92	105	103
Panama	91	80	93	100	116	105	58	50
Paraguay	105	119	71	83	67	116	121	120
Peru	73	96	69	70	67	116	80	80
Philippines	104	117	97	97	106	125	84	85
Poland	27	30	30	32	6	11	51	52
Portugal	22	24	32	31	4	13	27	29
Qatar	7	15	4	3	15	54	24	25
Romania	86	111	50	58	110	123	85	111
Russian Federation	68	79	90	84	26	17	94	115
Saudi Arabia	57	50	118	118	27	18	47	38
Senegal	80	77	112	112	37	28	81	72
Serbia	90	97	79	91	84	76	101	105
Singapore	24	22	48	47	32	16	12	11
Slovak Republic	53	47	26	27	108	104	56	55
Slovenia	33	31	29	29	84	76	35	33
South Africa	46	42	76	63	28	20	52	46
Spain	25	25	35	34	14	15	29	26
Sri Lanka	60	63	91	94	76	92	45	48
Sweden	15	13	6	6	62	65	8	7
Switzerland	2	2	3	4	100	53	1	1
Taiwan	37	89	41	46	103	130	26	28
Tajikistan	121	101	113	114	111	67	99	95
Tanzania	87	90	77	75	37	28	113	122
Thailand	82	62	123	123	33	21	70	49
Timor-Leste	108	110	56	52	76	92	127	130
Trinidad and Tobago	79	70	53	57	116	105	67	67
Turkey	85	58	86	79	126	100	44	43
Uganda	95	83	78	82	37	28	120	109
Ukraine	107	76	116	80	84	76	93	77
United Arab Emirates	29	27	27	14	124	115	17	19
United Kingdom	20	20	20	25	30	23	22	20
United States Region 1	16	18	17	19	8	9	19	21
United States Region 2	21	21	17	19	36	25	19	21
United States Region 3	10	10	17	19	3	2	19	21
Uruguay	41	56	31	33	67	116	53	53
Venezuela	130	129	127	103	127	126	128	129
Vietnam	96	100	92	98	76	92	103	102
Zambia	58	57	46	44	37	28	86	83
Zimbabwe	109	113	99	109	37	28	126	126

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