



MARSH & McLENNAN
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INSIGHTS



GLOBAL RISKS FOR INFRASTRUCTURE

Appendix

INTRODUCTION

The infrastructure sector faces a complex landscape of global risks in 2020. Against a backdrop of macroeconomic uncertainty, societal instability, weaponized cyber capabilities, acute environmental threats and geopolitical frictions, infrastructure investors will need to be adaptable to ensure the longevity and security of their assets. Doing so will require a textured understanding of the types of global risks the infrastructure sector faces in 2020, as well as their potential impacts. The 2020 Global Risks for Infrastructure Map, produced by [Marsh & McLennan Advantage Insights](#) in partnership with the [Global Infrastructure Investor Association \(GIIA\)](#), provides some guidance for investors looking to navigate the choppy waters ahead.

The Map draws on data from the Global Risks Report (GRR), a report published by the World Economic Forum (WEF) with support from Marsh & McLennan. Using the GRR's Executive Opinion Survey (EOS), in which 12,879 business executives from 133 economies ranked the top global risks of doing business in their respective markets, Marsh & McLennan has identified nineteen key risk types out of the Global Risks Report's thirty global risks that pose direct and material risks to infrastructure assets in key markets¹ (see Section 1). Each risk has been presented with a case study exploring the unique challenges these risks pose to infrastructure assets in the developed world (see Section 2). These case studies have been carefully selected from key markets whose top business leaders have expressed high levels of concern over the global threats looming on the horizon.

To provide infrastructure investors with an even broader view of these risks, four case studies demonstrating their interconnectedness have also been included (see Section 3). These case studies have been presented on a diagram illustrating the interconnections between today's global risks, which draws on data from the GRR's Global Risks Perception Survey (GRPS). Taken from around the world, the first two case studies illustrate the cascading manner in which risks can indirectly come together to impact infrastructure. Meanwhile, the latter two reflect the way discrete infrastructure-related risk events can indirectly catalyse additional adjacent risks for the infrastructure sector and beyond.

This analysis can be found in its primary form on the interactive visual tool hosted on the Marsh & McLennan Advantage Insights website: The Marsh & McLennan Global Risks for Infrastructure Map, found [here](#). This webpage allows users to visualize the results of the EOS and the GRPS, and explore relevant case studies. This supplementary appendix document serves as a static mirror to the interactive Global Risks for Infrastructure Map, featuring the same case studies and data made available on the interactive tool, and some additional statistical tables and details (see Section 4).

1. "Key markets" comprise economies categorized by the IMF as "Advanced Economies" with over US\$20 billion in nominal GDP as of 2017, and the top 25 economies by forecasted infrastructure investment between 2016-2040 as projected by the GI Hub (July 2017)

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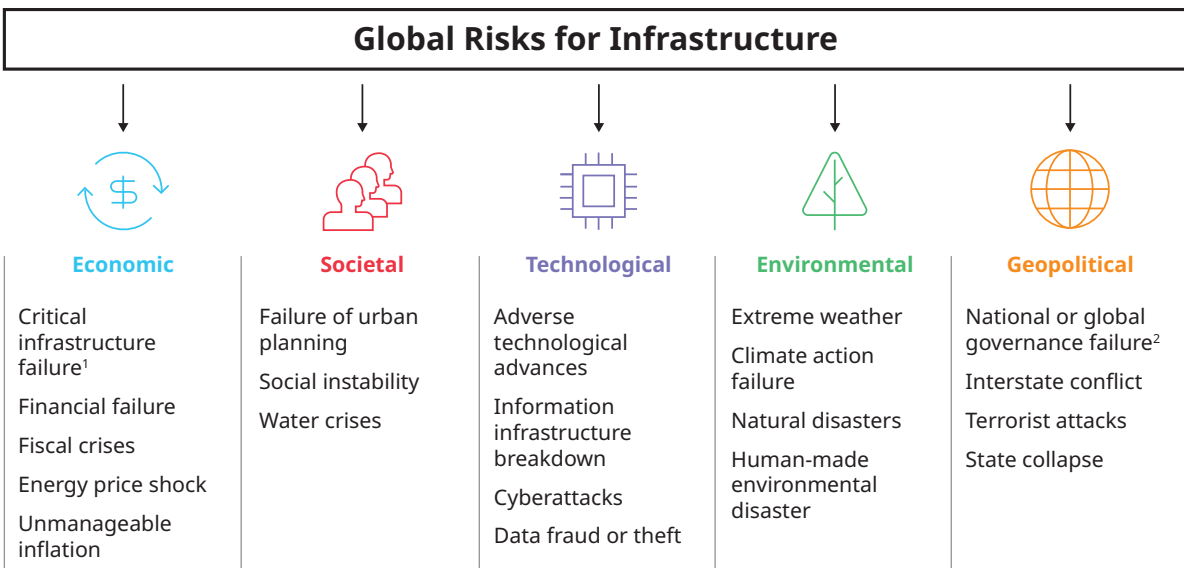
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RISK TAXONOMY

Risk types and definitions

GLOBAL RISKS

A “global risk” is defined as an uncertain event or condition that, if it occurs, can cause significant negative impact for several countries or industries within the next 10 years. A selection of the WEF’s Global Risks to Doing Business is presented below. This selection reflects Global Risks for Infrastructure: risks that have the potential to cause direct material damage to the infrastructure asset class in key infrastructure markets.



1. This risk is not covered as a separate risk in the subsequent section as it cuts through all risk types in the infrastructure sector context



2. This risk is a combination of two risk types: Failure of national governance, and failure of regional or global governance

DESCRIPTIONS OF GLOBAL RISKS TO INFRASTRUCTURE

	Global Risk ¹	Description
 <p>Economic</p>	Failure of a major financial mechanism or institution	Collapse of a financial institution and/or malfunctioning of a financial system that impacts the global economy
	Fiscal crises in key economies	Excessive debt burdens that generate sovereign debt crises and/or liquidity crises
	Severe energy price shock (increase or decrease)	Significant energy price increases or decreases that place further economic pressures on highly energy-dependent industries and consumers
	Unmanageable inflation	Unmanageable increases in the general price levels of goods and services in key economies
 <p>Societal</p>	Failure of urban planning	Poorly planned cities, urban sprawl and associated infrastructure that create social, environmental and health challenges
	Profound social instability	Major social movements or protests (e.g. street riots, social unrest, etc.) that disrupt political or social stability, negatively impacting populations, and economic activity
	Water crises	A significant decline in the available quality and quantity of fresh water, resulting in harmful effects on human health and/or economic activity
 <p>Technological</p>	Adverse consequences of technological advances	Intended or unintended adverse consequences of technological advances such as artificial intelligence, geo-engineering and synthetic biology causing human, environmental, and economic damage
	Breakdown of critical information infrastructure and networks	Cyber dependency that increases vulnerability to outage of critical information infrastructure (e.g. internet, satellites, etc.) and networks, causing widespread disruption
	Large-scale cyberattacks	Large-scale cyber-attacks or malware causing large economic damages, geopolitical tensions, or widespread loss of trust in the internet
	Massive incident of data fraud or theft	Wrongful exploitation of private or official data that takes place on an unprecedented scale

1. Note that these global risk names reflect those used in the GRPS rather than those of the EOS.

DESCRIPTIONS OF GLOBAL RISKS TO INFRASTRUCTURE

	Global Risk	Description
	Extreme weather events (e.g. floods, storms, etc.)	Major property, infrastructure, and/or environmental damage as well as loss of human life caused by extreme weather events
	Failure of climate-change mitigation and adaptation	The failure of governments and businesses to enforce or enact effective measures to mitigate climate change, protect populations and help businesses impacted by climate change to adapt
 Environmental	Major natural disasters (e.g. earthquakes, tsunamis, volcanic eruptions, geomagnetic storms)	Major property, infrastructure, and/or environmental damage as well as loss of human life caused by geophysical disasters such as earthquakes, volcanic activity, landslides, tsunamis, or geomagnetic storms
	Human-made environmental damage and disasters (e.g. oil spills, radioactive contamination, etc.)	Failure to prevent major man-made damage and disasters, including environmental crime, causing harm to human lives and health, infrastructure, property, economic activity and the environment
	Failure of national governance (e.g. failure of rule of law, corruption, political deadlock, etc.)	Inability to govern a nation of geopolitical importance as a result of weak rule of law, corruption or political deadlock
	Failure of regional or global governance	Inability of regional or global institutions to resolve issues of economic, geopolitical, or environmental importance
 Geopolitical	Interstate conflict with regional consequences	A bilateral or multilateral dispute between states that escalates into economic (e.g. trade/currency wars, resource nationalization), military, cyber, societal, or other conflict
	Large-scale terrorist attacks	Individuals or non-state groups with political or religious goals that successfully inflict large-scale human or material damage
	State collapse or crisis (e.g. civil conflict, military coup, failed states, etc.)	State collapse of geopolitical importance due to internal violence, regional or global instability, military coup, civil conflict, failed states, etc.

2

RISK PROFILES

Markets at risk & case studies



Economic risks



Societal risks



Technological risks

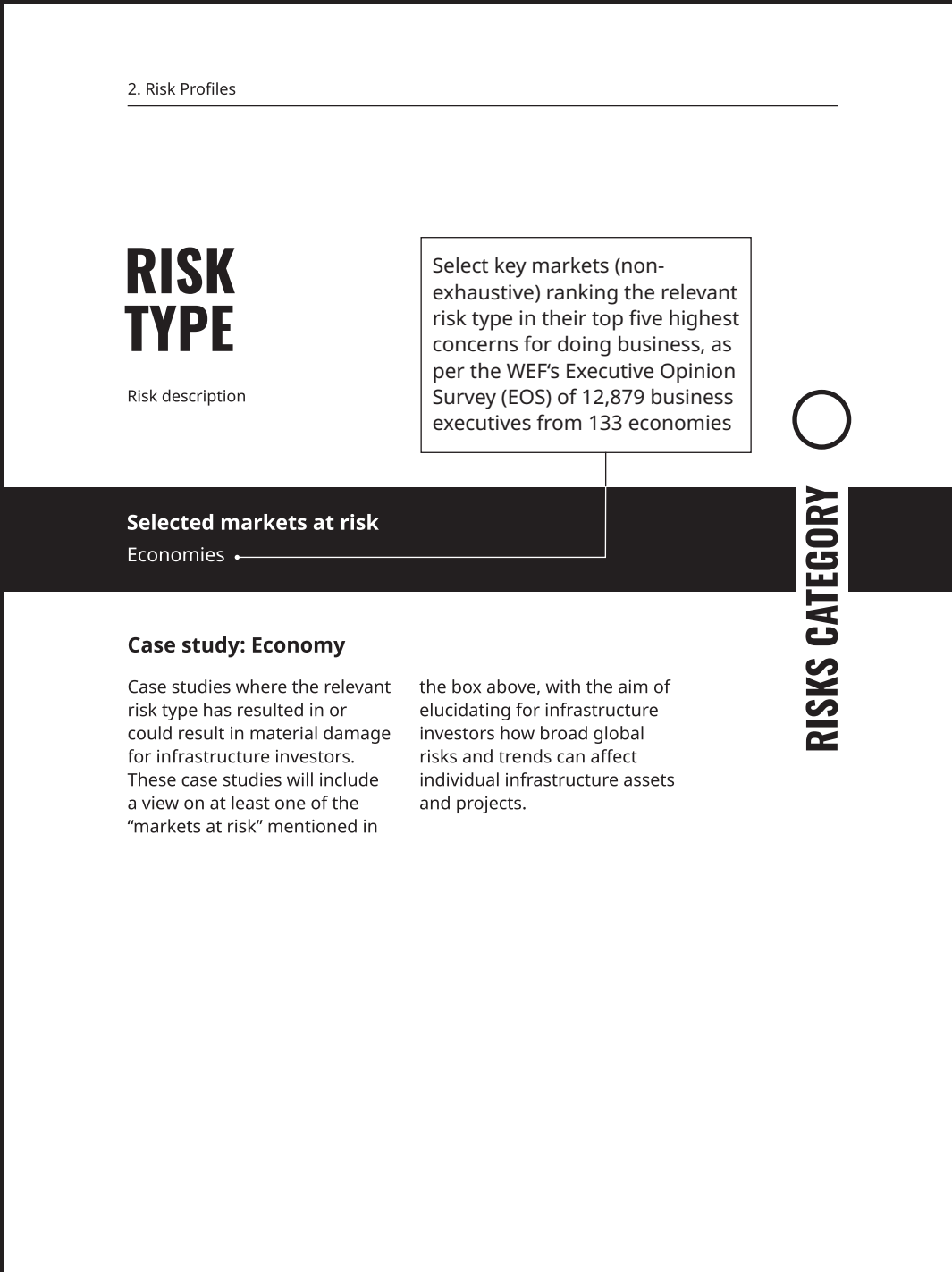


Environmental risks



Geopolitical risks

HOW TO READ THESE PAGES



FINANCIAL FAILURE

Collapse of a financial institution and/or malfunction of a financial system that impacts the global economy.



Selected markets at risk¹

Cyprus – Greece – Portugal – Sweden

ECONOMIC RISKS

Case study: Greece

Despite being on the road to recovery since the Greek Debt Crisis that arose after 2008, Greece's four systemic banks still face financial pains. As of Q3 2019, Greece has the **highest** Non-Performing Loan ratio in the EU at 37.4% (the EU's overall NPL ratio is 3%). Although some of their ratings have recently been adjusted upwards, many of Greece's four systemic banks' products continue to be rated **below** investment-grade (as of January 2020).

The infrastructure sector has already suffered fallouts from instability in the Greek financial system. The post-debt crisis period

saw Greek banks on the verge of collapse, with ATM withdrawals restricted to €60 per person per day. Starved of financing, Greece's largest construction companies suffered a 33% **drop** in share prices, and infrastructure investment **fell** by almost 30% between 2009-2013. Today, Greece's newly inaugurated **Hercules** plan, which allows the state to guarantee a portion of securitized NPLs, will aid in relieving strains on Greek banks' loan books and restoring confidence. However, despite a recent upswing in sentiment, infrastructure investors will need to remain vigilant against financial instability as the system broadly remains at risk.

1. As per WEF EOS data

FISCAL CRISES

Excessive debt burdens that generate sovereign debt crises and/or liquidity crises.



Selected markets at risk¹

Australia – Denmark – Ireland – Japan

ECONOMIC RISKS

Case study: Ireland

With over **€200 billion** in national debt (as of January 2020), Ireland is one of the **most** indebted nations in the developed world. Despite its restricted borrowing position, the island nation intends to **boost** infrastructure spending to plug its serious gap in transportation infrastructure, which The WEF's **Global Competitiveness Index** ranks considerably below that of Ireland's regional peers. Ireland's spending plans could impose additional **strains** on the government's fiscal position – slowing its rate of repayment and increasing the risk of financial complication in infrastructure projects.

It will be crucial for Ireland to prevent repeating the errors that led to the Portuguese fiscal crisis of the early 2010's, where Portugal's overburdened public obligations to infrastructure projects both exacerbated the nation's fiscal crisis and backfired onto infrastructure investors. At the height of the crisis, the Portuguese government was compelled to **renegotiate** a cut in its payment obligations for **nine** major motorway projects owned by both Portuguese and international construction firms. Adequate debt and financial system management will be crucial for preserving the stability of Ireland's infrastructure sector.

1. As per WEF EOS data

ENERGY PRICE SHOCK

Significant energy price increases or decreases that place further economic pressures on highly energy-dependent industries and consumers.



Selected markets at risk¹

Australia – Spain – Sweden – Taiwan

ECONOMIC RISKS

Case study: Australia

Severe energy price hikes in Australia have limited growth in the infrastructure sector, where volatile energy prices have affected long-term contracts and threatened project bankability. Research out of the University of Sydney shows that by 2018, Australian energy prices in real terms had increased by 70% on average [since 2008](#) – making it one of the world’s most expensive markets for energy. This steady rise has also been punctuated by discrete shocks that have shaved off revenue and stalled investment. For example, Telstra, one of Australia’s largest telecoms companies, lost [AUD\\$200 million](#) between 2017-2018 to energy price hikes. These

shocks have posed an unexpected obstacle to the company’s plans to cut costs and focus on developing a new 5G network.

Although significant recent advances in renewable energy development are projected to bring household electricity prices [down](#) between 2019-2022, the Australian energy market is still subject to shocks. Without adequate energy market reform and a [revaluation](#) of the country’s approach to implementing its energy transition, energy price shocks could continue to pose obstacles for energy-intensive infrastructure assets.

1. As per WEF EOS data

UNMANAGEABLE INFLATION

Significant energy price increases or decreases that place further economic pressures on highly energy-dependent industries and consumers.



Selected markets at risk¹

Argentina – Iceland – Turkey – Venezuela

ECONOMIC RISKS

Case study: Argentina

When President Mauricio Macri took power in 2015, his government **sought** to close Argentina's fiscal deficit and control runaway prices. However, by the end of 2019 Argentina's year-on-year inflation rate had reached **54%**, up from the 30%-40% (estimated) Macri inherited when he took power.

Although infrastructure investments can often serve as a safe haven against inflationary risk, greenfield projects – such as those in the renewable energy sector – can struggle to obtain financing in inflationary environments. Argentina's vaunted green energy projects

now face significant **financing** challenges and delays. Vecaso solar park, a US\$90 million 115 MW project in Argentina's Mendoza province that was scheduled to begin construction before the end of 2019, has been forced to **delay** construction due to the uncertainties surrounding Argentina's inflationary economy. Construction on four major wind farms by Argentine energy firm Genneia representing 200 MW were also **disrupted** for several weeks at the end of 2019 when the associated development banks and export credit agencies stopped making disbursements in the face of climbing inflation.

1. As per WEF EOS data

FAILURE OF URBAN PLANNING

Poorly planned cities, urban sprawl and associated infrastructure that create social, environmental and health challenges.



Selected markets at risk¹

Hong Kong – Ireland – Israel – New Zealand

Case study: Hong Kong

Hong Kong's hilly and land-scarce geography poses challenges to urban development – particularly in developing more urban transportation infrastructure. Urban planning obstacles in the major Asian financial hub of Hong Kong have contributed to a chronic problem of severe traffic congestion. In a 2014 report from the city's Transport Advisory Committee, the Committee [noted](#) that the expected rate of

road length increase up to 2020 would only reach about 0.4% per annum – despite the fact that the vehicle fleet was projected to grow at 3.4% in the same period.

This stagnation in Hong Kong's urban planning policies limits road growth and construction opportunities for developers and investors, despite the clear imperative that exists to alleviate the city's congestion.

SOCIETAL RISKS

1. As per WEF EOS data

SOCIAL INSTABILITY

Major social movements or protests (e.g. street riots, social unrest, etc.) that disrupt political or social stability.



Selected markets at risk¹

France – Greece – Russia – Spain

Case study: Spain

The final months of 2019 witnessed a new wave of social unrest and often violent protests in Catalonia. The unrest was first precipitated in 2017 by the disputed Catalan independence referendum, whose rejection by the central government sparked a general strike and demonstrations across Catalonia. Certain factions of the pro-independence movement have since actively targeted existing infrastructure assets, including but not limited to roads, rail, electricity grids and major transportation hubs such as railway stations and Barcelona's El Prat International Airport.

The Spanish Transport Association estimated a [loss](#) of €100 million in just the first week of protests when they re-erupted in October 2019. Another transport industry association, the Spanish Confederation of Goods Transport by Road (CETM), projected that the rising incidence of roadblocks could reach a cost of €25 million euros a day. Madrid continues to struggle – as it has since 2017 – to find a lasting compromise that can both satisfy the pro-independence movement as well as stabilize the Catalan region.

SOCIETAL RISKS

1. As per WEF EOS data

WATER CRISES

A significant decline in the available quality and quantity of fresh water, resulting in harmful effects on human health and/or economic activity.



Selected markets at risk¹

India – Philippines – Singapore

SOCIETAL RISKS

Case study: Singapore

The scarcely-resourced island nation of Singapore faces considerable water shortage threats. The city-state is dependent on imports for approximately 40% of its water supply, and the local water authority projects that Singapore's total water demand could double by 2060. As climate change continues to render ecological patterns less and less predictable, the threat of water shortages continues to grow

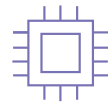
In July 2019, Singapore experienced its first dry spell in five years. This

resulted not only in decreased water levels in Singapore's own catchment areas, but also in the nearby [Linggiu Reservoir](#) in Johor Bahru, Malaysia: a major water source for the city-state of 5.8 million people, from which Singapore is contractually permitted to extract some 250 million gallons of water per day. As a result of the water shortages in the region, the Singapore government has been forced to raise water prices in recent years, introducing potential reputational and competition risks for the city's water utility operator.

1. As per WEF EOS data

ADVERSE TECHNOLOGICAL ADVANCES¹

Intended or unintended adverse consequences of technological advances.



Selected markets at risk²

Egypt – Germany – U.K.

Case study: Germany

The emergence of big data has given rise to concerns around data privacy, unconsented data collection and potential misuse. In 2017, the central German government **passed** a series of new surveillance and security laws that were widely considered to be the most wide-reaching and intrusive of their kind in Germany. These included new laws that required telecommunications providers in Germany to collect and retain user data, that created legal basis for state police to use malware to spy on Internet users, that allowed greater video surveillance

in public infrastructure, and that required airlines to collect passenger information.

These new laws did not emerge without backlash: **one** of these laws has already been deemed a violation of EU law, and the others continue to face judicial or media scrutiny. For infrastructure investors, the main risk will arise from reputational damage and litigative actions – their assets could potentially be entangled in public protest or lawsuits alleging breach of privacy or data abuse.

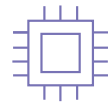
TECHNOLOGICAL RISKS

1. Note that as per the EOS survey, this risk is titled “Misuse of Technologies”

2. As per WEF EOS data

INFORMATION INFRASTRUCTURE BREAKDOWN

Cyber dependency that increases vulnerability to outage of critical information infrastructure (e.g. internet, satellites, etc.) and networks, causing widespread disruption.



Selected markets at risk¹

Italy – USA

Case study: USA

The United States' internet network has suffered a number of severe outages in recent years. In June 2019, major internet infrastructure and cybersecurity service Cloudflare suffered an hours-long outage and **lost** 15% of its global traffic. A similar incident occurred in November 2017, when Level 3, another internet infrastructure service provider, experienced **disruptions** to its service – resulting in an unusually large internet outage that lasted **approximately** 90 minutes.

These incidents have had significant repercussions for telecommunications companies. In the case of the Cloudflare outage,

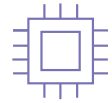
Cloudflare quickly pointed to its network provider as the primary cause of the disruption. In the Level 3 case, several major Internet Service Providers (ISPs) found their internet connections failing across the United States – including those of the nation's biggest telecommunications giants. Telecommunications providers can indeed find themselves at the receiving end of both disruption and blame in the events of information infrastructure breakdowns, making it all-the-more necessary that they remain resilient to these incidents and work with authorities to address their root causes.

TECHNOLOGICAL RISKS

1. As per WEF EOS data

CYBERATTACKS

Large-scale cyber-attacks or malware causing large economic damages, geopolitical tensions, data fraud or theft, or widespread loss of trust in the internet.



Selected markets at risk¹

Australia – Canada – U.K. – USA

Case study: USA

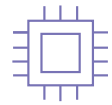
Government [intelligence](#) out of the United States indicates that beyond the often highly-profiled energy sector, the country's water and wastewater sector is also under direct and serious threat. In 2018, for example, a water utility based out of North Carolina [reported](#) that it had sustained "a sophisticated ransomware attack" on its computer systems. Although the safety of the company's water supply and customer information was not compromised, the attack wiped out several of the Onslow Water and Sewer Authority's other databases – forcing them to rebuild the affected systems from the ground-up.

In response to growing cyber threats, the sector has now also come under additional regulatory scrutiny. In 2018 the US Congress passed America's Water Infrastructure Act, [requiring](#) any water utility serving more than 3,300 people to carry out a "risk and resilience" assessment of its networks, including a review of cyber defences. With utility systems in the US increasingly under threat of cyberattack, water systems operators and investors will need to stay agile to be able to recover from attacks and adapt to new policies and regulations.

1. As per WEF EOS data

DATA FRAUD OR THEFT

Wrongful exploitation of private or official data that takes place on an unprecedented scale.



Selected markets at risk¹

Canada – Netherlands – U.K. – USA

Case study: Canada

According to the Office of the Privacy Commissioner of Canada, the country's federal data privacy watchdog, more than 28 million Canadians were [affected](#) by a data breach in 2019. Reports of data theft have increased dramatically since the government introduced mandatory data breach reporting law for Canadian businesses in 2018.

One such breach occurred on 17 April 2019 with significant fallout for a major infrastructure sector player when a large Canadian

telecommunications provider revealed that sensitive information belonging to 15,000 of its customers was [breached](#). Researchers say that the cascading effects of the breach mean that approximately 5 million records were exposed. Unencrypted data such as credit numbers, security codes and credit scores were among some of the data types affected. The incident placed the company's brand reputation and trust in jeopardy, and raised the company's potential risk of legal and regulatory [repercussions](#).

1. As per WEF EOS data

EXTREME WEATHER EVENTS

Major property, infrastructure, and/or environmental damage as well as loss of human life caused by extreme weather events.



Selected markets at risk¹

Austria – Canada – New Zealand – South Korea

Case study: South Korea

South Korean infrastructure suffered multiple instances of damage from major tropical storms in 2019. In September, Typhoon Lingling resulted in more than 120 flights being **grounded** nationwide, as well as the disruption of a commuter rail network and closure of a key gateway bridge to a major airport. Two weeks later, **Typhoon Tapah** damaged utility infrastructure, cutting power supply to 27,790 houses, while simultaneously causing the cancellation of 250 flights in 11 airports across Korea. Tapah also caused serious flooding across 60 roads in the southern region, with

both public and private facilities reporting approximately 600 cases of damage – particularly to an ongoing seawall project in **Ulsan**. In October, tropical storm **Mitag** made landfall, bringing 500 mm of rainfall to the south, causing widespread flooding and power outages to more than 44,000 homes.

A 2017 **study** says that when the maximum potential annual damage costs from natural disasters are considered, private facilities could represent almost a quarter of the projected US\$20.9 billion in damage through 2060 in South Korea.

ENVIRONMENTAL RISKS

1. As per WEF EOS data

CLIMATE ACTION FAILURE

The failure of governments and businesses to enforce or enact effective measures to mitigate climate change, protect populations and help businesses impacted by climate change to adapt.



Selected markets at risk¹

Finland – Ireland – Netherlands – Sweden

Case study: Netherlands

The Netherlands is a global pioneer in adopting innovative infrastructural adaptations to mitigate the negative impacts of climate change, and is compelled to do so because of its intrinsic geographical challenges. Roughly a third of the country lies below sea level and continues to sink further, making it one of the most vulnerable nations to climate change. In November 2018, the Dutch government pledged to **invest** €600 million in climate adaptation innovations, on top of the existing €1.3 billion a year on the **Delta Plan**, which focuses on limiting the probability of flooding through construction of public infrastructure such as dikes, beach nourishment and storm surge barriers.

However, despite its achievements, the Dutch government still has room to shore up its coastal defences. Although major Dutch urban centres **face** flood risk of 1/10,000, in the northern and southwestern sub-sea level coastlines – where the major port city Rotterdam sits – the risk of dikes breaking from storm surges rises dramatically to 1/4,000, and even 1/1,250. Exacerbated by rising sea levels, risk factors could increase tenfold – up to 1/125. Failure to adapt to these increasing risks could have major impacts on Dutch infrastructure: 90% of the urban infrastructure in Rotterdam sits **below** sea level, for example.

1. As per WEF EOS data

NATURAL DISASTERS

Major property, infrastructure, and/or environmental damage as well as loss of human life caused by geophysical disasters such as earthquakes or landslides.



Selected markets at risk¹

Iceland – Japan – New Zealand – Philippines

Case study: New Zealand

The 7.8 magnitude Kaikoura earthquake devastated New Zealand in 2016. The earthquake severely damaged infrastructure across the country, including roads, railways and ports, triggering additional side effects such as landslides and tsunamis.

The post-disaster damage came to businesses in the form of both insurance claims and lost revenue. Over NZD\$1.8 billion in insurance claims were **reported** after the incident, out of which NZD\$1.4 billion originated from

the commercial sector according to the Insurance Council. In the Kaikoura region – the epicentre of the earthquake – the utility, construction and transportation sectors **lost** 34% of their operability (i.e. of their normal productive capacity) within the first week of the disaster. New Zealand, which lies on a seismically active zone along the Pacific Ring of Fire, continues to be at risk of earthquakes and other associated natural disasters – and infrastructure is at the forefront of such risks.

ENVIRONMENTAL RISKS

1. As per WEF EOS data

HUMAN-MADE ENVIRONMENTAL DISASTER

Failure to prevent major man-made damage and disasters, including environmental crime, causing harm to human lives and health, infrastructure, property, economic activity and the environment.



Selected markets at risk¹

India – Italy – South Korea

Case study: South Korea

In July 2018, the Xe Pian-Xe Namnoy dam in Laos's Champasak province collapsed, flooding downstream villages, [displacing](#) at least 6,000 people. The project, part of a regional US\$1 billion dam system, was jointly funded and developed by two private Laotian entities and two South Korean companies. Shortly after the disaster, the Lao Ministry of Energy and Mines released [statements](#) on construction standards and [accelerated](#) project timelines as potential causes. Other [independent analyses](#) have also identified dam design and

material selection as plausible contributing factors.

In response, both of the Korean companies involved committed a combined [US\\$11 million](#) in relief efforts. They also suffered significant financial hits, with one company seeing a [30% plunge](#) in stock prices. Social backlash additionally posed potential reputational regulatory and legal risks for relevant stakeholders, as Korean civil society groups [implored](#) their government to disclose information and conduct independent investigations.

ENVIRONMENTAL RISKS

1. As per WEF EOS data

NATIONAL OR GLOBAL GOVERNANCE FAILURE¹

Inability to govern a nation of geopolitical importance or inability of regional or global institutions to resolve issues.



Selected markets at risk²

Canada – Greece – Spain – U.K.

Case study: Multiple

The inability of national, regional, and global governance entities to resolve political differences will have serious impacts on the infrastructure sector. National and regional governance uncertainties can give rise to delays, cancellations, financing shortages or contract renegotiations for greenfield projects. The ambiguity in the lead-up to the finalization of a Brexit deal between the EU and the UK, for example, introduced new uncertainties and delays for two major infrastructure projects: a £2 billion tunnel beneath [Stonehenge](#) and a high speed rail link between London and Birmingham called the [HS2](#).

Brownfield projects will also face significant fallouts. In particular, regional governance uncertainty can severely undermine revenue growth potential for assets sensitive to trade and passenger flows (such as transport) or that provide cross-border services (such as cross-border energy or water infrastructure). Canadian railways, for example, source 30% of their revenues from [trade](#). As law firm Norton Rose Fulbright has [noted](#), the newly minted USMCA trade agreement between Canada, the USA and Mexico, leaves several important questions unresolved for these Canadian railway operators – particularly around procurement, disputes, and tariffs.

GEOPOLITICAL RISKS

1. This risk is a combination of two risk types: Failure of national governance, and failure of regional or global governance

2. As per WEF EOS data

INTERSTATE CONFLICT

A bilateral or multilateral dispute between states that escalates into economic, military, cyber, societal, or other conflict.



Selected markets at risk¹

France – Japan – Switzerland – Taiwan

GEOPOLITICAL RISKS

Case study: Japan

Today's geopolitical climate means that interstate conflict has the potential to turn "hot", i.e. to lead to actual military confrontation. These developments can result in severe physical damage to infrastructure assets exposed to battle zones, as well as revenue loss or process disruption from blockades or occupation.

Interstate conflicts can also manifest as economic tensions that bite into revenues for trade-dependent or cross-border infrastructure assets (see Canada example), or that limit foreign

investment into local infrastructure. A trade war between Korea and Japan that began in 2019 has resulted in the active avoidance of Japan-Korea investment flows due to souring relations, for example. In July 2019, major institutional investor Korea Teachers' Credit Union (KTCI) scrapped plans to invest over US\$70 million in a global infrastructure fund packaged by a major Japanese trading house due to escalating tensions. Diplomatic dialogue will be crucial to restoring trade and investment flows between these two major Asian economies.

1. As per WEF EOS data

TERRORIST ATTACKS

Individuals or non-state groups with political or religious goals that successfully inflict large-scale human or material damage.



Selected markets at risk¹

Germany – Singapore – U.K. – USA

GEOPOLITICAL RISKS

Case study: U.K.

Transportation systems are the world's most heavily-targeted infrastructure sector for terrorist attacks according to the [Global Terrorism Database](#). Between 2000 and 2018, transportation systems faced higher numbers of terror attacks than water systems, utilities, telecommunications, or airports and aircraft systems globally. The United Kingdom is no exception: the country's transportation system saw 28 terror attacks in this period, compared with 8 terror attacks on all other forms of infrastructure combined.

The destabilizing effects of frequent terror attacks have had particularly

important impacts on London's underground railway system. Research shows that after the 7/7 bombings across London's public transport systems in 2005, passenger journeys on the London Underground [fell](#) by an average of 8.3% for the following 4 months. In 2017, passenger numbers fell in 2017 for the first time in 20 years – in part, the railway operator and experts concluded, due to fears of [terror](#). Transport for London (or TfL)'s [spending](#) programs on safety and collaboration with authorities will be instrumental in protecting against losses to human life and restoring the public's confidence in this critical infrastructure system.

1. As per WEF EOS data

STATE COLLAPSE

State collapse of geopolitical importance due to internal violence, regional or global instability, military coup, civil conflict, failed states, etc.



Selected markets at risk¹

Argentina – India – Mexico – Spain

Case study: Mexico

Civil [conflict](#) between the Mexican government and organized crime organizations threatens the stability of the state. [Estimates](#) say that since hostilities began in 2006, approximately 150,000 homicides have occurred as a result of organized crime – denoting, by political science [definitions](#), that the country is in a state of war.

The conflict has had particularly significant impacts on port assets in Mexico. In August 2019, Mexican President Andrés Manuel López Obrador (or “AMLO”) acknowledged that organized crime rings were in control of several customs stations

and ports, highlighting the port of Manzanillo – Mexico’s largest port by cargo throughput – as one of the country’s “most infiltrated” points. AMLO has announced his intention to push for shifting control over the country’s ports from the Secretary of Communications and Transportation (a civil body) to the Secretary of the Navy (or “Semar”, a military body). The prospect of being constrained by conditions imposed by the Semar has raised concerns of business disruption and increased costs [amongst](#) both port service operators and the President of the Port Maritime Council of Mexico.

1. As per WEF EOS data

3

INTER- CONNECTIONS

Case studies on interconnected risks

Extreme Weather in Chennai

A confluence of varied risk drivers exacerbate extreme weather impacts

Business Damages in Eastern Europe

A confluence of emerging social and political risks drive investor concerns and a critical infrastructure failure

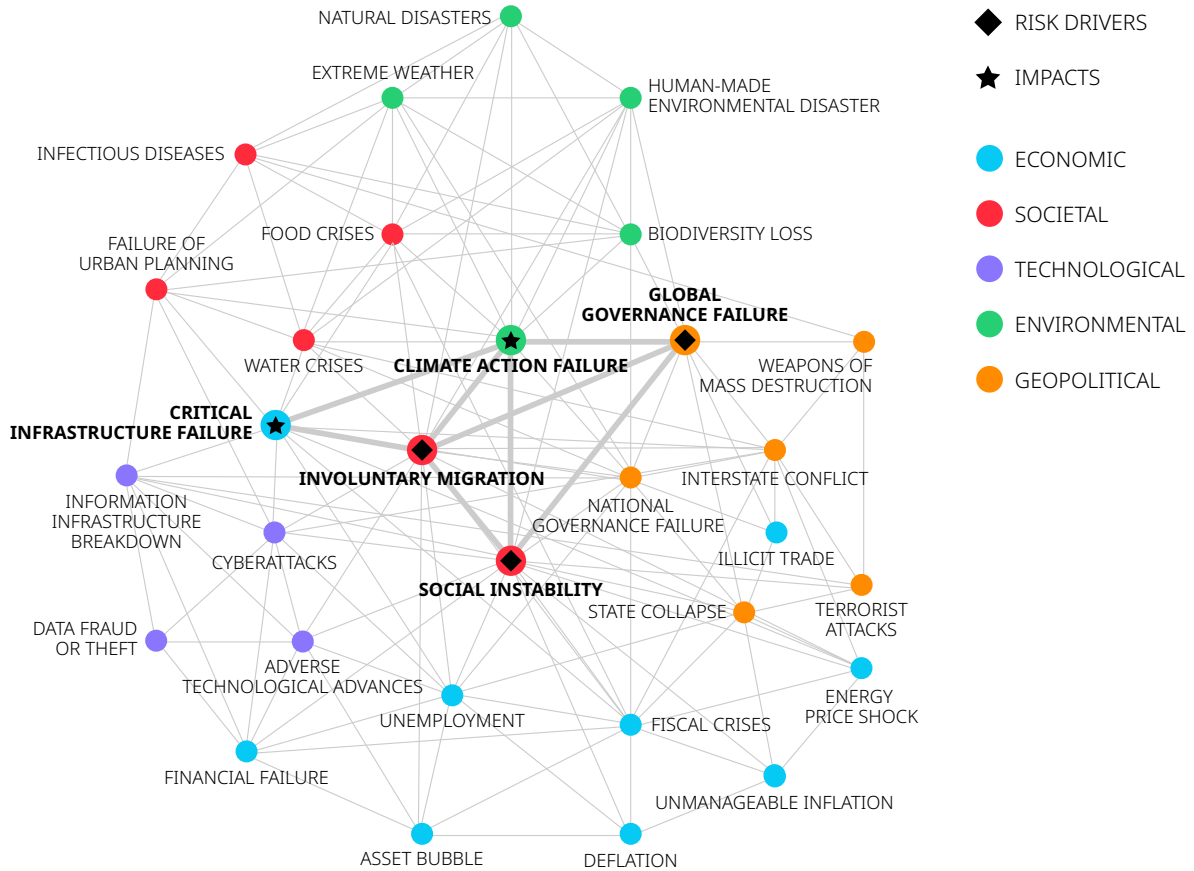
The Fukushima Disaster

A natural disaster catalyzes a variety of impacts for the domestic energy sector and beyond

Cyberattack on a Water Utility

Geopolitical incidents catalyze a series of knock-on events for a water utility, including hacktivism and risks to public health

BUSINESS DAMAGES IN EASTERN EUROPE

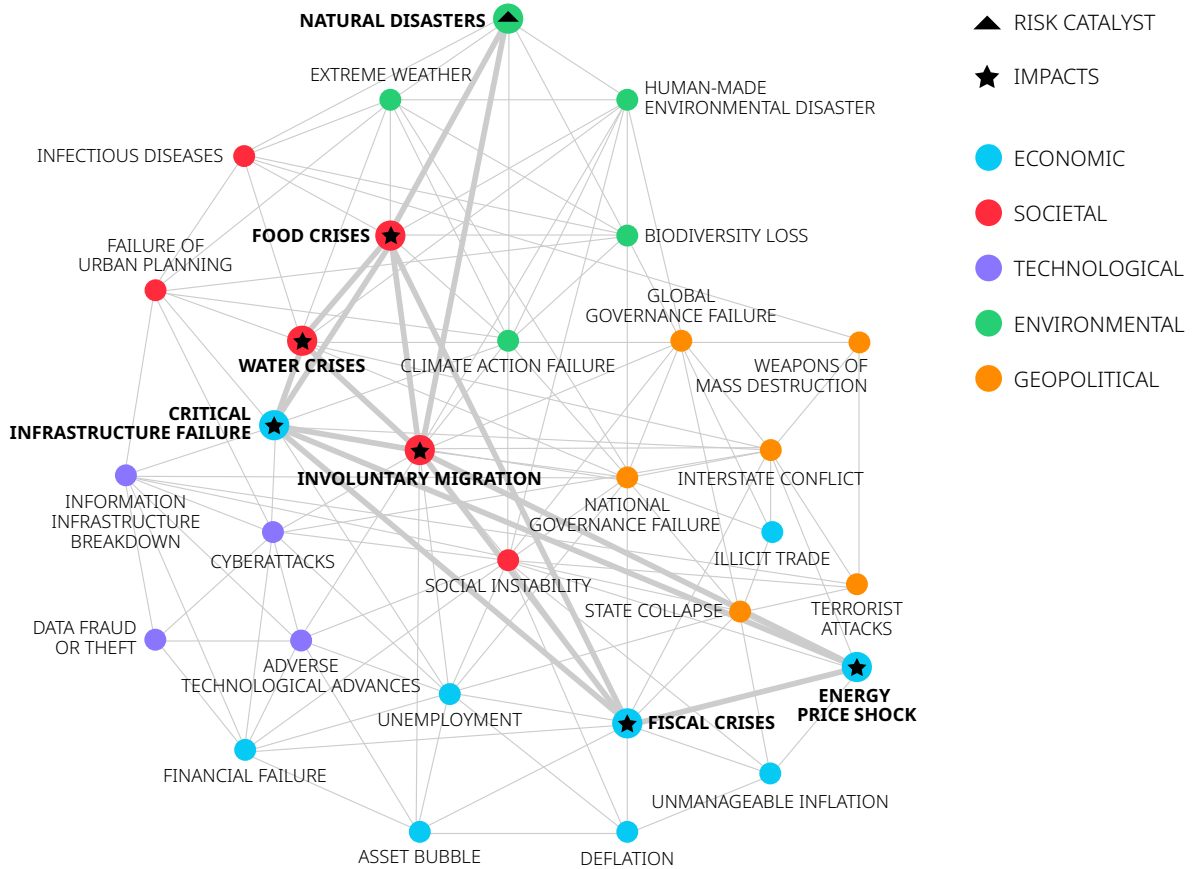


Social instability – fueled in part by **involuntary migration** from neighboring regions – has given rise to populist governments in several Eastern European nations such as Poland and Hungary. Several of these new governments have expressed **hesitation** over the implementation of **climate change mitigation and adaptation measures**, despite EU targets requiring considerable climate commitments from member nations.

As a result of this **failure of the regional EU governing body** to encourage member nations to comply with its targets, renewable energy investing in these countries can be risky. Poland’s energy policy in particular has

been described by industry members as a “rollercoaster”. The country’s wind sector has faced a range of recent policy shocks, from far-reaching construction **limitations** to plans for **caps** on green certificates and renewable energy prices. In 2018, a major US renewable energy group launched international arbitration proceedings against the Polish government, claiming the EU country had reneged on its commitments to build wind farms through its **new** policies. The firm now stands to lose considerable revenue from Poland’s **failure to invest in critical infrastructure**. The firm will also need to bear legal fees, as well as operational costs of exiting Poland, where it says it will no longer be doing business.

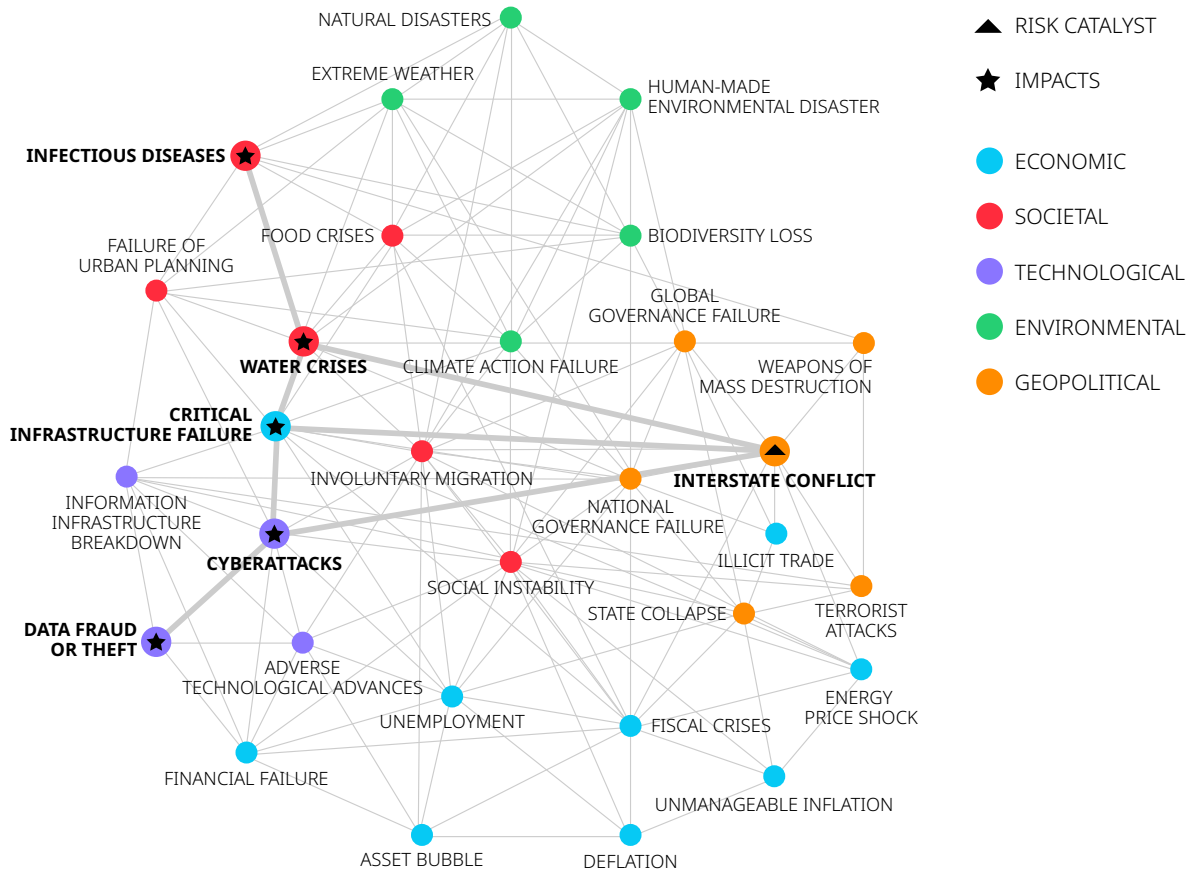
THE FUKUSHIMA DISASTER



In 2011, three nuclear cores at the now-famous Fukushima Daiichi power plant in Japan **melted** when a 14-meters high tsunami, triggered by a magnitude 9.1 earthquake, inundated the plant. This **natural disaster** and the subsequent **failure of the critical Fukushima power plant** resulted in the **involuntary evacuation** of **100,000** people, and contaminated **food and water** resources in the prefecture – giving rise to **lawsuits** against the company responsible and pressures on other surrounding infrastructure companies reliant on stable populations and water resources.

Japan still feels the impact of Fukushima today. By **2012**, the government had moved quickly to enact the sweeping denuclearization of the Japanese energy sector. The policy reform meant the loss of **30%** of the country's energy-generating capacity, and thus increased reliance on oil and gas imports, exposing the Japanese economy to external **energy price shocks**. The financial burden on the Japanese government has also been significant: a 2019 estimate forecasts that the government could take on over **US\$560 billion** in recovery costs over the next 40 years. Currently facing the world's **highest** general government debt burden, the Japanese government's **fiscal position** faces additional strains from the fallout from Fukushima.

CYBER-ATTACK ON A WATER UTILITY



In March 2016, Verizon’s monthly security breach publication drew widespread [attention](#) to a **cyberattack** on a major unnamed water utility. The hack was suspected to have been administered by a “hacktivist” group with motivations relating to the ongoing **Interstate conflict** in Syria. The system in question ran on operating systems from over a decade prior, leaving it particularly vulnerable to such an attack.

The attack gave rise to a number of related risks for the anonymous company. The compromised system allowed the hackers to take control of the utility’s water flow and chemical treatment system. Although the company was able to identify and reverse the chemical and flow changes in time, this **critical infrastructure failure** could have caused widespread health damages to the local community by distributing badly treated water, raising risks of **infectious disease** and **water crises**. The hackers additionally gained access to over 2.5 million personal and financial records, giving rise to **data fraud risks**.

4

DATA

APPENDIX

Top 5 risks to doing business by economy

RISK BY MARKET

This section features the data behind the interactive Marsh & McLennan Global Risks for Infrastructure Map. Listed here are key markets and their top-ranked risks, as per the WEF's Executive Opinion Survey (EOS) of 12,879 business executives from 133 economies. This survey was completed in 2019. The WEF dataset [omits](#) data for China, Georgia, Honduras, Mauritania, Nicaragua and Saudi Arabia. The EOS 2019 was not conducted in Belgium and Norway.

	1	2	3	4	5
Argentina	Unmanageable inflation	National governance failure	Social instability	State collapse	Fiscal crisis
Australia	Energy price shock	Cyberattacks	Asset bubbles	Critical infrastructure failure	Fiscal crisis
Austria	Cyberattacks	Data fraud or theft	Extreme weather	Asset bubbles	Climate action failure
Belgium	Cyberattacks	Global governance failure	Failure of urban planning	Fiscal crises	Unemployment
Brazil	National governance failure	Fiscal crisis	Critical infrastructure failure	Unemployment	Social instability
Canada	Cyberattacks	Data fraud or theft	Extreme weather	Energy price shock	Global governance failure

● Economic
 ● Societal
 ● Technological
 ● Environmental
 ● Geopolitical

RISK BY MARKET

	1	2	3	4	5
Cyprus	Asset bubbles	Fiscal crisis	Financial failure	Interstate conflict	National governance failure
Czech Republic	Cyberattacks	Asset bubbles	Fiscal crises	Unemployment	Energy price shock
Denmark	Fiscal crises	Asset bubbles Data fraud or theft		Cyberattacks Interstate conflict	
Egypt	Energy price shock	Unemployment	Adverse technological advances	Asset bubbles	Unmanageable inflation
Estonia	Asset bubbles	Cyberattacks	Energy price shock	Financial failure	National governance failure
Ethiopia	Food crises	Water crises	Fiscal crisis	Deflation	Asset bubbles
Finland	Cyberattacks	Climate action failure Involuntary migration Unemployment			Fiscal crises

● Economic
 ● Societal
 ● Technological
 ● Environmental
 ● Geopolitical

RISK BY MARKET

	1	2	3	4	5
France	Cyberattacks	Asset bubbles Interstate conflict		Energy price shock	Social instability
Germany	Cyberattacks	Asset bubbles	Involuntary migration	Data fraud or theft Adverse technol. advances Terrorist attacks	
Greece	Fiscal crises	Financial failure	Failure of national governance	Involuntary migration	Social instability
Hong Kong	Asset bubbles	Cyberattacks	Data fraud or theft	Failure of urban planning Interstate conflict	
Iceland	Unmanageable inflation	Natural disasters	Asset bubbles	Fiscal crises	Extreme weather
India	Water crises	Human-made environmental catastrophes	Terrorist attacks	Deflation	State collapse or crisis
Indonesia	Data fraud or theft	Cyberattacks	Natural disasters	Energy price shock	Biodiversity loss

● Economic
 ● Societal
 ● Technological
 ● Environmental
 ● Geopolitical

RISK BY MARKET

	1	2	3	4	5
Ireland	Failure of urban planning Fiscal crises		Cyberattacks	Asset bubbles	Climate action failure
Israel	Terrorist attacks	Cyberattacks	Interstate conflict	Weapons of mass destruction	Asset bubbles Failure of urban planning
Italy	Cyberattacks	Information infrastructure breakdown	Human-made environmental catastrophes	Food crises	Data fraud or theft
Japan	Natural disasters	Cyberattacks	Fiscal crisis Interstate conflict		Extreme weather
Latvia	National governance failure	Financial failure	Cyberattacks	Asset bubbles	Energy price shock
Lithuania	Asset bubbles	National governance failure	Interstate conflict	Energy price shock	Social instability
Luxembourg	Cyberattacks	Asset bubbles	Interstate conflict	Data fraud or theft	Energy price shock Failure of critical infrastructure Involuntary migration

● Economic
 ● Societal
 ● Technological
 ● Environmental
 ● Geopolitical

RISK BY MARKET

	1	2	3	4	5
Mexico	National governance failure	Illicit trade	Social instability	Energy price shock	State collapse or crisis
Netherlands	Cyberattacks	Asset bubbles Data fraud or theft		Climate action failure	Terrorist attacks Unemployment
New Zealand	Natural disasters	Cyberattacks	Critical infrastructure failure	Failure of urban planning	Extreme weather
Nigeria	Unemployment	Critical infrastructure failure	National governance failure	Energy price shock	Terrorist attacks
Norway	Extreme weather	Data fraud or theft	Involuntary migration	Information infrastr. breakdown Cyberattacks Energy price shock Financial failure	
Philippines	National governance failure	Critical infrastructure failure	Natural disasters	Water crises	Failure of urban planning
Poland	Interstate conflict	Energy price shock	Fiscal crisis	Cyberattacks	National governance failure

● Economic
 ● Societal
 ● Technological
 ● Environmental
 ● Geopolitical

RISK BY MARKET



RISK BY MARKET

	1	2	3	4	5
Sweden	Cyberattacks	Interstate conflict	Asset bubbles	Data fraud or theft Involuntary migration Unemployment	
Switzerland	Cyberattacks	Data fraud or theft	National governance failure	Terrorist attacks	Adverse technological advances
Taiwan	Interstate conflict	Energy price shock	Asset bubbles	Cyberattacks	Global governance failure
Turkey	Fiscal crisis	Interstate conflict	Unmanageable inflation	National governance failure	Unemployment
United Kingdom	Cyberattacks	Data fraud or theft	National governance failure	Terrorist attacks	Adverse technological advances
United States	Cyberattacks	Data fraud or theft	Terrorist attacks	Information infrastructure breakdown	Critical infrastructure failure
Vietnam	Asset bubbles Failure of urban planning		Unemployment	Fiscal crisis	National governance failure Illicit trade Unmanageable inflation

● Economic
 ● Societal
 ● Technological
 ● Environmental
 ● Geopolitical