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ADVANTAGE

# 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 markets <sup>1</sup> (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

1. "Key markets" comprise economies categorized by the IMF as "Advanced Economies" with a nominal GDP of at least US\$20 billion as of 2017, and the top 25 economies by forecasted infrastructure investment between 2016-2040 as projected by the [GIIA](#) (July 2017).

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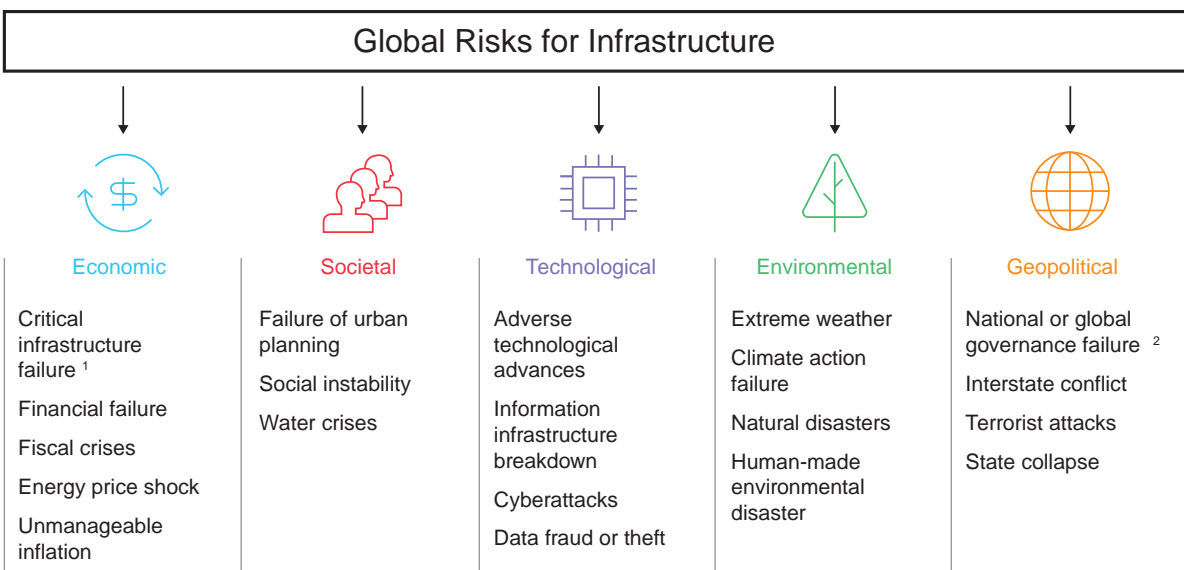
RISK

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

Global

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# ñ RISK PROFILES

Markets at risk & case studies



Economic risks



Societal risks



Technological risks



Environmental risks



Geopolitical risks



2. Risk Pr

**RISKS CATEGORY**



# ECONOMIRISKS



ECONOMIC

# ENERGY PRICE SHOCK

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



Selected markets at risk <sup>1</sup>

Australia – Spain – Sweden – Taiwan

## 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 e r66 238Hoft of







# 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 risk <sup>1</sup>  
India – Philippines – Singapore



# ADVERSE TECHNOLOGICAL ADVANCES

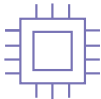


TECHNOLOGICAL



# TECHNOLOGICAL RISKS

# DATA FRAUD



TECHNOLOGICAL RISKS



# 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 risk <sup>1</sup>

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**

# 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 risk <sup>1</sup>

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.

1. As per WEF EOSdata

# 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 risk <sup>1</sup>  
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.

1. As per WEF EOSdata



# NATIONAL ADR GLOBAL

GEOPOLITICAL RISKS

# INTERSTATE CONFLICT

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

Selected markets at risk <sup>1</sup>

France – Japan – Switzerland – Taiwan

## 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-

# TERRORIST ATTACKS

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



Selected markets at risk <sup>1</sup>  
Germany – Singapore – U.K. – USA

## 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 EOSdata

# GEOPOLITICAL RISKS

# ò 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

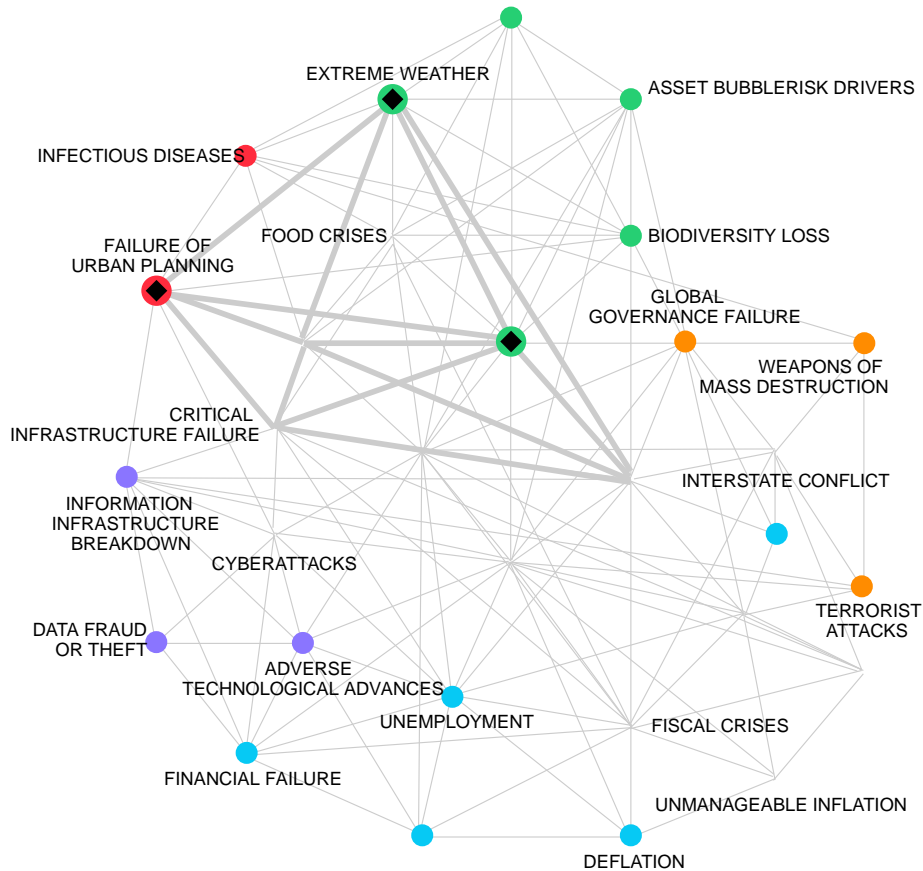
## The Fukushima Disaster

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

# EXTREME WEATHER IN CHENNAI



The Indian city of Chennai frequently suffers damage from extreme weather : particularly from severe water shortages as well as unmanageable flooding. This has been attributed in part to uncontrolled urban growth after the city began to actively attract IT-sector companies and talent in 2008, resulting in significant encroachment onto the city's water bodies and natural drainage systems. This failure of urban planning and of climate-change mitigation and adaptation has increased the damage the city sustains when extreme weather strikes. Chennai's local government has also been slow to curb the power of the city's local "water mafias", who charge extortionate water prices in difficult times. This failure of national governance has also been raised as a factor behind the government's inaction over infrastructure development and resilience-building against extreme weather.

As a result, in 2015, when the city was inundated by its heaviest rainfall in over 100 years, over a million residents were displaced from their homes and the city was disrupted for days. In 2018 Chennai's rainfall fell by 55%, leaving the city without rainfall for 200 days and scrambling for water supplies. These water crises and the failure of the city's critical infrastructure to manage them have occurred recurrently in recent years, and have also affected infrastructure operators across sectors. Major power distributor Tangedco lost nearly US\$140 million each year between 2015-2018 due to flood damages, and in 2017, the major 1050MW Tuticorin thermal plant was temporarily shut down due to a lack of water for cooling. Additionally, Chennai's water shortages in 2018 caused companies across industries to pay as much as 30% more for private water supplies.



### 3. Interconnections

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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

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### 3. Interconnections

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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 "hactivist" 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

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DATA

APPENDIX

Top 5 risks to doing business by economy

# RISK BY

4. Data appendix

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Greece

Fiscal crises

Financial failure

Failure of national  
governance



# RISK BY MARKET

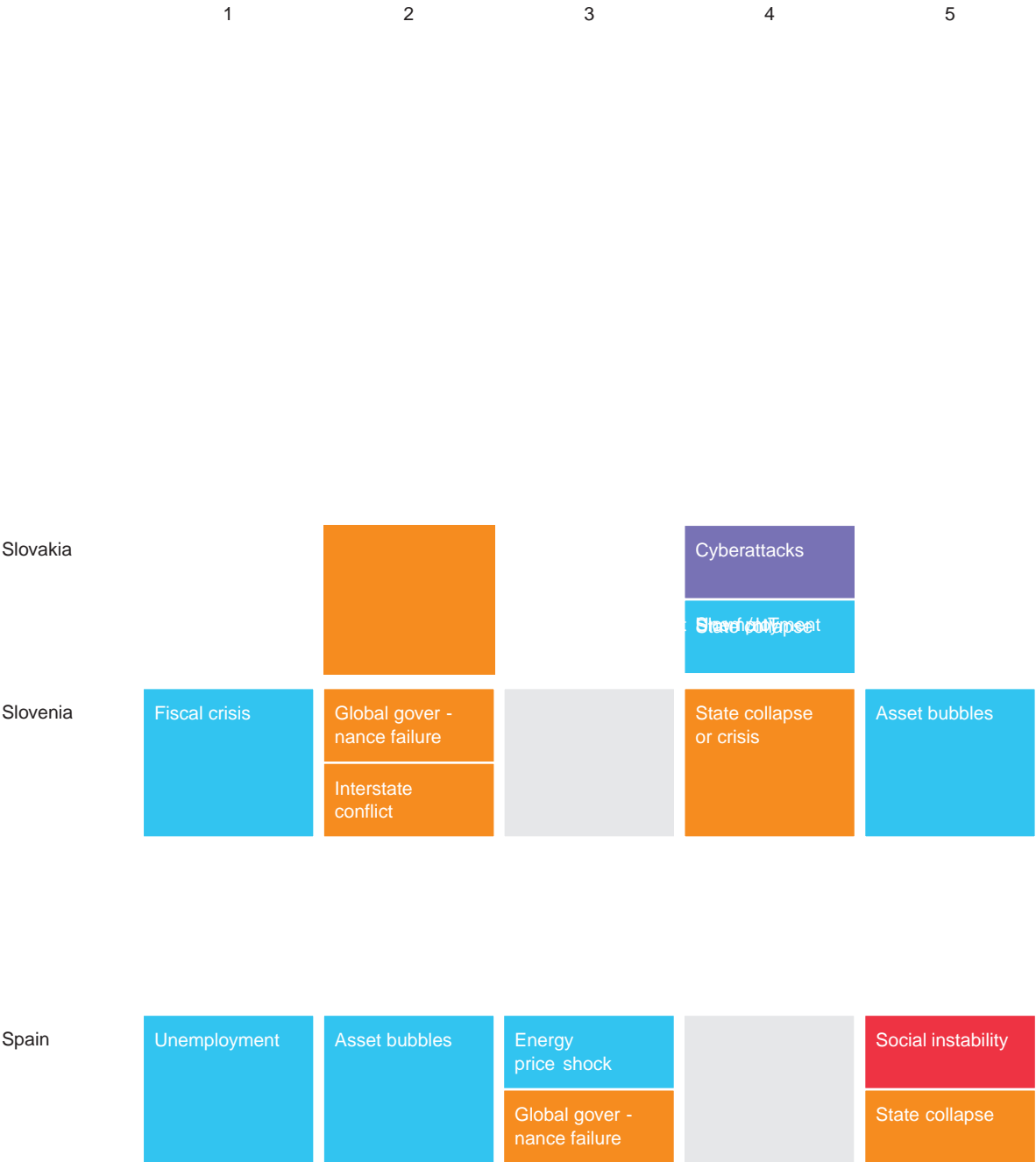
	1	2	3	4	5
Ireland	Failure of urban planning Fiscal crises		Cyberattacks	Asset bubbles	Climate action failure
Israel	Terrorist attacks	Cyberattacks	Interstate F R Q Š L F W	Weapons of mass destruction	Asset bubbles Failure of urban planning
Italy	Cyberattacks	Information infrastructure breakdown	Human-made 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 F R Q Š L F W	Energy price shock	Social instability
Luxembourg	Cyberattacks	Asset bubbles	Interstate F R Q Š L F W	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		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	-6Q68 0 0.76 0 k 5
Norway	Extreme weather	Data fraud or theft	Involuntary migration	Information infrastr. breakdown Cyberattacks Energy price shock Financial failure	

# RISK BY MARKET





# RISK BY MARKET

	1	2	3	4	5
Sweden	Cyberattacks	Interstate FRQŠLFW	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 FRQŠLFW	Energy price shock	Asset bubbles	Cyberattacks	Global governance failure
Turkey	Fiscal crisis	Interstate FRQŠLFW	Unmanageable LQŠDWLRQ	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

Technological

● Environmental

● Geopolitical