Transforming National Resilience Systems For Future Generations

Socio-economic resilience is the outcome of a well-structured national resilience system, enabled by holistic and sustained government investment programs.

WORLD GOVERNMENTS SUMMIT 2024

in collaboration with

ARTHUR D LITTLE

To Inspire and Enable **The Next Generation of Governments**

The World Governments Summit is a global platform dedicated to shaping the future of governments worldwide. Each year, the Summit sets the agenda for the next generation of governments with a focus on how they can harness innovation and technology to solve universal challenges facing humanity.

The World Governments Summit is a knowledge exchange center at the intersection of government, futurism, technology, and innovation. It functions as a thought leadership platform and networking hub for policymakers, experts and pioneers in human development.

The Summit is a gateway to the future as it functions as the stage for analysis of future trends, concerns, and opportunities facing humanity. It is also an arena to showcase innovations, best practice, and smart solutions to inspire creativity to tackle these future challenges.


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Topics

Foreword

In the last 100 years, instances of disaster and national crisis have increased 50-fold, with their severity and frequency also rising over time. In a context of urgency, the leaders of today have a duty to foster a culture of resilience and build the appropriate resilience systems across government that will benefit future generations.

While government preparedness for crisis varies world-wide, program spending has typically followed a ‘boom and bust’ cycle when disaster strikes.

This reactionary approach often results in absence of national leadership, unclear resilience arrangements, misalignment across government entities, lack of scalability in national response systems, and vulnerable communities. Notably, it also leads to socioeconomic value at risk that could reach ~$30 trillion (USD equivalent) globally, over the next two decades.

To avert such losses and to limit the risks to citizens, societies, and economies in times of crisis, the onus is now on government leaders to develop enhanced national resilience systems, shaped by a collaborative, whole-of-economy, and citizen-centric approach.

Introduction

Over the last 50 years, major crises and disasters have become more frequent and severe, impacting nations significantly.

Whether natural or man-made, accidental or deliberate, disasters in all their forms wreak havoc, causing extensive loss of life and injury to citizens, damaging property and assets, or even eradicating entire towns and communities. In some extreme cases, they can also directly affect gross domestic product (GDP) and national economic performance, with lasting impact that can prove challenging to reverse.

Government preparedness varies world-wide, yet across nations, program spending has typically followed a 'boom and bust' cycle in response to major disasters. This is politically expedient for leaders seeking to manage limited financial resources across multiple government priorities and is often accompanied by rapid investment in measures to remediate the critical points of failure identified in post-disaster reviews. However, whilst arguably well intended, this reactive approach is fundamentally flawed, often resulting in absence of national leadership, unclear resilience arrangements, misalignment across government entities, lack of scalability in national response systems, vulnerable communities, and significant value at risk (VAR). In immature national resilience systems that are often shaped by inconsistent or insufficient funding and reactive fixes to emergency response arrangements, Arthur D. Little (ADL) estimates that ~$30 trillion (USD equivalent) in global VAR could be at stake over the next two decades. This VAR is driven by loss of life and damage to assets, critical infrastructure, and essential services that often results from severe national disasters.

To avert such losses and to limit the wide-ranging risks to societies and economies in times of crisis, the onus is now on government leaders to change their modus operandi and focus squarely on building national resilience that is fit for today's world – and for the generations to come.

Adding to the urgency of the situation is a stark fact: in the last 100 years, instances of disaster or national crisis have increased 50-fold.

And in the age of climate change and rapid technology developments (i.e., artificial intelligence, quantum computing, and robotics), there is no sign of an imminent slowdown.

With the call to action clear, developing robust national resilience systems now requires a paradigm shift away from siloed approaches and towards whole-of-economy and citizen-centric planning, preparedness, detection, response, and recovery (PPDRR), or 'Resilience Lifecycle'. Here, collaboration is key; government, private enterprise, and the third sector must work together with communities to co-produce public safety outcomes and minimize the socio-economic impacts of national crises or disasters.

The task of building fully integrated national resilience systems is formidable, and no one country has the perfect answer. Yet, over the past 20 years, leading countries have invested heavily across the public sector to realize the necessary changes required for successful PPDRR in times of crisis – in many cases, with significant and observable results.

Against a backdrop of high stakes and potential gains, this joint ADL and World Governments Summit paper aims to support government leaders along the vital journey toward national resilience by:

1. Unpacking the definitions of resilience and their applications to government, while highlighting the countries currently leading the way in resilience practices

2. Exploring the evolving global risk landscape and its evolution over the last century

3. Identifying the strategically critical risks that impact national preparedness agendas worldwide

4. Considering the socio-economic VAR up to 2040 if these risks are not managed or m itigated effectively

5. Highlighting leading government practices for resilience reforms and identifying a realistic proportion of GDP that should be re-invested into resilience system development and refinement to protect future generations

6. Delivering actionable insights for national leaders as they consider their own unique national resilience systems

For many countries, the journey to enhanced resilience is just beginning, and while there is no 'silver bullet', a formula is emerging. Nations with proactive and engaged leaders; modern and integrated laws, policies, regulations; a robust national concept of operations; the right strategies across ministries at different levels of government; integrated PPDRR capabilities; and strong community engagement programs have the power to build resilience that is visible within the fabric of their societies and reflected in national economic performance – especially in the face of adversity or in the aftermath of catastrophic events.

Section 1

First Principles: Risk, Incident & National Resilience

Not to be conflated with specialized areas of risk management or business continuity management, national resilience is the ability of a nation to resist, absorb, accommodate, and recover rapidly from incidents that may impact the function or performance of its economy.

Such incidents are as wide-ranging as they are unpredictable, with natural disasters, pandemics, cyberattacks, hostile threats, and critical infrastructure failure counting among them.

While many of the abovementioned incident types impact society and the environment, such considerations fall outside the scope of this report. Rather, the discussion that follows focuses primarily on the economic implications, while acknowledging the often-inextricable links that exist between economy, society, and the natural world.

Similarly, for the purposes of this publication, 'risk' is limited to natural disasters and man-made technological incidents, leaving inflationary, fiscal, and financial crises outside the remit of the report. Specifically, the incident types considered within the

parameters of this discussion are informed by the data set used[1], with the top 20 risks listed in Figure 2.

Emergency, Crisis, Disaster

In addition to establishing the scope of this report, it is useful to differentiate between different incident types, including emergency, crisis, and disaster. An emergency is an event resulting from a natural or man-made incident that poses a risk to life or assets, with a consequential impact on society, the economy, a nation's cultural heritage, or the natural world. The escalation of an emergency necessitating the activation of a management arrangement is then classed as a crisis, while a disaster is a sudden, severe event that causes significant loss of life or harm to property, health, society, the economy, or the environment. Critically, a disaster demands a swift national response, as detailed within most nations' national disaster plans. Close coordination and cooperation between stakeholders is essential and, in some extreme cases where a state of disaster is called for under law, there can be a temporary transfer of powers from the current head of state to another pre-determined leader – for example, the commissioner of police or commander-in-chief of the military.

The Dimensions of National Resilience

A country's ability to implement a swift and effective response to an emergency, crisis, or disaster hinges on the national resilience systems in place. The most effective systems are risk-based and designed in line with a holistic vision for resilience – a vision that factors people (individuals, families, communities, and vulnerable community groups), society, cultural dynamics, economies, and the built and natural environments into the equation. The United States Federal Emergency Management Agency (FEMA) offers such a vision, with global applicability[2]:

The US agency envisages **resilient people** who enjoy optimal health and wellbeing along with a sense of security, social connectedness, and diminished vulnerability. Similarly, it considers a **resilient society** to be characterized by a robust sense of belonging, a high degree of trust, and community empowerment that supports strong civic engagement. Meanwhile, **resilient economies** demonstrate features such as societal inclusivity, a diverse range of thriving industries, and pillars that draw on regional strengths and assets. FEMA's vision also includes a **resilient built environment** that supports a high quality of life through the provision of adequate housing and robust and adaptable critical infrastructure systems that support innovation and economic growth. Finally, complementing the built environment should be a **resilient natural environment** with clean land, air, and water, as well as healthy ecosystems that can withstand shocks and stressors.

1. EM-DAT, the International Disaster Database published by the Centre for Research on the Epidemiology of Disasters (CRED).
2. National Resilience Guidance, FEMA,(updated September 2023), Available at: National Resilience Guidance | FEMA.gov

Sustainable development is also critical to resilience. At the national level, measures designed to reduce poverty, boost inclusion, and improve public health, among other factors, can lead to increased prosperity and free up capital that can be allocated to enhancing national resilience. Importantly, for development – and resilience – to be sustainable, related processes must be inclusive, thus fostering equity down the generations.

The need for sustainable development has long been acknowledged by the global community. In 2015, all United Nations Member States adopted the 2030 Agenda for Sustainable Development, including the 17 Sustainable Development Goals (SDGs) detailed within it[3]. An urgent call to action, the SDGs recognize that ending deprivation in all forms must be accompanied by clear strategies that improve health and education, reduce inequality, facilitate economic growth, and protect the planet.

National resilience transcends each of these goals. However, sizeable gaps typically exist between vision, policy themes, and the operational reality on the ground. Worldwide, communities are facing an increasingly complex set of challenges presented by increasingly frequent national, regional, and local incidents. For many countries, these disasters and their consequences are catalyzed further by systemic national issues that can include outdated legislation, failure of government service systems, legacy or ageing infrastructure, environmental destruction, and poverty – all of which undermine a nation's ability to recover from a major incident and continue to thrive.

3. United Nations, Sustainable Development Goals, available at: THE 17 GOALS | Sustainable Development (un.org)

Section 2

Context: The Evolving Risk Landscape

It is essential to view national resilience through the lens of a constantly evolving risk landscape, with ‘risk’ in the context of this report limited to natural disasters and man-made technological incidents (accidental or deliberate) as outlined in the figures below.

Globally, the total number of emergency incidents has increased more than 50-fold in the last century, with reported incidents rising by almost 5,987%[4] since early the 1900s. What's more, when it comes to natural disasters, climate change driven by global warming is predicted to drive further increases in frequency and severity over the next 50 years. Already, over the past four decades, events tied to floods and extreme temperatures have increased significantly, by 186% and 182%, respectively, with emergency incidents relating to storms, roads, and water also rising sharply – by 60%, 71%, and 54%. Despite these troubling trends, cyclical and event-driven reforms are having a major impact, while incomplete reporting across all types of events prior to the 1980s undoubtedly skews some findings and belies the significant progress made over the years.

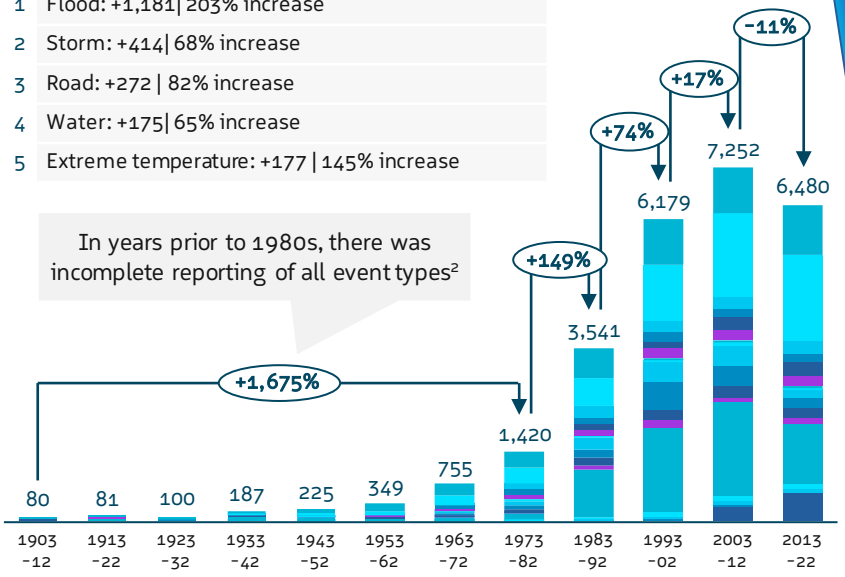
While some historical data may be unreliable and incomplete, what is clear today is that although incidents of crisis and disaster have increased over time, the rate of growth has been steadily diminishing with each passing decade, starting from the 1970s. In the period 1973 to 1992, the growth rate for emergency incidents stood at 149%, falling to 74% between 1992 and 2002, and declining further to 13% in the period 2002-2012. Notably, between 2003 and 2022, the world witnessed a 10-year reduction in events by approximately 15%, with industrial explosions falling by 72% and industrial accidents reducing by 67%. For their part, epidemics fell by 53%, air accidents by 47%, and road incidents by 46%.

4. It is important to note that this 5,987% simple growth rate is a combination of: (1) emergency event frequency over the period; and (2) the evolution of more robust monitoring and reporting practices of government that evolved from the 1970s onwards

FIGURE 1: HISTORICAL TRENDS IN THREAT TYPES

Last 40 years (1983-92 to 2013-22)	
1	Flood: +1,181| 203% increase
2	Storm: +414| 68% increase
3	Road: +272	82% increase
4	Water: +175| 65% increase
5	Extreme temperature: +177	145% increase

In years prior to 1980s, there was incomplete reporting of all event types[2]



- Storm
- Flood
- Earthquake
- Drought
- Extreme temperature
- Landmass movement
- Industrial accidents
- Volcanic activity
- CBRNE
- Disease (e.g. pandemics)
- Fires (Structural & Industrial)
- Wildfire
- Transport incidents
- Infrastructure collapse
- Crowd-control incidents
- Tsunamis
- Acts of terrorism
- Cyber attacks
- Insurgency
- Acts of war

Reported emergency incidents have gone up almost 5,987% since early 1900s

The rate of growth over the last 50 years has been diminishing every 10 years:
- 149% (1973 – 1992)
- 74% (1992 – 2002)
- 13% (2002– 2015)

From 2003 to 2022 we have seen a 10-year reduction in events by ~11%, with the following major movers:

Top five event types that most reduced:
- Explosion (industrial): 71%
- Industrial accident: 67%
- Epidemic: 50%
- Air: 46%
- Road: 42%

Evolving generational shifts are precipitating a noticeable uptick in military actions and activities proven in the increased number of wars over past two decades

Notes: 1. Others include animal incidents, chemical spills, collapses, explosions, industrial fires, gas leaks, glacial lake outburst floods, impact from meteorite incidents etc., industrial accidents, infestations, mass movements (dry), oil spills, miscellaneous accidents (general), poisoning, radiation, volcanic activity. Miscellaneous accidents comprise accidents at stadiums, mines, etc. 2. Data reporting issues may be due to lack of resources, data reports, etc.

Source: EM-DAT, Imperial War Museums, ADL

The Importance of Coping Capacity

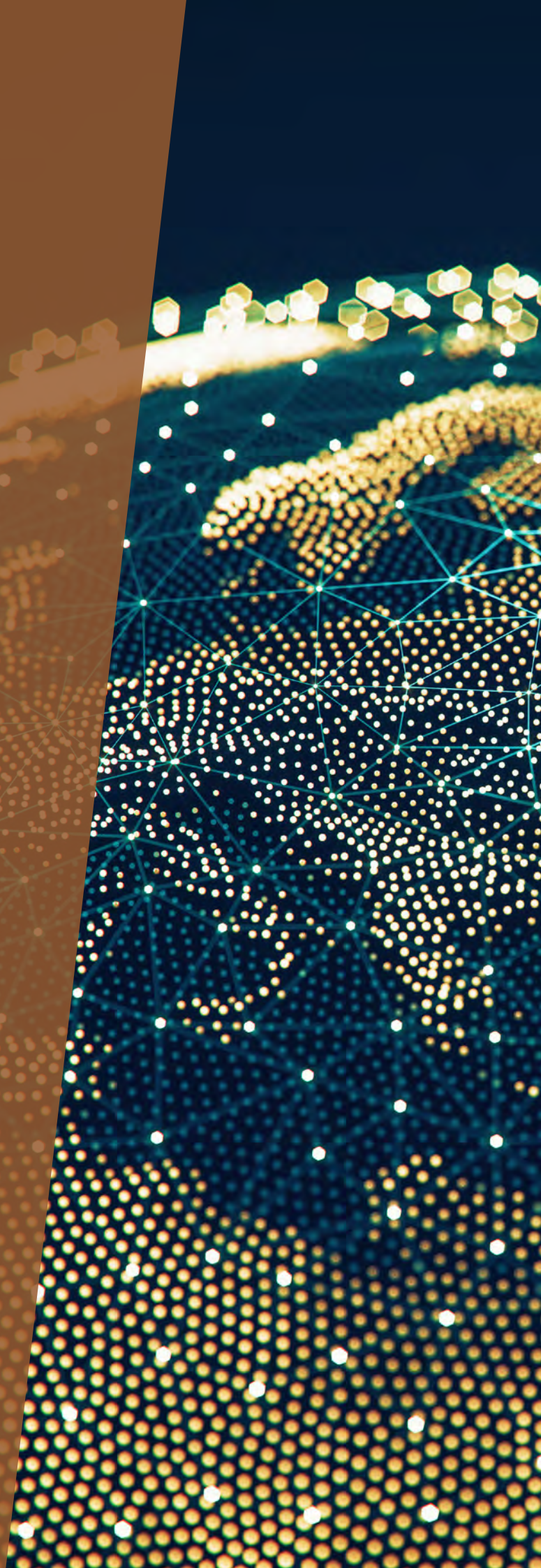
A driving force behind the decline in growth rates for national crises and disasters is coping capacity. In fact, over the past two decades, countries with higher adaptive capacity on the INFORM Risk Index[1] have seen a reduction of up to 50% in reported emergency incident rates. The index calculates disaster risk for 191 countries, covering 99% of the world's population. INFORM, or 'Index for Risk Management' is a collaboration between the Inter-Agency Standing Committee Reference Group on Risk, Early Warning, and Preparedness and the European Commission.

The INFORM Risk Index focuses on coping capacity and assesses how effectively a government has addressed issues to enhance the resilience of society. Specifically, it gauges a country's ability to handle disasters through organized activities, government efforts, and infrastructure. Luxembourg serves as a standout example. A country with strong coping capacity, it experienced a 50% decline in the total number of emergency incidents across 16 major risk factors between the periods 2003-2012 and 2013-2022, as per EM-DAT, the International Disaster Database published by the Centre for Research on the Epidemiology of Disasters (CRED). During the same timeframe, Europe and Oceania, which also possess robust coping capacities, witnessed declines of 18% and 12%, respectively.

The picture for other parts of the world, however, is more complex. In the Middle East, where coping capacity has historically been weaker (with notable exceptions in the GCC), emergency incident rates increased by 12% between 1993-2002 and 2003-2012, before falling 16% in the subsequent period up to 2022. Similarly, in Latin America and the Caribbean, the incident rate rose 14% before declining by 13% during the same time periods. These significant shifts point to concerted efforts among nations lacking in adaptive capacity to enhance their capabilities and adopt new approaches to PPDRR.

Section 3

Global National Risk and Threat Scenarios



Even for countries with high levels of adaptive capacity, declines in emergency incidents are exactly that – declines.

Planet Earth has a habit of reminding us that no country is entirely immune to crisis and disaster. Over the last 20 years, the severity of certain national incidents has increased, with direct impacts and far-reaching consequences for economies around the world.

In 2005, Hurricane Katrina in the United States resulted in 1,833 lives lost and one million residents displaced, while four years later, the Black Saturday Fires in Australia led to 173 fatalities and destroyed more than 2,000 homes, with financial losses estimated at more than $3 billion. In an example of a different kind, the year 2012 saw the Shamoon malware attack on petrochemicals giant, Saudi Aramco, which wiped around 35,000 computers. And of course, no glance back at recent history would be complete without consideration of the seven million lives lost as a result of COVID-19, and the $2.5 trillion hit that the pandemic dealt to global GDP.

These incidents are reflective of historical trends in both natural and man-made risks. Specifically, 20 high-impact risks have challenged world leaders for several decades and will continue to do so in the years ahead.

FIGURE 2: TOP 20 CRITICAL RISKS FOR NATIONAL LEADERS

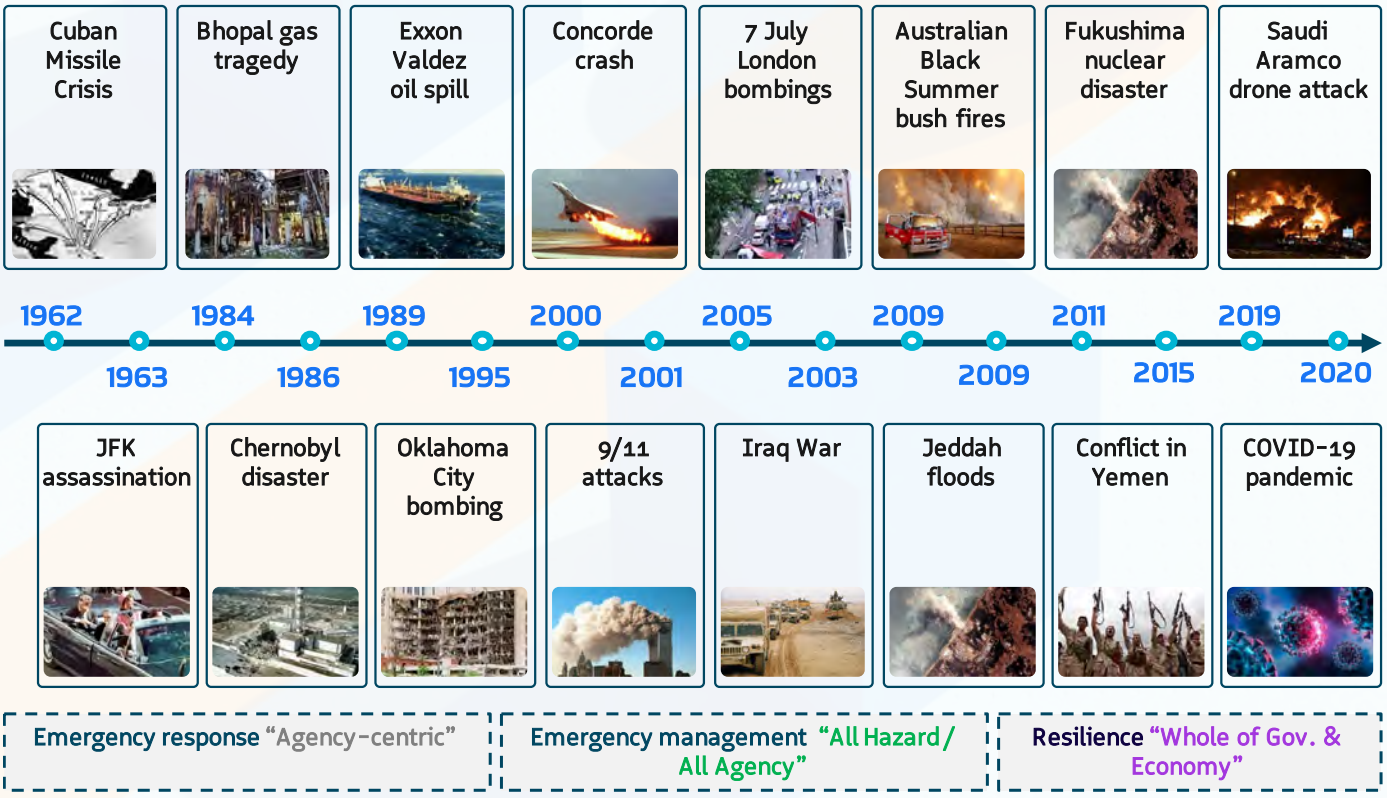
Note: CBRNE stands for Chemical, Biological, Radiological, Nuclear, and high yield Explosives
Sources: National Risk Register UK, National Preparedness Report FEMA, National Disaster Management Plan 2016 India, National Risk Assessment Ireland, EM-DAT, Global Terrorism Database, and ADL team

Shifting Paradigms

From health pandemics to cyberattacks, each hard-hitting crisis of recent decades has revealed flaws in the responses of governments across geographies and, for many countries, has triggered the commencement of structured reviews of national arrangements, which have changed and evolved over time.

Many of these 'triggers' stand out as key events in world history, from the Cuban Missile Crisis and the assassination of John F. Kennedy in the 1960s, to the Chernobyl disaster of 1986 and Fukushima nuclear disaster in 2011. The global threat landscape has also been marked by acts of war and terrorism, including the 9/11 attacks and subsequent Iraq War, to name just two.

FIGURE 3: EVENTS THAT HAVE DRIVEN CHANGE



Source: ADL analysis

With the scale, frequency, severity, and complexity of national disasters increasing over the decades, governments have been compelled to change tack – often dramatically. Fifty years ago, an **'agency-centric'** approach was widely adopted by governments worldwide. It would typically involve emergency services such as the

Shifting Paradigms

police, fire brigade, and other first responders working in silos on planning, preparedness, and response, with multiple government agencies stepping in during the aftermath of a crisis to drive restoration efforts. Over time, however, shortcomings of this approach came to include poor coordination, low levels of integration, information silos, duplication and multiplicity of effort, resource scarcity, lack of scalability, and low interoperability, among others.

Examples from modern history include the responses to the assassination of US President John F. Kennedy in 1963 and the Oklahoma City bombing – the deadliest act of domestic terrorism in US history. Though occurring three decades apart, both incidents were marred by uncoordinated responses from the emergency services, with agencies all swiftly deployed, but operating in isolation. Fast forward to the 2020s, and these examples contrast sharply with the response to COVID-19. Across countries, the pandemic led to whole-of-government approaches designed to identify, detect, and contain the virus, and to manage coordinated (public and private sector) interventions in the form of rapid vaccination development and deployment programs worldwide.

From the failures of the agency-centric approach emerged the **'all hazard, all agency'** paradigm of emergency management. This modified approach included revised legislation, central coordination, multi-agency planning, and enhanced command, control, and coordination, along with greater focus on interoperability and the development of robust recovery systems. These new measures facilitated greater precision in terms in terms of understanding and addressing the needs of different groups, individuals, and businesses. However, the 'all agency, all hazard' approach also brought a raft of new challenges relating to degrees of government stakeholder involvement, community preparedness and response readiness, cross-border support and mutual aid agreements, data security and information sharing, and the integration of private and third-sector capabilities, alongside other issues.

A series of valuable lessons can be garnered from the limitations and weaknesses of the agency-centric and all hazard, all agency approaches, as outlined below:

Lessons Learned

Importance of national leadership:

National leaders must be fully present, visible, informed in real-time, and enabled by robust communications to re-assure communities. Political distancing from events or a perceived lack of care can have significant negative fallout. For instance, in 2009, a series of bushfires devastated the Australian state of Victoria. The day the fires broke out, the state's police commissioner at the time, Christine Nixon, was widely criticized for attending a haircut appointment and a dinner during the community's hour of

Shifting Paradigms

need. By contrast, former British prime minister, Winston Churchill, was highly regarded by th public for his presence and potent leadership style during World War II. Nixon's actions do not necessarily render her negligent in her post and Churchill's reputation is not beyond reproach, but public sentiment and perceptions matter when it comes to national resilience.

Unclear resilience arrangements:

A complex patchwork of legislative and government policy 'fixes' can evolve over time, with ministries and other government entities unclear on changing roles and responsibilities, leading to an un-coordinated approach to PPDRR[5]. In many cases, it requires a catastrophe to get it right. Often, it is only in the aftermath of a hurricane, flood, or fire, that policy and legislation is adequately revised, and patchwork fixes are replaced by holistic arrangements.

Strategic misalignment:

Focus on agency and risk-specific planning versus 'all hazard, all agency' planning, can create information siloes across government, with little to no coordination at the national, regional, or local levels. For example, the CIA in the United States has classified information that it shares exclusively with the US Government, while the police may share information with a limited range of agencies. In the lead up to the 9/11 attacks in New York, the CIA was reportedly aware of a threat, but a lack of information sharing between agencies likely hindered the creation of an accurate threat profile.

Focus on criticality:

A lack of clarity on what matters most can mean that critical infrastructure and essential services are not prioritized. Meanwhile, infrequent or erratic exercising and implementation of plans can lead to strategic vulnerabilities that are open to exploitation, either through misfortune (i.e., man-made accidents) or action of hostile actors. In the case of cyberattacks, it is essential to distinguish between a potential attack on a supermarket chain and an attack that could shut down rail networks, water systems, or a nation's nuclear facilities. In response to this need, the European Union established the European Programme for Critical Infrastructure Protection (EPCIP) – a package of measures aimed at improving the protection of such infrastructure across EU member states. Central to the EPCIP is the European Critical Infrastructure Directive, which is a procedure for identifying and designating critical infrastructures and a common approach to protecting them.

Misaligned concept of operations:

Misaligned concepts of operations and the absence of essential single-agency, multi-agency, and whole-of-government capabilities can severely limit a nation's ability to plan, prepare, detect, respond, and recover from national disasters. In times of emergency, interoperability is essential and the absence of it can hamper response and recovery efforts on multiple levels. In the 1980s

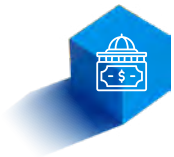
5. PPDRR: Resilience lifecycle that contains five critical phases: Planning (inc. Risk Management), Preparedness, Detection, Response & Recovery.

Shifting Paradigms

in Australia, the police, ambulance service, and fire brigade were unable to communicate at the site of a fire emergency because their comms systems each operated on different frequencies.

Vulnerable community groups:

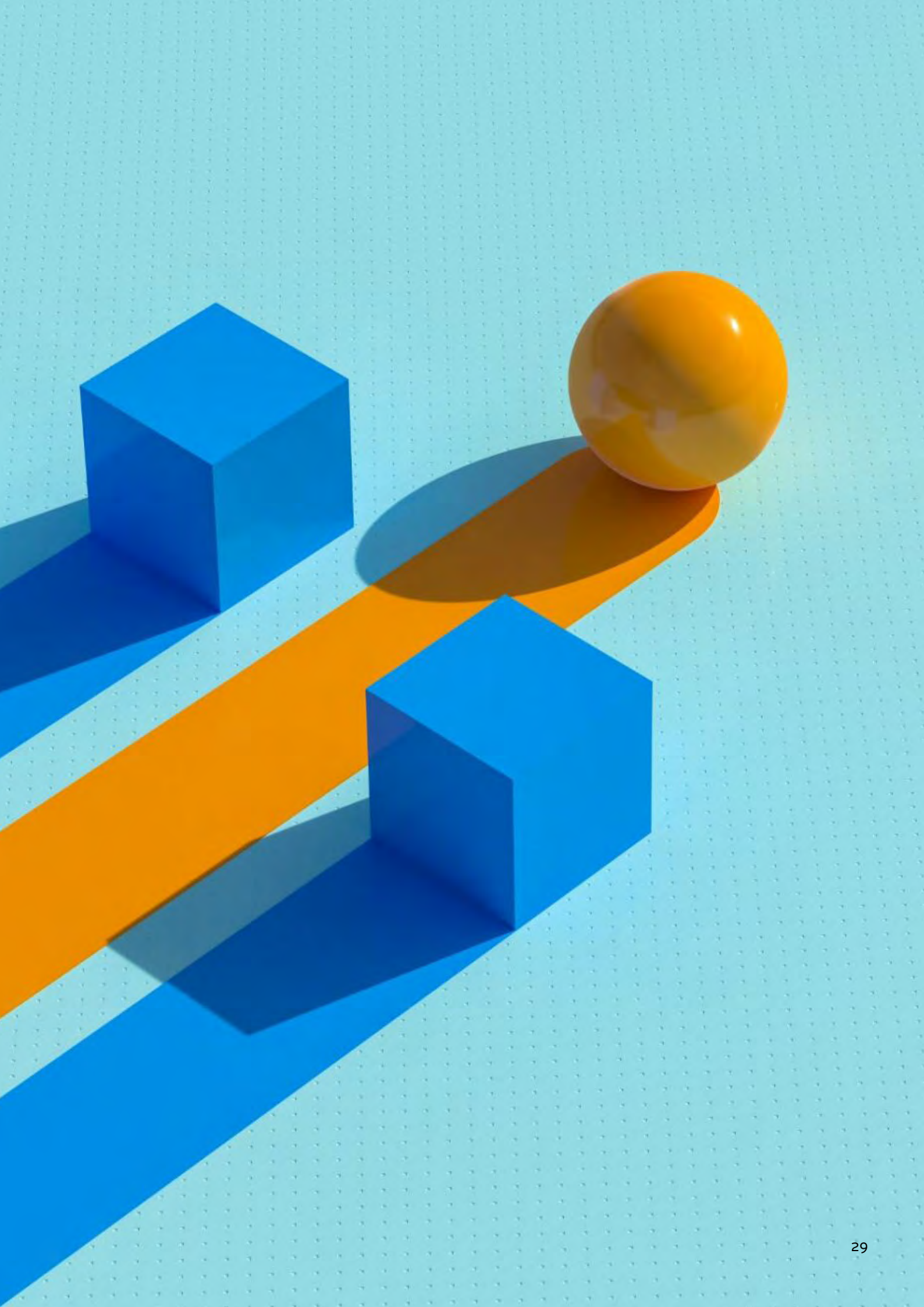
A lack of identification, engagement, awareness, and education programs targeting specific or vulnerable community groups can result in ineffective planning that is not tailored to the specific needs of these citizens and community groups, leaving some more vulnerable to specific risks or threats than others. For instance, a community may be home to individuals who only speak a foreign language, hospital patients on life support, and elderly people with mobility constraints. From a PPDRR perspective, each of these circumstances must be factored in, with measures potentially ranging from awareness building campaigns in a variety of languages to multi-agency evacuation arrangements for hospitals.



Funding volatility:

As recency effects[6] set in and a crisis begins to fade from the headlines, government funding is drawn to other priorities, with the development and sustainment of capabilities being de-prioritized. This is known as the complacency trap. Hurricane Katrina is a case in point. The category 5 hurricane tore through New Orleans and the surrounding areas in 2005, causing destruction and severe flooding that led to 1,392 deaths, and costs estimated at up to $145.5 billion. For months, the crisis was frontline news and the US government pumped money and resources into the rescue and recovery efforts. However, with the passage of time, media attention and political will began to wane, causing money to be diverted to other pressing issues and complacency to set in. The government's failure to sustain its investment and interest over time left the country vulnerable to future disasters. In fact, in 2017, Hurricane Harvey hit, causing catastrophic flooding, more than 100 deaths, and $125 billion in damage - tying it with Hurricane Katrina as the costliest tropical cyclone on record.

6. Recency effects: "The recency effect is a cognitive bias in which those items, ideas, or arguments that came last are remembered more clearly than those that came first" Source: www.sciencedirect.com. (n.d.). Recency Effect - an overview | ScienceDirect Topics. [online] Available at: https://www.sciencedirect.com/topics/psychology/recency-effect.



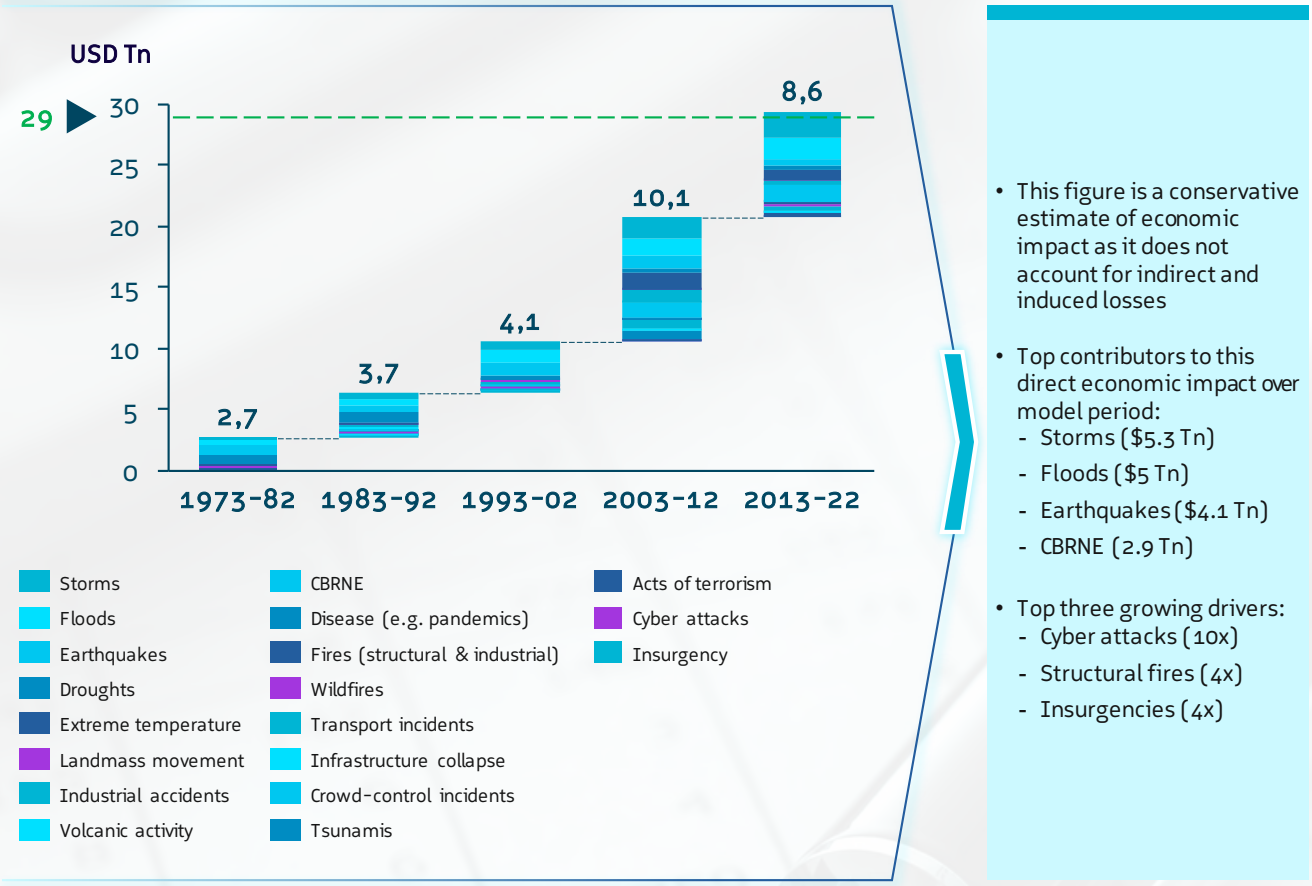
Section 4

Socio-Economic Impact & The Global Value at Risk

The rise of national resilience efforts has been spurred by the immense socio-economic toll that emergencies, disasters, and crises have taken over the years.

While precise figures are difficult to determine, ADL estimates that the direct economic impact of incidents since the 1970s exceeds $35 trillion (USD equivalent) globally, with the main contributors including acts of war, storms, floods, and earthquakes, along with chemical, biological, radiological, nuclear, and high yield explosives (CBRNE). This estimate does not include indirect or induced losses, suggesting that the total figure could in fact be significantly higher.

FIGURE 4: DIRECT ECONOMIC IMPACT FROM EVENTS SINCE 1973



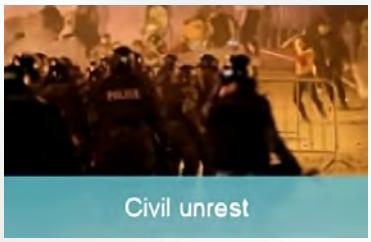
- This figure is a conservative estimate of economic impact as it does not account for indirect and induced losses
- Top contributors to this direct economic impact over model period:
  - Storms ($5.3 Tn)
  - Floods ($5 Tn)
  - Earthquakes ($4.1 Tn)
  - CBRNE (2.9 Tn)
- Top three growing drivers:
  - Cyber attacks (10x)
  - Structural fires (4x)
  - Insurgencies (4x)

Notes: 1. Others include animal incidents, chemical spills, collapses, explosions, industrial fires, gas leaks, glacial lake outburst floods, impact from meteorite incidents etc., industrial accidents, infestations, mass movements (dry), oil spills, miscellaneous accidents (general), poisoning, radiation, volcanic activity. Miscellaneous accidents comprise accidents at stadiums, mines, etc. 2. Data reporting issues may be due to lack of resources, data reports, etc. 3. Some direct economic impacts of incidents were imputed from existing EM-DAT data.

Source: EM-DAT, United Nations, Imperial War Museums, Arthur D. Little

Looking to the future, the landscape appears equally challenging, with trillions more dollars at stake globally if national risks are poorly managed and mitigated. According to ADL estimates, the value at risk over the next two decades could exceed ~$30 trillion (USD equivalent) on aggregate assuming the frequency of incidents remains stable and applying the historical 10-year growth rate incident severity[7] to project outward to 2042 as nations stabilize their national resilience programs.

7. Incident severity refers to the economic cost associated with loss of life and damage to assets from the top 20 reported risks in EM-DAT data sets over the last 10 years.


Civil unrest


Pedestrian accidents


Car accidents


Climate change


Tsunami


Natural pandemic


Volcanic eruption

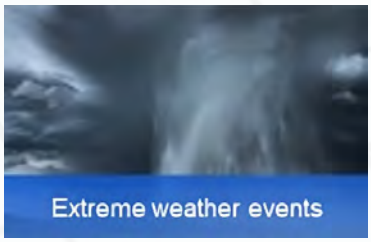

Public infrastructure failure


Workplace violence

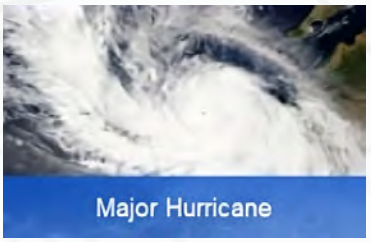

Civilian crowd crush/mass casualties


Flooding incident


Major Earthquake


Extreme weather events


Wildfires

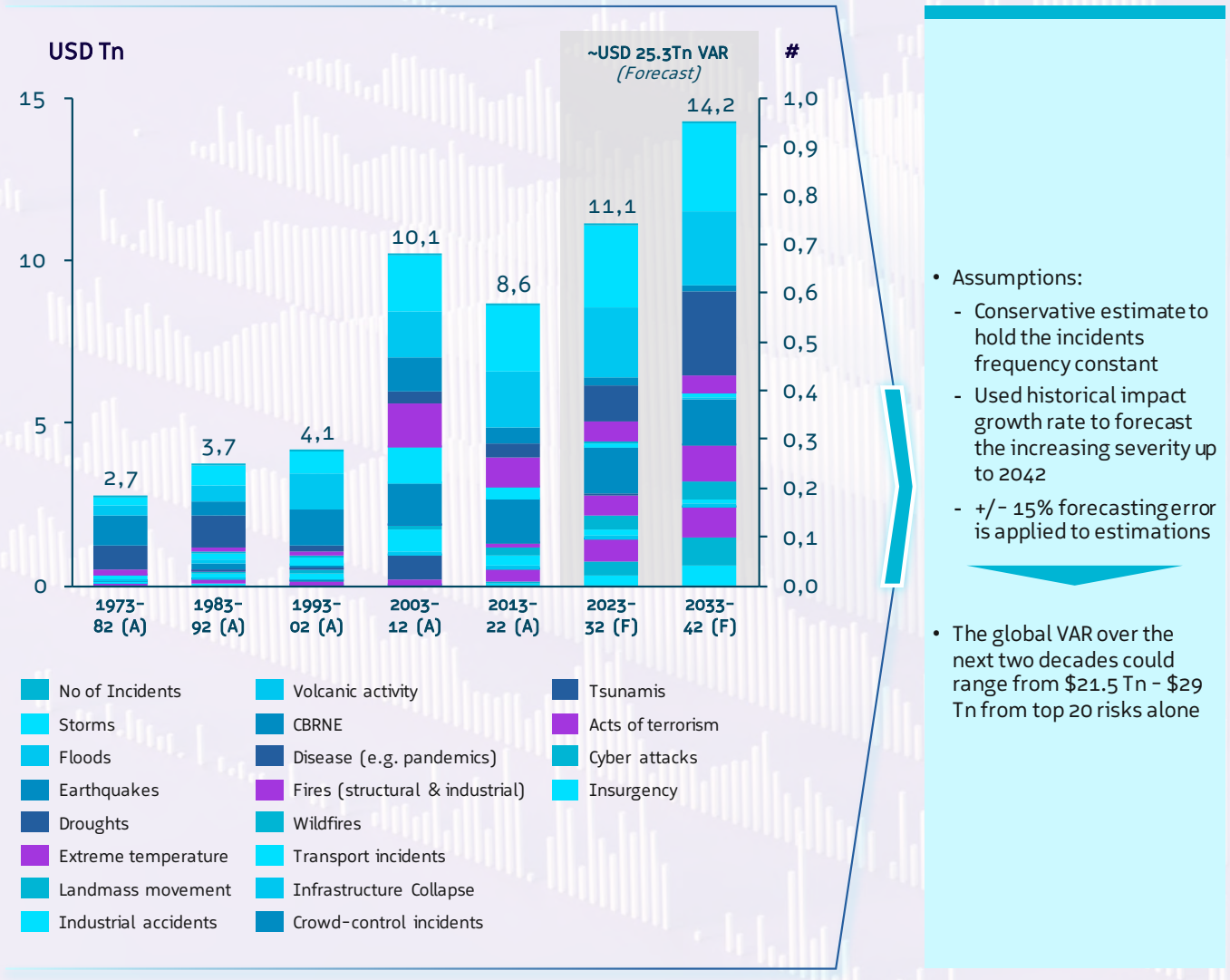

Major Hurricane


Cyber attack


CBRNE attack


Fire incident

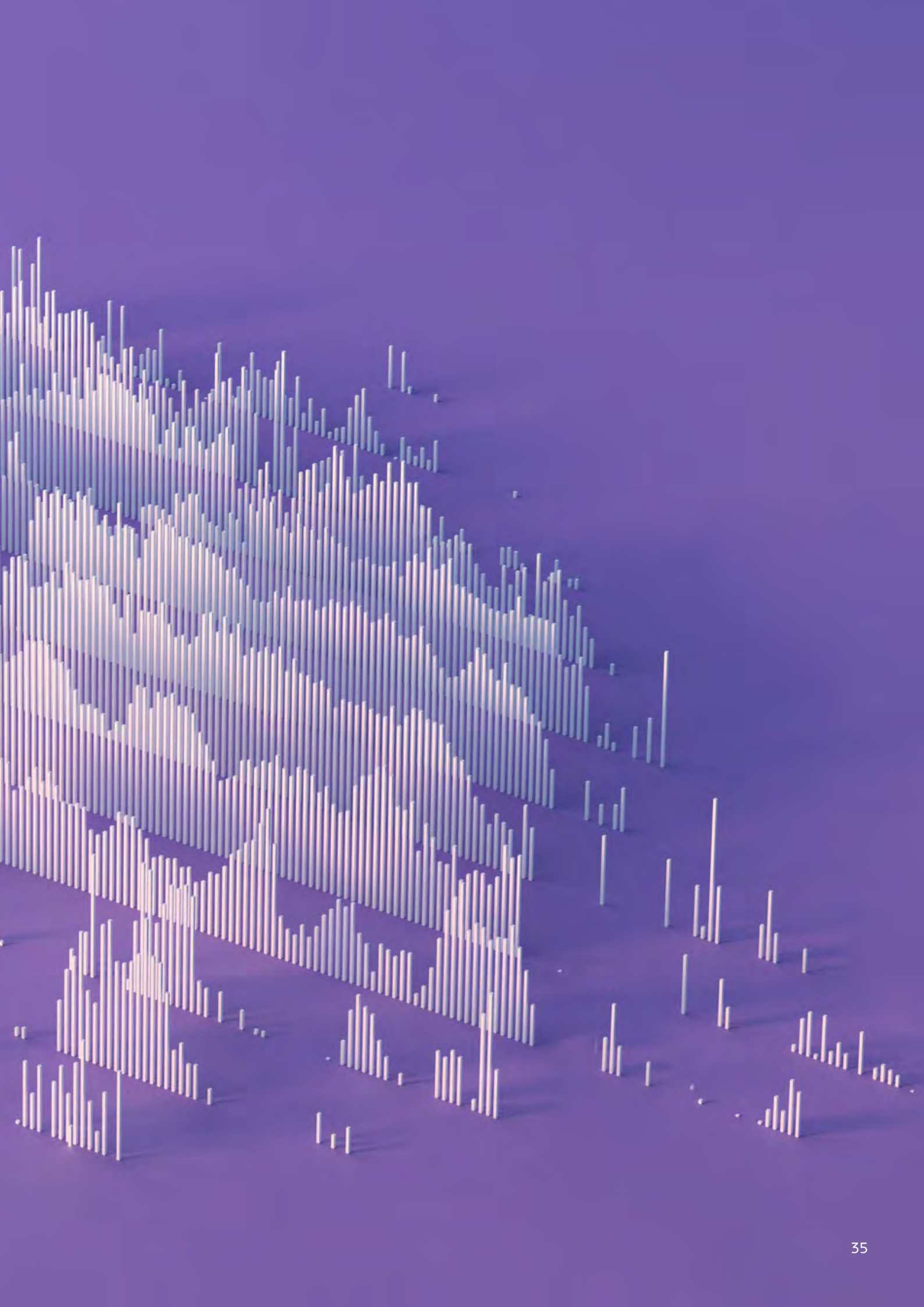
FIGURE 5: FORECAST OF SOCIO-ECONOMIC VAR FROM POORLY MITIGATED NATIONAL RISKS



- Assumptions:
  - Conservative estimate to hold the incidents frequency constant
  - Used historical impact growth rate to forecast the increasing severity up to 2042
  - +/- 15% forecasting error is applied to estimations
- The global VAR over the next two decades could range from $21.5 Tn - $29 Tn from top 20 risks alone

Notes: 1. Others: include animal incident, chemical spill, collapse, explosion, industrial fire, gas leak, glacial lake outburst flood, impact, industrial accident, infestation, mass movement (dry), oil spill, miscellaneous accident (general), poisoning, radiation, volcanic activity. Miscellaneous accidents comprise accidents at stadium, mine, etc. 2. Data reporting issues may be due to lack of resources, data reports, etc. 3. Data excludes acts of war..

Source: EM-DAT, United Nations, Imperial War Museums, Arthur D. Little



Section 5

High Performing National Resilience Systems: The Key Themes

Eight critical considerations have been developed from leading practice benchmarks that can assist countries in transforming their national resilience systems and developing a resilient culture within their communities:

FIGURE 6: KEY THEMES IN TRANSFORMATION NATIONAL RESILIENCE SYSTEMS

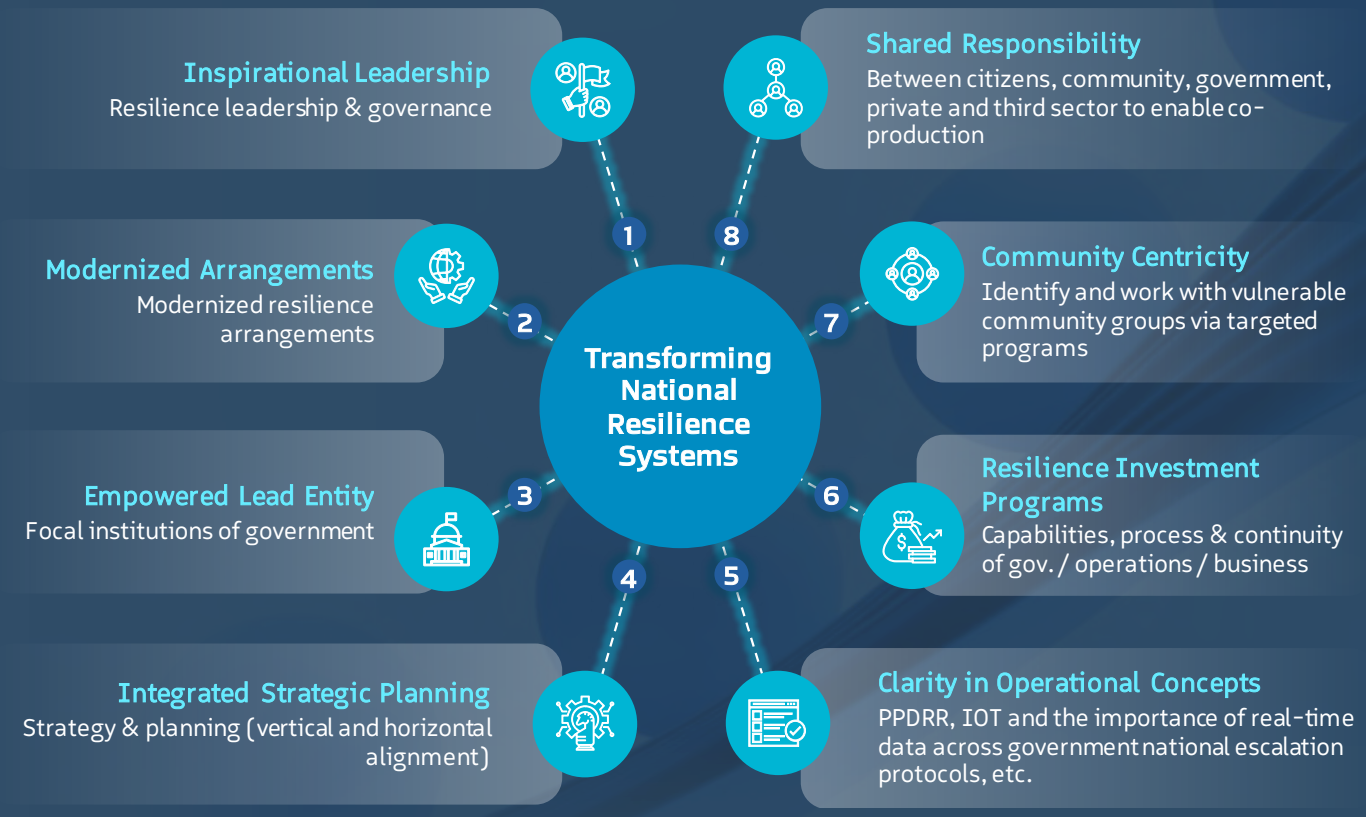
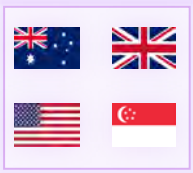


FIGURE 7: KEY BENCHMARKING INSIGHTS

1	Inspirational Leadership	Inspirational leadership before, during and after a crisis **ensures the countries preparedness, readiness and resilience** in response to National crisis and disasters	
2	Modernized Arrangements	Modernized Resilience Arrangements with visionary National policies, integrated legislation and regulations, operational policies and guidelines that **enable clarity of roles and responsibilities** for all system actors is fundamental to success in implementation	
3	Empowered Lead Entity	Leading countries have defined, developed and assigned powers too a specific organization at National level to **lead 'All Hazard / All Agency' resilience agendas**	
4	Integrated Strategic Planning	Top-down strategic planning in this environment does not work. It needs to be a blend of policy led investments from central government combined with community centric or bottom-up risk-based planning, to **ensure preparedness for events at the community level**	
5	Clarity in Operational Concepts	**Planning** (inc. Risk Management), **Preparedness**, **Detection**, **Response** & **Escalation** protocols, **Relief** and **Recovery** are core aspects of leading Resilience systems. Adoption and use of distributed IOT sensors helps provide real time data access across Government	
6	Resilience Investment Programs	Investment programs in this domain are **often reactive**, particularly in countries which follow democratic election cycles. The 'Boom / Bust' nature of funding resilience programs is a critical point of failure. **It needs to be considered as an annual necessity for success**	
7	Community Centricity	This is a fundamental component of successful resilience programs. Identifying and working with vulnerable communities (ie. Disabled, Culturally & Linguistically Diverse (CALD) groups, etc) with targeted programs **enhance awareness and response readiness**	
8	Shared Responsibility	There is a shared responsibility between citizens, community, government, private and third sector to **enable co-production of public safety outcomes**. Enabling readiness requires single, multi-agency & whole of government exercises with 'at risk' communities	

Section 6

Investing in Resilience

When it comes to resilience systems, securing a spot among the ‘high performers’ requires significant investment, with the nature of government investments in defense, civil defense, and security and intelligence varying depending upon international commitments and the nation’s state of modernization.

The table presented in Figure 8 outlines the top 15 performing countries, including their GDP and investment in national resilience reform and performance programs.

FIGURE 8: TOP 15 PERFORMING COUNTRIES

	GCC				Asia	Europe					America		Oceania		
All numbers are of 2022	Kuwait	UAE	Bahrain	KSA	Singapore	Lux/g	Ireland	Germany	Denmark	Malta	UK	USA	Canada	Australia	NZ
GDP (USD bn)	175	507	44	1,108	466	81	533	4,082	400	18	3,089	25,439	2,137	1,692	248
Total Government Budget (USD bn)	75	16	9	257	215	23	95	540	117	6	1,495	6,011	298	421	75
Population (Mn)	4	9	1	36	6	0.6	5	84	6	0.5	66	333	39	26	5
Country Size (urbanized area)[1] (km²)	773	2,263	330	7,757	454	283	1,261	36,996	2,235	174	22,676	186,573	13,983	11,946	1,970
Defence + Intel. + Civil Defence Budget ($ Bn)	16.6	19.6	2.4	130.37	16.6	1.0	3.4	62.7	5.7	0.2	254.6	953.7	31.8	40.4	4.5
Defence + Intelligence + Civil Defence Budget %	22.1%	51.1%	25.5%	50.5%	7.7%	4.4%	3.6%	11.6%	4.9%	3.8%	17.0%	15.9%	10.7%	9.6%	6.0%
Lack of Coping Capacity Index Score (INFORM)	3.7	1.8	2.8	3.3	1.1	1.4	1.6	1.6	1.2	2.6	1.6	2.2	2.4	2.1	1.8
Overall INFORM Risk Index Score	2.5	1.7	1.4	3.6	0.7	1.1	1.4	2.4	1.4	1.7	2.0	3.2	2.4	2.4	1.4

Five Eyes Countries

1. Latest figures available from World Bank are from 2015
Source: World Bank, National Budget Reports for Kuwait MoF, UAE MoF, Bahrain MoF, Saudi Arabia MoF, Singapore MoF, Ireland Treasury, Germany Federal MoF, Denmark MoF, Malta Ministry for Finance, Canada MoF, New Zealand Treasury, United Kingdom Treasury, United States of America Treasury, Australia Treasury, INFORM Risk Index, Stockholm International Peace Research Institute (SIPRI) Military Expenditure Database, ADL analysis

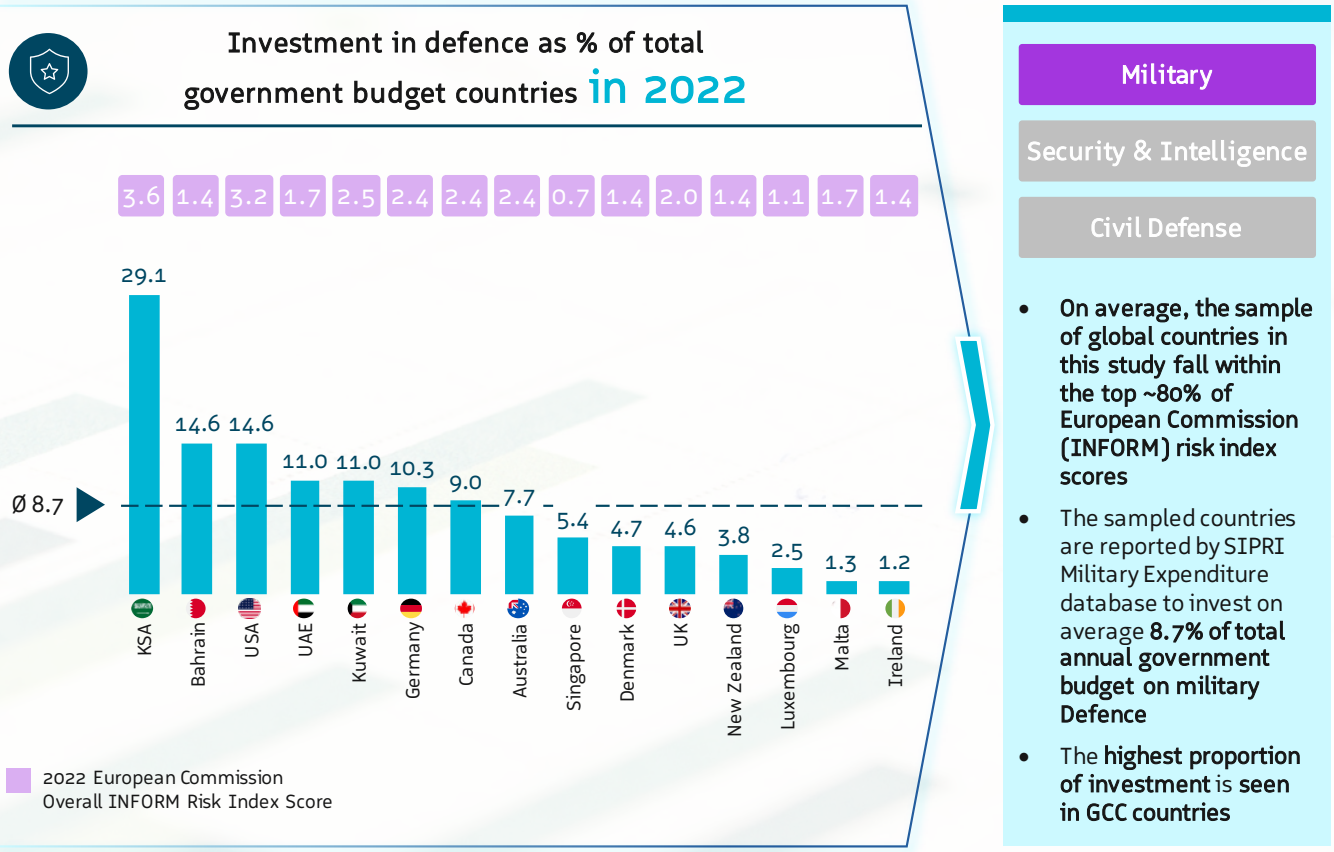
In the GCC, 25% to 51% of investment is directed towards modernizing government resilience practice as part of relatively new national powers. Meanwhile, the nations within the 'Five Eyes' intelligence alliance invest consistently to maintain standards for interoperability, intelligence sharing, and joint coalition operations and mutual aid agreements. The 'Five Eyes' include Australia, Canada, New Zealand, the United Kingdom, and the United States, all of which are parties to the multilateral UK-USA Agreement, a treaty for joint cooperation in signals intelligence.

Interestingly, expenditure levels for Singapore are equivalent to that of the Five Eyes countries, with the small nation state considered an example of leading practice in Asia. For its part, Europe has been trending between 3.8% to 4.9% with a noted increase in government expenditure by Germany in recent years to modernize its defense industry capabilities and systems. Specifically, Germany has allocated 11.6% of its budget to defense, security, and civil defense.

Across geographies, defense spending as a proportion of government budget varies depending on the geo-political threat profile of a given nation and its current modernization agenda. As illustrated in Figure 8, nations

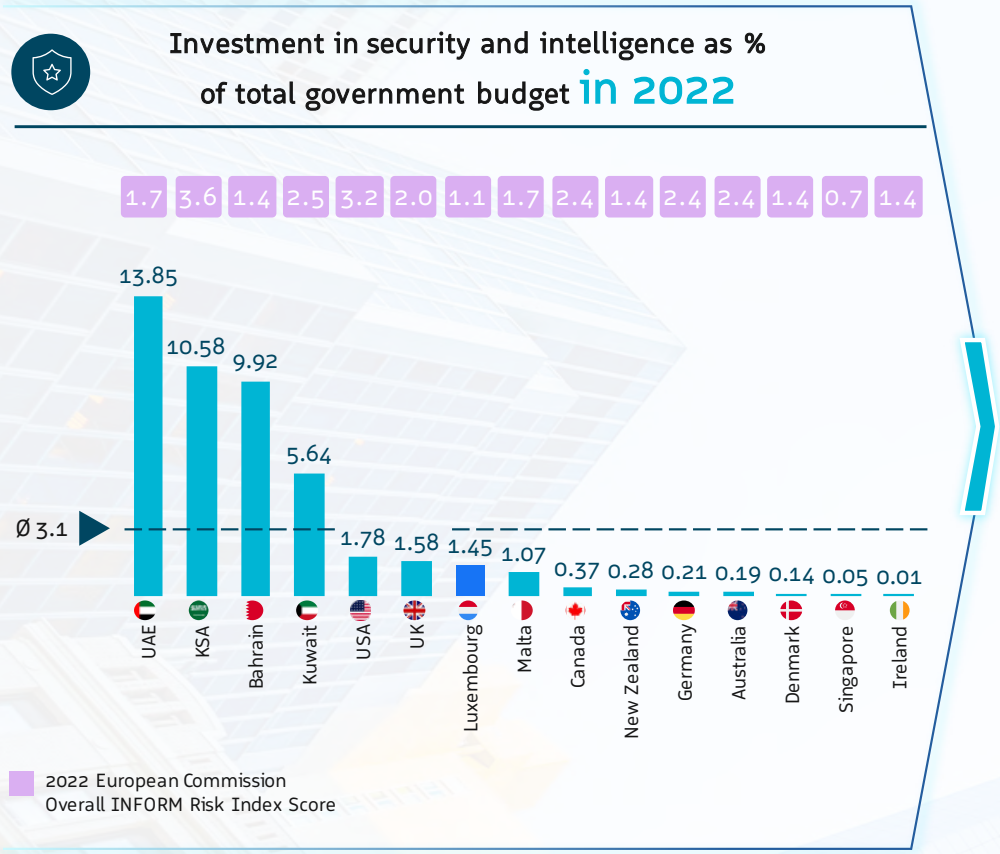
with strong resilience systems typically invest 8.7% of total annual government budget on military defense, with the highest proportion of investment evident in the GCC. Governments also spend an average of 3.1% of their total budget on security and intelligence activities that enable their countries to interoperate and share intelligence effectively, and around 4.5% on civil defense systems, including ambulance services, which are commonly termed 'red and blue' light services.

FIGURES 9: INVESTMENT AS % OF GDP ACROSS DRIVERS OF RESILIENCE



Note: The European Commission (INFORM) risk index scores are evaluated from 0 – 10, across all countries, where 0 is the lowest risk and 10 is highest risk index score
Source: World Bank, Stockholm International Peace Research Institute (SIPRI) Military Expenditure Database, INFORM Risk Index, and Arthur D. Little team.

The geopolitical tensions in the Middle East and rising oil prices have contributed to a trend of increasing military spending from GCC countries. Several GCC nations spent a significant proportion of their government budget on military capabilities, typically above the average spending of 8.7%. Saudi Arabia (KSA) is the biggest spender in the region and the fifth biggest in the world, with its military spending increasing 16% in 2022, based on SIPRI data.



Military

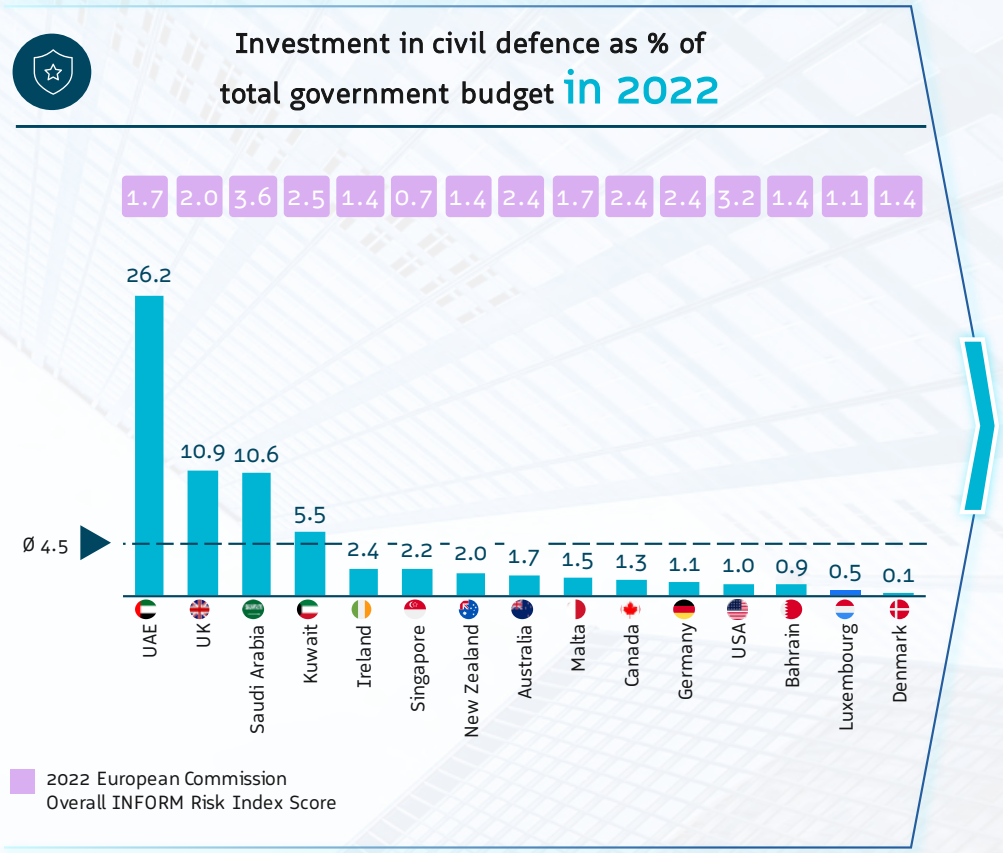
Security & Intelligence

Civil Defense

- Sampled global countries in this study typically **invest 3.1% of total annual government budget** on security and intelligence
- The **highest proportion of investment** is seen in GCC countries as a result of **geopolitical uncertainties**
- It appears that there is a sustainment cost for Intelligence & Security in mature economies that is significantly less due to lower threat profiles and more developed / mature economies

Note: The European Commission (INFORM) risk index scores are evaluated from 0 – 10, across all countries, where 0 is the lowest risk and 10 is highest risk index score
Source: World Bank, Budget Reports, INFORM Risk Index, and Arthur D. Little team.

Traditionally, several countries in the western hemisphere, particularly in Europe, have spent relatively conservatively on security and intelligence. However, growing tensions at the borders warrant the need for effective counter-terrorism capability to avoid life-threatening terrorist incidents. As such, these countries should increase their security and intelligence investments to around 3.1% of government budget spending, in line with nations renowned for their strong resilience spendings such as the UAE and KSA.



Military

Security & Intelligence

Civil Defense

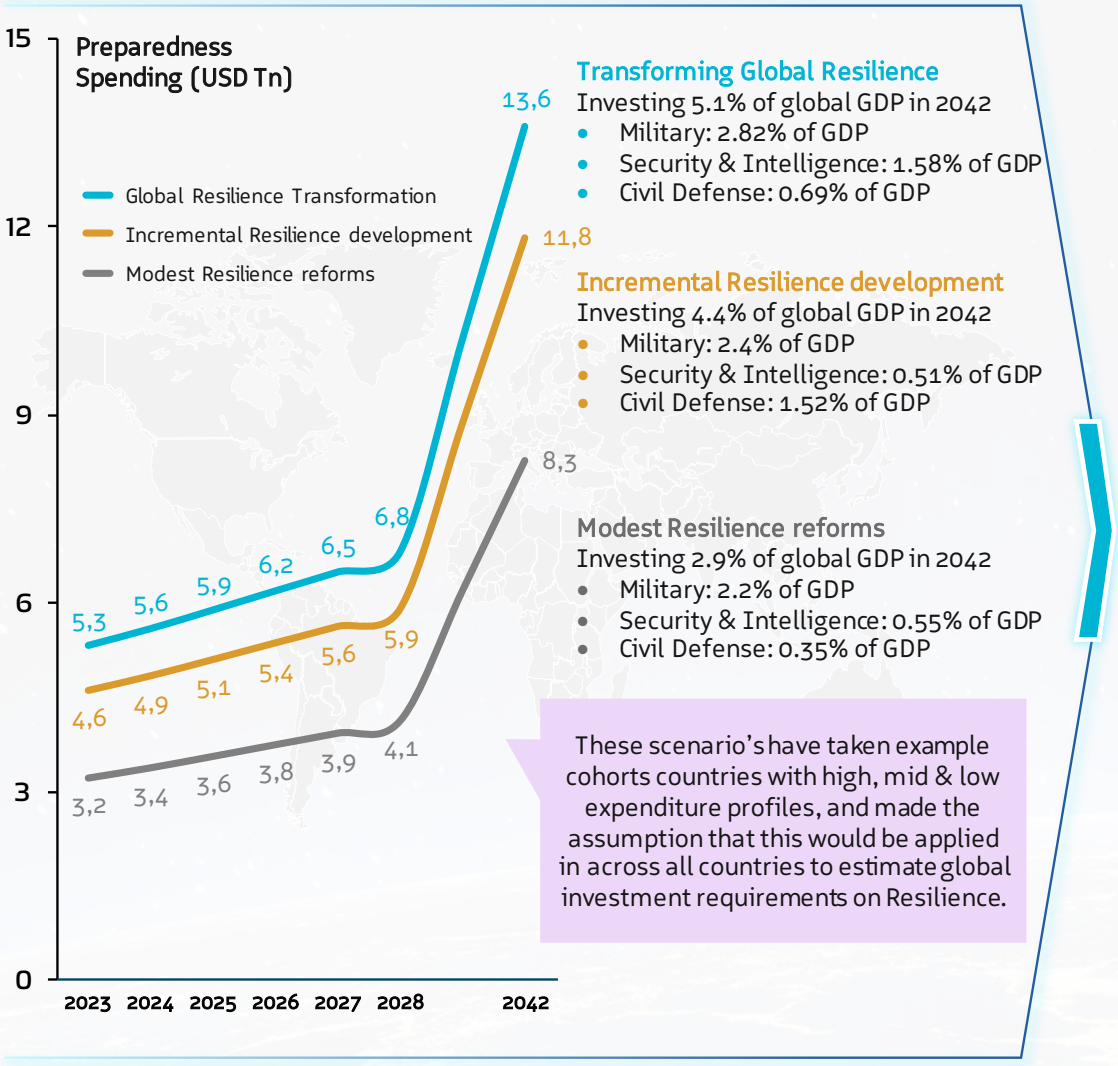
- Sampled global countries in this study typically **invest 4.5% of total annual government budget on Civil Defence**
- AS with Security and Intelligence, the highest proportion of investment is seen in GCC countries due to their transformative posture
- Higher spend countries on Civil Defence are either transformative (ie. UAE & Kuwait), or have significant national public Civil Defence and Ambulance services

Note: The European Commission (INFORM) risk index scores are evaluated from 0 – 10, across all countries, where 0 is the lowest risk and 10 is highest risk index score
Source: World Bank, Stockholm International Peace Research Institute (SIPRI) Military Expenditure Database, INFORM Risk Index, and Arthur D. Little team.

Moving forward, the exact size of investments in resilience will be determined by the level of preparedness a government wishes to achieve, with figures ranging from conservative, to moderate, to transformational. At the lower end of the scale, countries such as Germany, Denmark, and Ireland commit an average of 1.2% of their GDP to resilience spending, rising to ~4% for countries including the UK, USA, and Australia. By contrast, GCC nations including Saudi Arabia and the UAE spend in excess of 6% of their GDP on resilience, indicating a serious commitment to shoring up their national capabilities.

At the global level, drawing on IMF data, ADL forecasts that spending equating to an average of 4.4% of national GDP will result in $12 trillion annual investment from government leaders towards the end of next two decades. What's more, as the severity of crises and disasters increases, spending on civil defense and security and intelligence could reach $14 trillion annually by 2042.

FIGURE 10: TOTAL ANNUAL GLOBAL INVESTMENT TO ENHANCE NATIONAL RESILIENCE BY 2042



- National **leaders' policy position on Resilience and resilience investment programs** will dictate how prepared their nations will be to control and respond to future risks, crisis & disasters
- In the **base case, a 4.4% of GDP investment** is projected to result in **~USD 11.8 Tn annual investment** from national leaders by 2042
- As transformative aspirations increase, we expect national leaders to commit more to resilience increasing expenditure to **~USD 13.6 Tn per annum by 2042**

Source: IMF Global Distribution, IMF GDP Forecasts 2023-28, Stockholm International Peace Research Institute (SIPRI) Military Expenditure Database, National Budget Reports, Arthur D. Little projections based on historical growth.

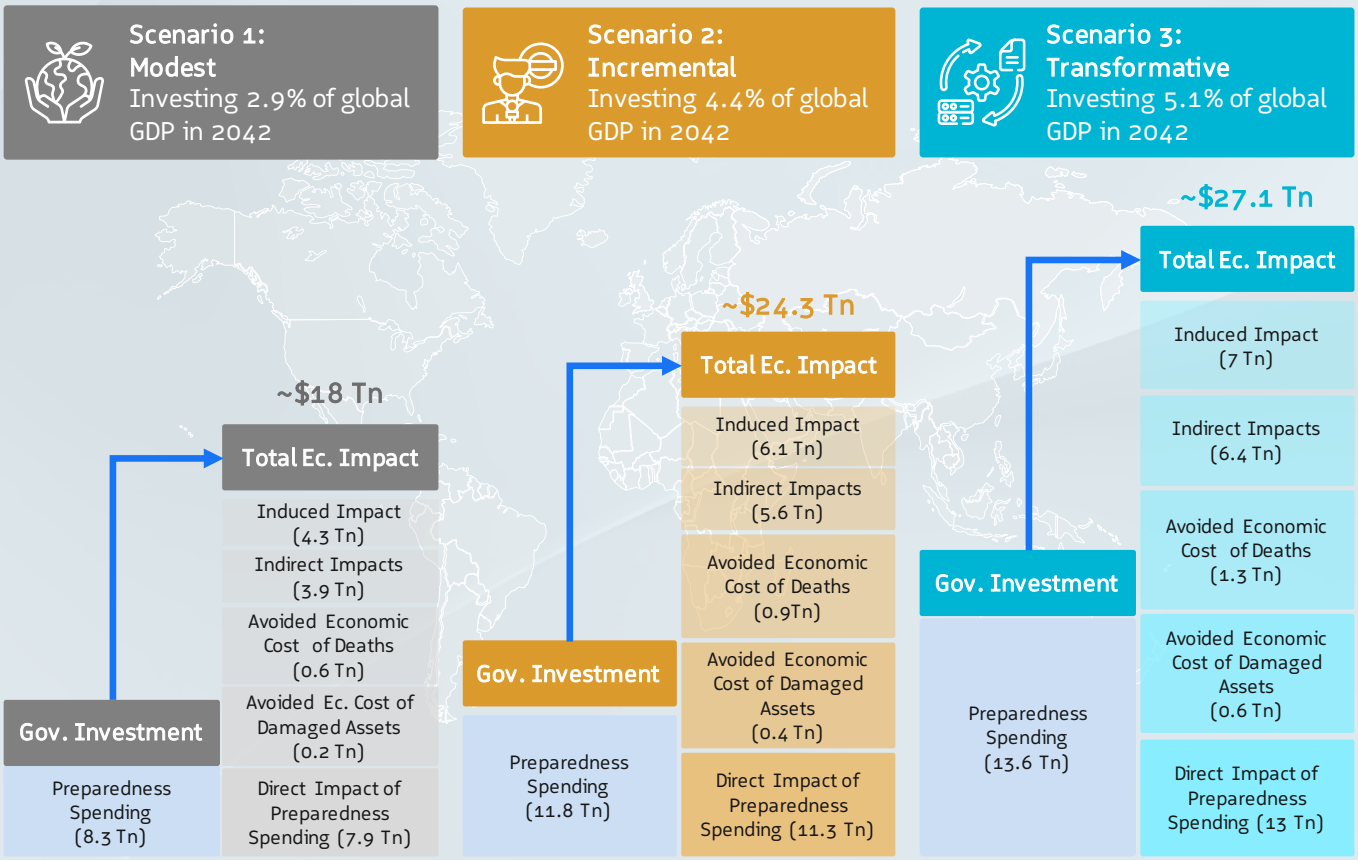
Section 7

The Global Benefit of Enhanced National Resilience

Estimates indicate that the total expenditure on national resilience enhancement and reforms can contribute ~$27 Tn per year to the global economy by 2042.

Yet, the potential benefits make the outlay worthwhile. The total economic impact of government spending has ~2.1x socio-economic return on investment from robust national resilience transformation with ~51% reduction in loss of life and 43% reduction of damage to assets. The figure below illustrates the implied socio-economic return on investment – or total economic impact – from structured government investment in national resilience programs worldwide across three scenarios.

FIGURE 11: TOTAL ECONOMIC IMPACTS OF RESILIENCE INVESTMENTS BY 2042



Total economic impact of national resilience spending could reach up to USD ~27 Tn to the global economy with **2-2.2x socio-economic return on investment from robust National Resilience transformation with ~51% reduction in loss of life and 43% reduction of damage to assets**

Note: The impact of Acts of war are not included in the above projections.
Sources: RAND Corporation, EM-DAT database, IMF GDP Projections (2023-28), Global Terrorism Database, IBM Cost of Data Breach Reports, Surfshark Arthur D. Little team

Section 8

Tangible Impact

Amidst the forecasts, estimates, and projections, there are tangible examples of the impact that government investment and intervention can have on the national resilience of countries across the globe.

The United States of America:

In recent decades, the United States has made several interventions to mitigate a diverse range of risks from storms, earthquakes, and volcanic activity to cyberattacks, terrorism, and CBRNE threats. Back in 1973, the US passed the Flood Disaster Protection Act, with results including a potential reduction in deaths of 80%, a 57% reduction in injuries, and a potential 93% reduction in adjusted damage per occurrence post-intervention. Then, in 1986, the US established the Volcano Disaster Assistance Program, with equally impactful results, including a 50% reduction in deaths and an 81% reduction in adjusted damage per occurrence post-intervention. A decade later, it established the California Earthquake Committee, with outcomes including a 60% reduction in deaths, a 50% reduction in injuries, and a 36% reduction in adjusted damage per occurrence per magnitude post-intervention.

Since 2000, further interventions by the US Government have included the USA Patriot Act in 2001 to combat the impact of acts of terrorism resulting in a potential 22% reduction in deaths, and training in radiological and nuclear detection introduced in 2011 by the Nuclear Detection Office to mitigate CBRNE threats. The latter resulted in a potential 89% reduction in loss of life and 57% reduction in injuries.

Australia:

Since the 1990s, successive government administrations in Australia have made concerted efforts to address multiple natural risks. In response to rising temperatures and declining rainfall levels, the country introduced the National Drought Policy in 1992 followed by the release of a heatwave plan for Victoria in 2011. The heatwave plan led to a potential reduction in deaths of 58% and a 50% reduction in injury per occurrence related to extreme temperatures. The National Bushfire Recovery Agency was also established in 2020, with the potential impact including a 91% reduction in loss of life, an 88% reduction in injury, and an 82% reduction in adjusted damage. While yielding more modest results, Australia's National Road Safety Strategy of 2001 and Work Health and Safety Act of 2011 were also implemented successfully.

Asia:

Across the continent of Asia, countries including China, Japan, and India have each made targeted interventions relating to natural risks. In the face of the rising threat of tsunamis, Japan developed an agreement in 1997 entitled 'A Guidance on Reinforcement of Tsunami Disaster Prevention Countermeasures in Local Disaster Prevention Planning'. Among the potential impacts were a 99% reduction in loss of life and 66% decline in adjusted damage per magnitude per occurrence, post intervention. Meanwhile, in 2003, China established real-time monitoring and an early warning system relating to landmass movement, resulting in potential reductions of 38% and 80% in injuries and adjusted damage per occurrence, respectively.

For its part, India introduced measures to reduce the impact of extreme weather events like operational implementation of regional modelling systems between 2001 and 2010, resulting in a potential 49% reduction in deaths, a 15% reduction in injuries, and an 89% reduction in adjusted damage per occurrence. The country also released guidelines for managing crowds, with potential impact including a 71% reduction in deaths and a 70% reduction in injuries.

Section 9

Insights for Successful Transformation

The Rise of Systems Thinking Applied to National Resilience

Our global study shows that leading countries have applied complex systems thinking to the refinement of their National Resilience systems in recent years, which can be represented across five key interrelated dimensions:

Dimension 1 – Arrangements: Resilience is a policy, a statement of intent, and an outcome for a nation that has successfully configured its arrangements (i.e., legislation, policies, regulations and standards, and complementary national investment programs) in a way that will best enable it to return to a state of normality following a major incident. Here, laws are harmonized concerning national security, risk, business continuity management, and emergency management relating to all aspects of PPDRR, along with other related statutes. Governance is also integrated for resilience systems across the lifecycle, while policies and guidelines are developed for all aspects of the resilience system, defining whole-of-government roles and responsibilities, escalation protocols, and levels of system activation that can be exercised and scenario tested effectively. In addition, regulations and standards are established for resilience programs and outcomes in national entities are underpinned by continuity of funding from government to develop and sustain the necessary resilience capabilities across the nation.

Dimension 2 – Strategy and plans: A range of resilience plans and strategies are devised for the national, regional, local, community, and ministerial levels, with plans varying to reflect the specificities of different hazards. At the regional, municipal, and local levels, forums are typically representative of emergency service organizations, government organizations, and key members of society to ensure that community readiness is in line with the readiness of government, businesses, and emergency services.

Dimension 3 – Capability & operations: A concept of operations (CONOPs) is devised for the entire national resilience system. The CONOPs considers how a nation responds to a crisis, how the escalation protocol work, and how this translates effectively into a series of capabilities relating to people, processes, technology, governance, infrastructure, assets, training, and exercising during each of the PPDRR stages. The concept of operations and capability building are designed to guarantee continuity of government operations and of business, with integration and management of volunteers and the third sector.

Dimension 4 – Community: Citizen centricity is the most fundamental guiding principle in defining effective national resilience systems that are both culturally relevant and impactful. Resilient citizens and communities express a level of risk awareness, responsiveness, and solidarity in the face of adversity. They recognize the notion of 'shared responsibility' in working

The Rise of Systems Thinking Applied to National Resilience

with government and emergency services to help ensure their own individual and community safety. As such, programs need to be established that target the needs of individuals and the wide variety of vulnerable community groups including families, culturally and linguistically diverse (CALD) communities, and people of determination, that form our societies. Additionally, volunteerism is a key theme and integral aspect of the workforce that makes up some countries' national emergency service organizations (i.e., fire services, maritime safety services, flood response, and state emergency services).

Dimension 5 – Leading resilience: There is a clear and typically legislated hierarchy or chain of command that exists across governments when national disaster plans are activated. These plans specify lead versus support agency roles for specific emergency types. They also define the 'command, control and coordination' mechanisms inherent across the PPDRR lifecycle, at national, municipal, and local levels. These leadership and decision-making protocols or authorities are enabled by: (1) multi-agency governance or resilience forums for planning and preparedness but more importantly by: (2) the right types of operations centers and technology enablement in the response, relief, and recovery phases.

There is a variety of types of operations center that exist within high performing national resilience systems: head of state briefing rooms, national coordination centers, agency specific command and control centers, regional coordination centers, and forward command centers for frontline incident management. In all cases, these centers are operated under a common incident management system'[8] – a codified operating manual for management with technology that has evolved through the Internet of Things (IOT)[9] to provide a 'common operating picture.' This enables leadership decision-making, community engagement, early warnings, emergency alerts, and resource allocation, deployment, and management – all with the intent of reducing the likelihood of loss of life and damage to assets, critical infrastructure, and the environment.

Across all dimensions, a national resilience system must be led from the center by a designated or specific entity that is empowered by senior governance forums in the national leadership arrangements (i.e., national security council). This entity should lead regular strategic, risk-based future scenario planning, ongoing national risk monitoring, integrated crisis and disaster management standards development, and planning and exercising for all matters relating to continuity of government, all built around location-specific threats for vulnerable or 'high risk' communities and citizens country-wide.

8. The Incident Management System is a tool for marshalling pre-identified and pre-assembled resources to respond to an emergency or disaster. Source: Perry, R.W. (2003). Incident management systems in disaster management. Disaster Prevention and Management: An International Journal, 12(5), pp.405-412. doi:https://doi.org/10.1108/09653560310507226.

Critical Success Factors for National Leaders

Regardless of geography, demographics, or resources, countries right across the globe are united in the absolute need for structured investment in national resilience system reform. For some nations, the journey is just beginning. For others, modernized laws, policies, and plans have been implemented and even tested in real-life crisis situations. Wherever a government stands on the road to national resilience, the following insights can support ongoing efforts to manage, respond to, and prepare for disaster, whatever its shape or form.

1. **Coalition:** Supra-national coalitions, national political alliances, and mutual-aid agreements matter to support risk identification, mitigation, and early warning of incidents that could escalate to a crisis or disaster.
2. **Leadership:** Inspirational and committed leadership is a must with omni-channel messaging direct to community and via multiple points of influence in culturally diverse communities.
3. **Coordination:** A national coordination body for risk management, preparedness, standard setting, and resilience reporting is critical. Such a body requires a mandate and appropriate powers to execute its responsibilities.
4. **Infrastructure:** Critical infrastructure and essential services are priority number one. They need to be assessed for vulnerabilities, with appropriate remediations in place to protect and prevent accidental or malicious damage.
5. **Reform:** A resilience reform premium exists for countries developing or looking to reform their national resilience systems in terms of capital and operational expenditures. While capital expenditures will depend on a nation's baseline status and risk factors facing the nation, ADL estimates that operational expenditures could increase as much as threefold for the first two years of the resilience transformation programs to review, reform, and institutionalize national arrangements.
6. **Civil defense:** Civil defense can no longer be the poor cousin of defense, security, and intelligence agencies. A minimum annual investment of 0.7% of GDP in the long run is a must.
7. **Standards:** Interoperability and the IOT for detection require national standards to ensure efficient and effective government expenditure.
8. **Integration:** Integrated multi-agency, risk-based governance at the national, regional, and municipal or local levels in turn enables risk-based planning within the smallest economic units, starting from the individual level and growing to include the family, home, community, and municipality dimensions. Through such an approach, customized, citizen-specific plans can be developed.
9. **Community:** Targeted and customized community engagement, awareness building, and education programs for at-risk community groups drives generational behavioral change.
10. **Return on investment:** Socio-economic return on investment is measurable and can be derived from investing at benchmark comparable rates in leading edge programs and capabilities to offset the impact and probability of event occurrences, whether natural, man-made, accidental, or deliberate disasters.

Various nations have adopted Incident Management Systems. For instance: National Incident Management System (NIMS) in United States directs government, NGOs, and the private sector to collaborate in preventing, protecting, mitigating, responding to, and recovering from incidents FEMA (2022). Similarly, Australia has Australasian Inter-service Incident Management System AIIMS, which is integral to Australia's emergency management doctrine for the fire and emergency services industry and allows Australian agencies to collaboratively address incidents with an integrated and effective response.

Source: National Incident Management System | FEMA.gov. [online] www.fema.gov. Available at: https://www.fema.gov/emergency-managers/nims, AIIMS 2017 | Australasian Inter-service Incident Management System. [online] Available at: https://www.afac.com.au/initiative/aiims.

9. The Internet of Things (IoT) is a network of physical objects—devices, vehicles, appliances—embedded with sensors, software, and connectivity for collecting and sharing data. Source: IBM (2015). What is the internet of things? [online] www.ibm.com. Available at: https://www.ibm.com/topics/internet-of-things.

Section 10

National Resilience: Limitations, Ethics, Equity & Trade-offs

While the need for national resilience is universally accepted, approaches to achieving it come with limitations, ethical considerations, and trade-offs.

Limitations & Ethical Considerations

In today's world, few areas of life are immune to the impact of advances in digital technologies – and resilience is no different. In many respects, technology has been a force for good in shoring up national security and in improving speed, scale, and efficiency of response to, and recover from crisis. However, advanced technologies like artificial intelligence and the IoT do not come without inherent ethical risks of their own. They are driven by data that can create privacy concerns and controversy for government, business, and society worldwide.

Despite the concerns, societies and economies have evolved thanks to innovations in science and technology. In this sense, embracing technological advances is a must. However, certain technologies do

require appropriate scrutiny, regulation, and governance. One clear and current example of this is self-generative artificial intelligence, a so called 'genie that has been let out of the bottle'. Through the national resilience lens, growing or complete reliance on such technology in diagnostics and decision-making, although undoubtedly beneficial, brings about obvious risks of unintended consequences. These could include potential mis-issues or misinterpretation, high dependency on a technology that could fail or malfunction, or the subjugation of human leadership in key decision-making roles and functions – for example, in command and control decisions.

More broadly, areas for consideration where ethics are concerned include the use of emerging technologies in capability preparedness, early detection, and surveillance prior to responding to an incident. In many countries, data privacy laws prevent government entities from legally capturing citizen data, utilizing it without express prior consent, or compromising privacy through technology-driven surveillance. However, countries that have been fast adopters of technology for intelligence and surveillance purposes, in environments where privacy regulations are more arguably more liberalized, have implemented such technologies and programs effectively in their cities and communities – with significant crime reduction and positive public safety results.

In Jeddah, Saudi Arabia, where flooding is common, early warning systems that use IoT sensors are in the process of being deployed, while similar early warning and emergency alert systems have been critical in preparing for and managing the impact of catastrophic bushfires in Australia. It is important to note, however, that roll out of such systems and other technologies come with significant integration and cybersecurity costs and require equally significant community engagement. All of these factors must be consider in the design, build, and deployment of such solutions and in the development of operations and / or fusion centers that will be recipients of such data, information, and warnings for decision-making.

As in all emergency response environments, there is a shared responsibility within a community to recognize its role in co-producing public safety outcomes with government services. The engagement of community, awareness building, and training requirements for vulnerable / at risk community members in unison with emergency service organizations is critical to success in remediating the limitations of agency-centric planning and preparedness.

Other advanced technologies that are making a significant impact during responses to defence, security, and civil defense-related risks, are drones, advanced robotics, and other unmanned systems. The deployment of such capabilities, especially those with military applications (i.e., advanced target systems) trigger fundamental questions about the ethics of their use in conflict, and the requirements for human involvement, oversight, and decision-making around the use of lethal force.

Equity & Trade-offs

Beyond technology, there is another fundamental balancing act that governments must master in their journey toward enhanced resilience, namely the notion of: 'risk and return' as applied to government investment vis-à-vis public safety and national resilience system outcomes. 'Gold plating' emergency services by positioning police officers and other emergency responders on every street corner would go a long way towards mitigating crime rates and improving enhanced crisis responses times. However, this is not realistic as such an approach would come at cost to government that would compromise its ability to invest in other essential services.

This trade-off in resource allocations amongst government service portfolios, such as healthcare, education, infrastructure, environment, and other essential services is driven by resources scarcity. Clearly, wealthier and / or more developed countries will have invested in more comprehensive resilience systems, while developing countries with lesser access to sovereign capital reserves will need to optimize their expenditure within their available budget envelope. Therefore, governments must apply a dynamic prioritization mindset to find effective ways to manage expenditure, optimize public spending to meet national policy outcomes, control priority national risks, and handle community expectations through robust engagement and awareness building programs.

A final ethical consideration relates to equity and consistent access to capital across nations to enhance resilience systems. Many developing countries have highly vulnerable communities and are among the least wealthy, meaning that regardless of political will, they may not have the financial resources to allocate to extensive national resilience interventions. This can be addressed at a supra-national level via global funding schemes and humanitarian aid programs, but it can also be overcome with effective regional 'government to government' support mechanisms to help share the burden. For example, in Australasia and in Europe, some countries have signed mutual aid agreements that involve capability sharing beyond national borders, thus enabling collaborative responses to crises and emergencies as required.

Specific examples include: (1) Security and intelligence sharing (i.e., Five Eyes), (2) mutual aid agreements that result in the deployment of assets and resources to combat fires in different countries (i.e., Australia and California), (3) provision of search and rescue capabilities post-earthquakes, and (4) 'defence assistance calls' where governments and civil defence agencies will formally request deployment of military capability in a domestic context to support logistics, policing, equipment, and supplies requirements to help nations respond to threats that are more catastrophic in nature. Such bilateral and in some case multi-lateral agreements are a step toward promoting equity and resource sharing in the face of risks that can detrimentally impact the national resilience of countries worldwide.

Conclusion

With significant value at risk on the horizon, national resilience is a government priority. Yet, several challenges relate to the design, development, and institutionalization of national resilience systems, and these must first be overcome to enable the required holistic reforms.

To effectively tackle each of these challenges and to manage public value at risk for the long term, there is an overarching need to build resilience into the DNA of the national economy by focusing on citizens, vulnerable community groups, society, public sector policy, resilience system design, and consistent funding that enables the development and sustainment of single-agency, multi-agency and whole-of-government capabilities.

Specifically, it is important that governments adopt a systems approach to national resilience and develop a framework that makes national arrangements clear to all stakeholders. Other priority areas for governments include the development of a CONOPS that facilities a whole-of-government response, the establishment of robust training and education campaigns, and leadership that is solid, consistent, and visible. These measures will help to build resilience in communities, in turn enabling resilient outcomes when disaster hits.

But there is a caveat: the degree to which a government can act upon each of these areas is predicated on the financial resources at its disposal, its level of economic development, and its progress towards achieving the UN's SDGs. There is also the issue of exposure. Countries with low risk profiles may choose

not to invest significantly in enhancing the related resilience capacities. However, for a country that is vulnerable to one or more of the natural or man-made incident types outlined in this report, careful consideration should be paid to building the necessarily resilience on a regular, ongoing basis.

With national leaders focused on resilience building as a core national policy position, we see the opportunity to reduce global value at risk by $0.8 trillion to $1.9 trillion by 2042, through structured investment programs aligned with leading practise countries that spend between: 2.9% - 6.1% of GDP on resilience preparedness. On aggregate, there is a global potential to achieve total economic impact of between $18 trillion and $27.1 trillion by 2042, subject to the maturity and investment rate of the nations concerned. We also expect wider synergies from regional coordination bodies and nationally aligned resilience agendas, as witnessed through mutual aid support provided to countries in crisis by supra-national bodies (i.e., United Nations) and other alliance partners.

A final ethical consideration relates to equity and consistent access to capital across nations to enhance resilience systems. Many developing countries have highly vulnerable communities and are among the least wealthy, meaning that regardless of political will, they may not have the financial resources to allocate to extensive national resilience interventions. This can be addressed at a supra-national level via global funding schemes and humanitarian aid programs, but it can also be overcome with effective regional 'government to government' support mechanisms to help share the burden. For example, in Australasia and in Europe, some countries have signed mutual aid agreements that involve capability sharing beyond national borders, thus enabling collaborative responses to crises and emergencies as required.

Specific examples include: (1) Security and intelligence sharing (i.e., Five Eyes), (2) mutual aid agreements that result in the deployment of assets and resources to combat fires in different countries (i.e., Australia and California), (3) provision of search and rescue capabilities post-earthquakes, and (4) 'defence assistance calls' where governments and civil defence agencies will formally request deployment of military capability in a domestic context to support logistics, policing, equipment, and supplies requirements to help nations respond to threats that are more catastrophic in nature. Such bilateral and in some case multi-lateral agreements are a step toward promoting equity and resource sharing in the face of risks that can detrimentally impact the national resilience of countries worldwide.

“Socio-economic resilience is the outcome of a well-structured government resilience system and holistic national investment program. Leaders of today have a duty to inspire, develop, and sustain a culture of resilience within citizens, society, and the public, private, and third sectors for the benefit of future generations.”

Alexander Buirski

Partner – Arthur D. Little

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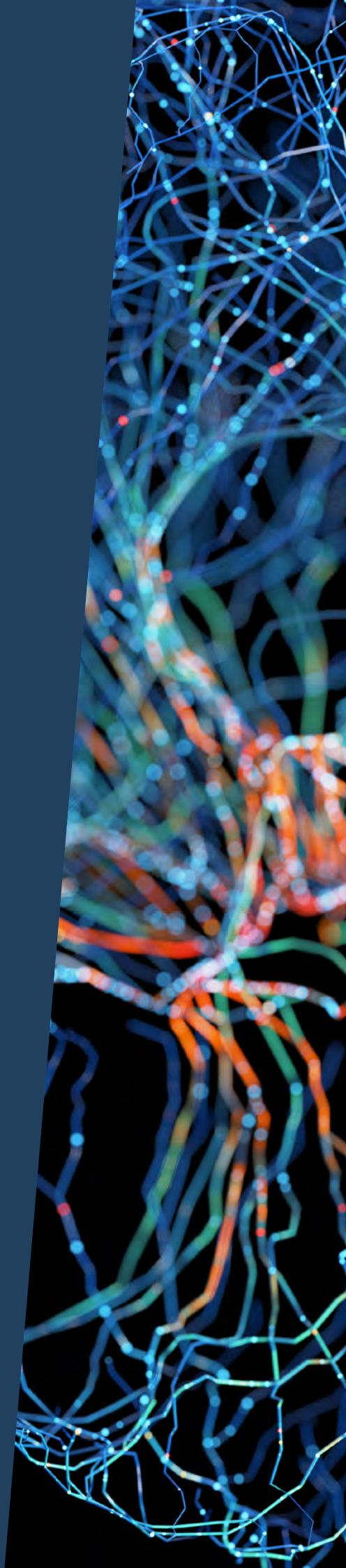

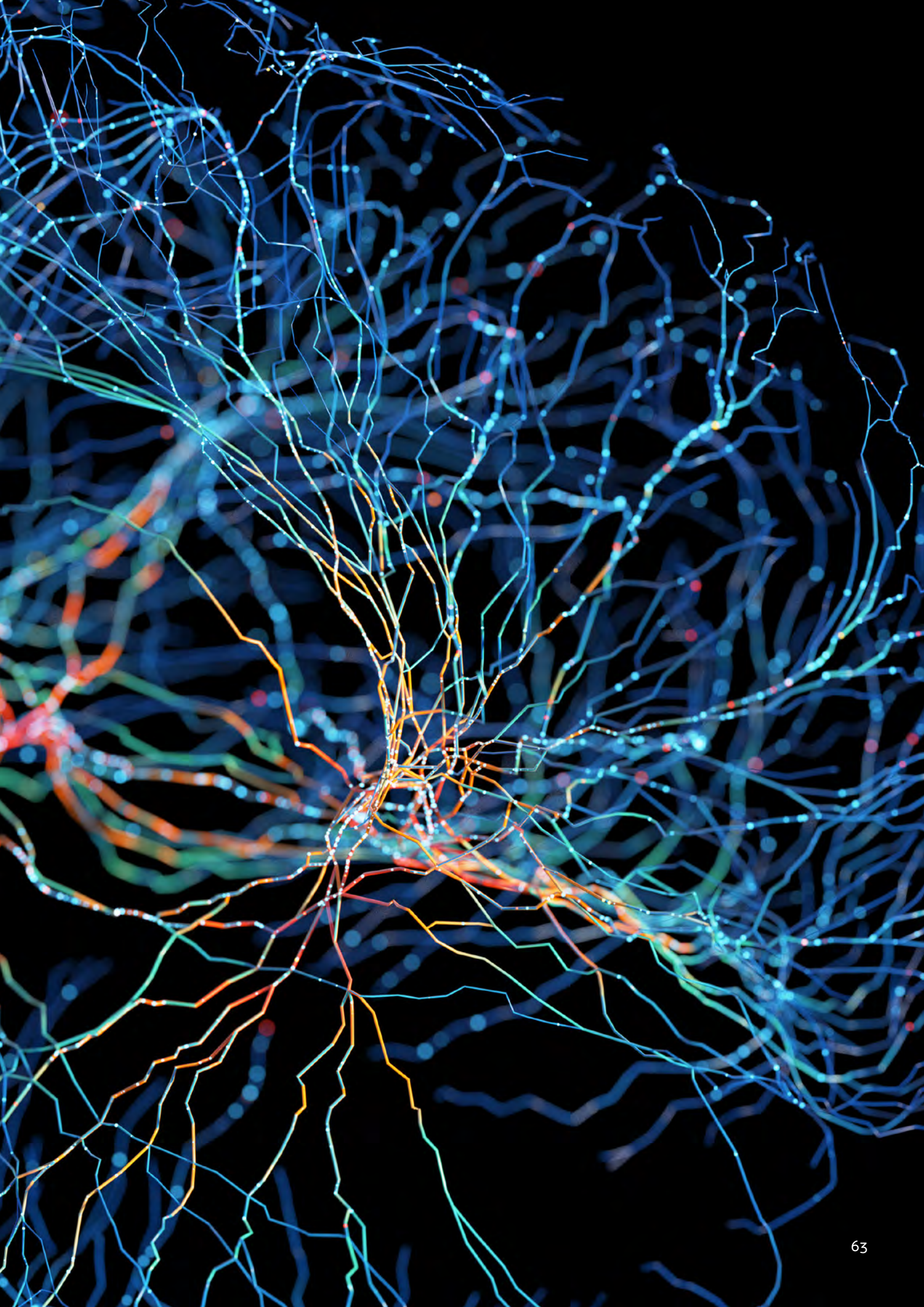

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