

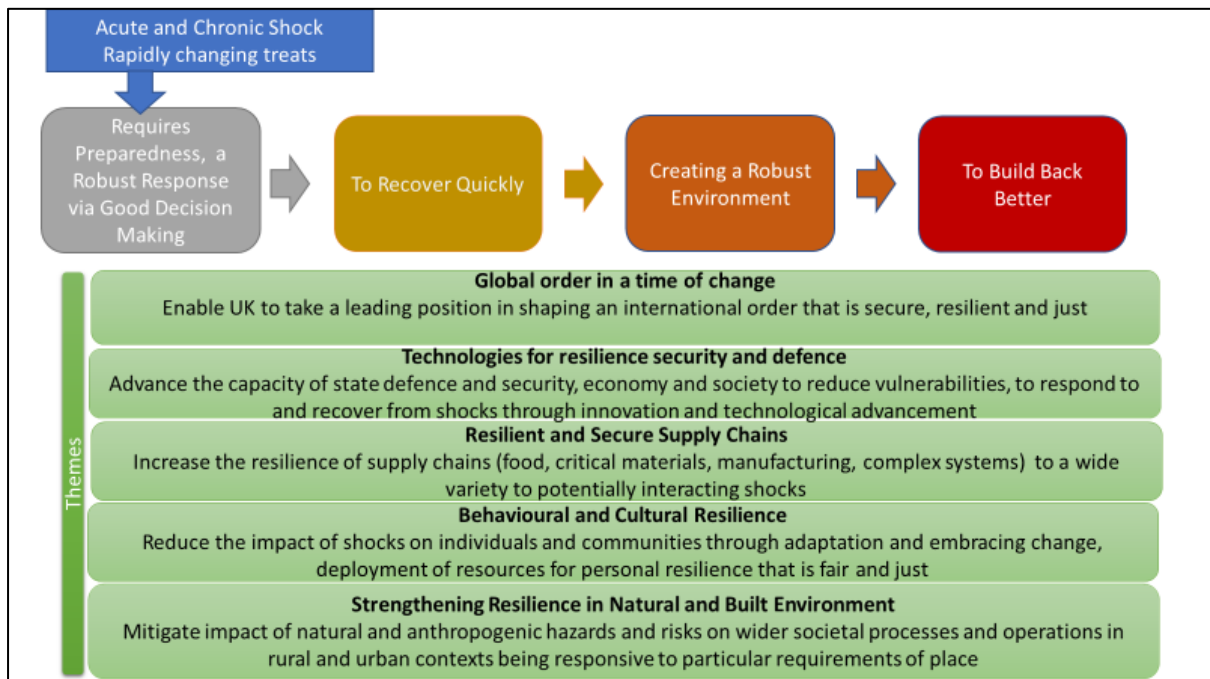
## Building a Secure and Resilient World

Building a Secure and Resilient World is a theme which has reached new levels of urgency in the wake of repeated systemic shocks from the financial crisis to pandemic to climate emergency to conventional armed conflict. The theme provides UKRI with a robust response to the challenges identified in the Integrated Review, including defence and security, science diplomacy, economic growth, a responsible cyberpower status, and a force for good across norms and regulations, and crisis response. This theme directly tackles core methodologies for supporting a better and more robust approach to managing crisis from business to government to communities.

Marrying cultural adaptability, technological innovation, theoretical understanding and analytical capability through our robust and connected research ecosystem and infrastructure will allow UKRI to offer up transformative interventions for others to adopt across priority activities. UKRI will deliver a range of activities tailored to enable resilience to different risks in different systems that is built on the strengths of our current economy and society, helps reduce vulnerability, prepares for robust and rapid responses and enhances recovery, and encourages approaches which bring positive transformation.

*Building a Secure and Resilient World* will enable coordination with, and integration of, UKRI into the wider security, defence and foreign policy communities in government, academia and business and ensure our collective investments delivers the greatest impact for the UK.

We propose to achieve our vision through a programme of interrelated subthemes:



## **Global Order in a Time of Change**

Effective functioning of the international order creates a necessary context for the pursuit of long-term economic, social and cultural prosperity in a collaborative way. UK, with its global standing and interests, is in a position to take a lead in shaping the open international order that would be fit for purpose in an increasingly interconnected, multipolar world; the international order that is more resilient to acute and chronic shocks as well as to the changing nature of threats. This not only requires maintaining technological advantage but also intensive collaborative efforts and diplomacy to strengthen existing alliances and pursue new ones, recognising that influence works both ways. Research plays an integral part of understanding Britain's role in the world and its relationships with other countries and regions to help shape nuanced approaches to diplomacy and development, including security, international trade, education, culture and heritage, conflict prevention and humanitarian protection, and other related areas in pursuit of the vision of global Britain.

As Britain re-approaches its existing relationships and endeavours to build new ones, the research we fund is a key to understanding the normative, ethical, the cultural and socio-economic frameworks of external partners, whether other countries or key players. On the one hand it can also help to develop better understanding of norms, practices and the rationale behind their conduct; more importantly on the decision culture and how decisions are made that impact their approach to international relations. A nuanced understanding of the afore mentioned areas will be an asset in pursuit of successful foreign policy in volatile and uncertain times. As such, we offer a constructive view on rethinking Britain's position in the world, relationships with others, and ability to take a lead in shaping international order in a time of change.

## **Technologies for Resilience, Security and Defence**

This subtheme will explore and critically assess the role of technologies in making systems more robust against external threats and speaks directly to the Government's recently published Integrated Review and prior to this the MOD Science and Technology Strategy (October 2020).

Building resilience into digital spaces is vital for national security, including critical national infrastructure and economic assets, and equally for the safety and wellbeing of individuals. How do we design resilience and security into pervasive, but currently independently designed, disjointed systems that will later need to be networked? At the same time, we need to explore and critically assess the consequences of information and networks interconnectivity and how to make the system more robust against external threats. The approach must involve investigating the joint roles of technology, organisations and individual networks, and people; to design intelligence into the fabric of the systemic network and all its constituent parts, making them adaptive while being reconfigurable, secure and based on strong ethical considerations.

Critical to our further understanding of 'Systems of Systems' thinking, this approach will involve investigating the joint roles of technology, organisations and individual networks, and people; designing intelligence into the fabric of the systemic network and all its constituent parts, making them adaptive while being reconfigurable, secure and based on strong ethical considerations. This theme will support strengthening resilience in online spaces to contribute to national security, including the protection of critical national infrastructure and economic assets, and to improve the safety and wellbeing of individuals.

## **Resilient and secure supply chains**

Global supply chains, which have run smoothly for decades, have suddenly been impacted by a number of connected systemic issues: a global shortage of semiconductor chips; an energy-supply crisis; disruptions to transport; and labour shortages. The UK has experienced gaps on supermarket shelves, queues at petrol pumps, and shortages of goods including cars, fridges, and construction materials. Shortages and delivery delays are now a major problem across much of the world.

World business today depends on just-in-time supply chains. This system, by which businesses rely on deliveries of raw materials or stocks exactly when they are needed, has become an entrenched feature of global trade, enabled by falling transport and communication costs. In theory, it is meant to improve efficiency by eliminating waste (e.g. of time, space or stock); such dispersion, however, makes supply chains vulnerable, with single events knocking them off-course. For example, the blocking of the Suez Canal by the *Ever Given* caused chaos for firms around the world.

Delays to the delivery of inputs for manufacturing means that finished products are delayed. When a whole array of problems hit just in-time supply chains – factory closures, worker shortages, shipping delays – at the same time, they create vast ripple effects for global business and for the economy and society. Supply chain shocks reduce productivity, directly impacting GDP and increasing consumer prices; however, they can also lead to shortages of products and resources that are essential for survival and our way of life such as food, minerals and energy.

As an island nation with limited self-sufficiency in any given sector, the UK is largely dependent on a combination of international supply chains and domestic production to meet its needs. Supply chains operate within complex systems, with many interdependencies, increasing the potential for systemic shocks. This includes both physical infrastructure (e.g. materials, transport/shipping routes, storage, labour, energy availability) and digital infrastructure (e.g. data and automated systems). However, there are also externalities such as climate change, natural disasters, pollution and disease threats. There is also increasing competition for scarce global natural resources which underpin much of our economy and way of life, and an increasing need to source goods and raw materials in the most sustainable way.

The UK's reliance on international supply chains has implications for national security and means a global interdependency with other countries. Whilst the pandemic has exposed cracks in this system, the rise of economic nationalism pre-pandemic has already increased trade barriers. The National Resilience Strategy identifies 13 critical national infrastructure sectors: Chemicals, Civil Nuclear, Communications, Defence, Emergency Services, Energy, Finance, Food, Government, Health, Space, Transport and Water. Supply chains transcend the UK, and their resilience is vital to the levelling up agenda. They provide employment opportunities where there might be deprivation, invest in R&D and give local areas a sense of pride and identity.

## **Behavioural and Cultural Resilience**

Strengthening resilience through change is not separable from understanding behavioural and cultural impact of shocks and how they can be avoided and/or reduced. It involves learning better communication around change and adaptation (including visual communications); investigating the social and cultural underpinning of individual, family and community resilience, understanding cultural reasons for embracing or resisting change; looking at the resources for personal resilience (including heritage and other cultural assets); building the relationships between notions of change and notions of fairness and justice across generations. It includes learning how past societies have perceived change and developed resilience through innovation to help us shape future proof approaches that are sustainable and just. This area of work seeks to balance stabilization with dynamism, to create the conditions for the kinds of change which underpins prosperity whilst mitigating the risks of change which undermines society.

Through this work we can answer the challenge of empowering and energizing communities across the UK and internationally. Social cohesion, trust and democracy research is particularly relevant here helping to understand behaviours and inform social policies that grow connectedness, build interpersonal and institutional trust and increase community resilience. We will examine interdependencies, develop new measures of cohesiveness, employ social network analysis, and develop and test interventions designed to increase social cohesion.

Behavioural and cultural resilience is inherently related to how we, at individual, community and organisational levels, make decisions in anticipation of and response to complex, dynamic and evolving nature of risks and threats. Moreover, government and businesses need the ability to make decisions based on integrated analysis, data, skills, and local level knowledge of what works enabling the ability to act. There is a need for appropriate infrastructure and skills to support decision-making that is complex and inclusive for sustainable social, economic, cultural and environmental outcomes that can improve preparedness to hazards, risks and threats, as well as our capacity to successfully respond to them.

## **Strengthening Resilience in Natural & Built Environments**

This sub theme directly speaks to the ambitions of the Integrated review of ‘building resilience at home and overseas’ recognising the ‘transnational nature of many challenges, from climate change and biodiversity loss to biosecurity and energy security crises’. The relationships between resilience and location (north south, urban, rural, town city, region) is crucial in building environmental resilience that is future proofed and is critical for achieving the levelling up agenda by mitigating the impact of shocks on social and economic prosperity of places that face greater, and often cyclic, level of risks (e.g. floods). Cities are often a focus of attention but some ‘shocks’ have a greater impact on rural and peripheral economies and societies, particularly in the context of rural poverty and the fragility of agricultural economies.

To strengthen resilience, we need improved understanding of the linkages and dependencies of natural hazards and risks and their interrelations and impacts on wider societal processes and operations in rural and urban contexts. There is a need to consider the wider implications of dynamic risks, vulnerability and recovery – resilience is the ability to withstand and recover repeatedly from shocks. Knowledge of the attributes associated with the capacity to successfully respond and recover as well as the barriers and obstacles are important and requires consideration that risk exists within a complex system interrelated social, economic, cultural, health, environmental, and technological factors.

Improved understanding will support robust decision making. This requires access to trustworthy data at relevant scales, increased understanding of uncertainty, of how decisions made in one part of a system affect the response of other parts of the system and can interact for multiple situations. For example, evidence already shows that there can be unanticipated impacts on our electricity infrastructure following a flood; understanding interconnected impacts is critical when recovering from an acute shock and mitigating against future shocks. To achieve this there is a need for an appropriate infrastructure and new skills to support decision-making that is responsive to the dynamic and evolving nature of risks and threats, is inclusive to deliver sustainable social, economic, cultural and environmental outcomes that can improve preparedness to hazards, risks and threats.

The scale of societal change needs to transcend a compartmentalised way of thinking about society: the natural world as we find it – from the shape of landscapes to the global distribution of species and, of course, environmental pollution – is shaped by both natural and distinctively human forces. Building resilience requires embedded deeper understanding of important environment and social challenges, how changes can support a more sustainable society to encourage people, as well as organisations to think or act differently. Designing new approaches to sustainably managing and adapting current environments could benefit from technologies such as Digital Twins to link and transform thinking to develop and deliver systems able to withstand global or local shocks and quantum technologies to deliver more accurate data and timely warnings.

Linking to the ‘Building a green environment’ Theme, this sub theme will also require transformation of professional and financial services to change the way biodiversity and nature-based solutions are accounted for in major financial and infrastructure decisions, if we are to build back better, stronger, and greener.