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Risk Governance, State Capacity, and Critical Human Security: Evolution of Risk Governance in Response to Systemic Risk in the UK and South Korea

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The COVID-19 pandemic highlighted the critical need for inclusive risk governance to address systemic risks that extend beyond health crisis to encompass broader societal, economic, and political dimensions. This article examines the evolution of risk governance in the United Kingdom and South Korea, exploring the intersectionality between state capacity, risk governance, and critical human security. It investigates how different institutional and policy frameworks and political choices influence the evolution of risk governance in two countries during the COVID-19 pandemic. It found that both countries adaptively restructured their institutions and broadened the involvement of diverse stakeholders to address the systemic risk. However, significant challenges persisted in fully integrating diverse perspectives due to the limited capacity of coordination across different actors and scales of government within risk governance. This research calls for a rearticulation of risk governance frameworks that integrate human security and inclusive participation, particularly as risks become increasingly complex and intersect across multiple dimensions of daily life.

Keywords: risk governance; critical human security; inclusive risk governance; systemic risk

Introduction

In a more interconnected, multi-scalar, complex, and individualised world work, well-being and everyday life are increasingly influenced by global financial flows, international trade and multi-national corporations, technology, and climate change, which have themselves become sources of risk and insecurity through an 'architecture of fragility' (Wernli *et al.*, 2023: 207). As society, economy, policy, and determinants of human security are constituted through these multiple, overlapping networks of interaction above and below the state so the nature, sources, conduits, and distribution of what are predominantly anthropogenically manufactured (Giddens, 1999) risks have evolved to ' . . . .challenge conventional risk analysis and management' (Schweizer, 2021: 78, also see Schweizer *et al.*, 2022). Goldin and Vogel (2010) argue that the 'tidal wave of globalisation' and the subsequent deepening of levels of interdependence and complexity have created unintended consequences and the production of systemic risks embracing new and much broader risks, which themselves 'gain momentum through these inherent properties of modern societies' (Schweizer, 2021: 79). The COVID-19 pandemic, the focus of this article, is a recent example of the implications of the scale and depth of interconnection for cascading shocks across multiple domains (Kennett *et al.*, 2024).

The COVID-19 pandemic has provided valuable opportunities to emphasise and highlight the intersection of state capacity and risk governance for human security and the necessity to explicitly incorporate recognition of these connections within inclusive risk governance. It has demonstrated the imperative for states to deploy flexible and adaptive risk governance strategies capable of addressing the dynamic nature of systemic risks and their societal impacts (Ramia and Perrone, 2023). It has also brought into sharp focus the limitations of traditional technocratic approaches to risk management, which rely heavily on expert assessments with the potential to develop an over-attachment to certain dominant policy viewpoints, and which often fall short in addressing the complexities of systemic risks due to their limited engagement with diverse stakeholders (Boin and Lodge, 2021). Such approaches inadequately capture the intersectionality and multidimensional nature of systemic risk, particularly in contexts where vulnerabilities intersect along socio-economic, health, and political lines. This inadequacy underscores the need for inclusive risk governance that integrate diverse perspectives to ensure that risk responses are equitable and protective of vulnerable populations (Renn, 2008; Van Asselt and Renn, 2011) and human security and well-being more generally. As Boin and Lodge (2021: 3) explain 'uncertainly is tamed through continuous engagement with the environment . . . it is a process of constant evaluation' that in our interpretation of risk governance prioritises the well-being of individuals in economic, health, social, and political dimensions (Human Security Unit, 2016; Kennett *et al.*, 2024).

In this context, this article begins by examining the concepts of systemic risk and inclusive risk governance, exploring their intersection with state capacity and human security. Drawing on relevant secondary data, reports, and documents from South Korea and the UK, it then goes on to investigate how different institutional, political choices, policy frameworks influenced the evolution of risk governance in two countries during the COVID-19 pandemic. By examining the evolution of risk governance over time in both countries, it will provide deeper insights into the relevance of integrated risk governance and social policy approaches for managing systemic risks in an increasingly interconnected world.

Risk and risk governance in contemporary societies

According to Schweizer (2021) systemic risks are exceedingly complex and interdependent, characterised by transboundary impacts, cascading effects, tipping points, non-linear developments, and a lag in regulation and perception. Their ripple effect extends across the whole system, even beyond national boundaries, which threatens various societal domains (Renn *et al.*, 2017; Kaufman and Scott, 2003). COVID-19 exposed how a health crisis can transcend the boundaries of public health to affect governance, economics, and social stability. For example, lockdowns and social distancing measures disrupted supply chains, reduced consumer demand, and led to widespread unemployment. Conflicting public health messaging and inadequate risk communication undermined trust in institutions, hampering compliance with safety measures. Vulnerable populations, such as low-income groups and ethnic minorities, faced disproportionate health and economic risks, revealing deep-rooted inequalities. In other words, the COVID-19 pandemic, which initially emerged as a health crisis, has persisted and evolved into a systemic risk that has generated widespread insecurities across the various societal dimensions.[1]

Different from the conventional aspects of risks, systemic risk is inherently complex, uncertain, and ambiguous due to the dynamic interplay of factors that amplify or attenuate causal relationships. Complexity intensifies uncertainty beyond statistical confidence levels, with systemic risks heightening ambiguity around both the magnitude and likelihood of adverse effects. Shifting probabilities and distributions make predictions challenging, unlike conventional risks that are well understood and predictable within established frameworks (Schweizer *et al.*, 2022).
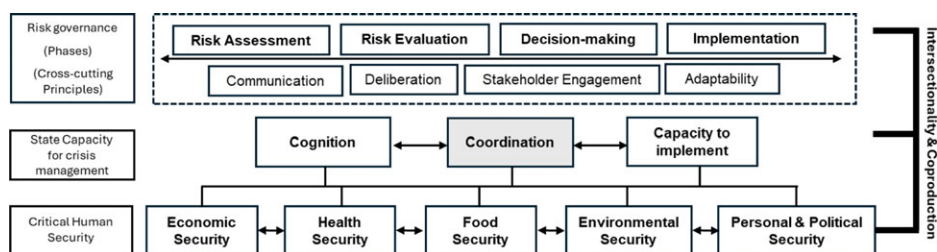
Figure 1. Inclusive risk governance, state capacity, and critical human security framework.

Therefore, systemic risks – characterised by their cascading effects, transboundary impacts, and non-linear developments – require collaborative and networked governance to navigate their inherent complexities (Aven and Renn, 2010; Van Asselt and Renn, 2011). Risk governance extends beyond traditional risk management by emphasising collaboration, transparency, inclusivity, and adaptability (Renn, 2008). It involves systematically identifying, assessing, managing, and communicating risks, particularly in contexts of complexity, uncertainty, and ambiguity (Renn, 2015; IRGC, 2020). Unlike traditional approaches, which often focus narrowly on technical solutions, risk governance emphasises the interconnectedness of risks and the need for multi-sectoral and multi-actor engagement. Since its conceptualisation by the IRGC, risk governance has emphasised risk communication, deliberation, and stakeholder engagement as cross-cutting elements across all stages (IRGC, 2005; Renn, 2015; IRGC, 2020). Similarly, the ISO 31000 risk management standard which is most widely used in the practice underscores the importance of stakeholder integration, communication, and continuous adaptation as key principles of risk governance (International Standard Organization, 2018).

While previous studies on risk governance have focused on identifying technical methods for stakeholders' participation, there is a critical gap in understanding how to expand participants in risk governance and effectively coordinate relationships among governments and stakeholders. Therefore, this article will examine how risk governance has evolved during the COVID-19 pandemic to manage systemic risks. We will incorporate the *inclusive risk governance framework* (see Figure 1), which integrates state capacity and critical human security as elaborated further in subsequent sections.

Integrating critical human security, state capacity and inclusive risk governance

To address systemic risk, which has a multidimensional and complex impact on human security, a different approach is required that places a more explicit focus on societal impacts. Critical human security encompasses various dimensions of everyday life which are economic, health, food, environmental, and community security as well as personal and political freedom (Human Security Unit, 2016; Kennett et al., 2024). Incorporating dimensions of the critical human security approach into risk governance is an attempt to avoid the depoliticisation of risk (Fawcett and Marsh, 2014; Kettell and Kerr, 2022) and 'the technocratic, decisionistic, and economic models of risk assessment and management' (Van Asselt and Renn, 2011: 436). Instead, it encourages an engagement with risk in a way that is people focused, forefronts considerations of the social, economic, and ecological risks to everyday life and the pursuance of social policy objectives for promoting solidarity and trust (Guter-Sandu, 2021). It has the potential to consider and address power relations, institutional structures, and state capacities that shape and perpetuate, for example, gendered and racialised insecurities (Williams, 2021) and which can also highlight conflict and contestation over resources (Kennett et al., 2024) and guide state responses and the selection and mobilisation of policy instruments.

Furthermore, the pervasive nature of systemic risks necessitates a fundamental rethinking of risk governance frameworks to effectively address the multifaceted dimensions of critical human security. Although the initial threat of the COVID-19 was primarily to health security, government preparedness for and responses to the crisis also had a significant impact across all the parameters of human security. This underscores the renewed recognition of the importance of the state's capacity, which enables coordinated responses to such risks across societal dimensions.

The *state capacity* approach is concerned with state responses, institutional capacity, and the selection and mobilisation of policy instruments. However, implementation and intervention can only be effective if corresponding institutional and public sector 'infrastructural power' (Weiss and Thurbon, 2022: 700), strategic capacity and capabilities to achieve policies, goals and political legitimacy, and trust are in place (Kennett *et al.,* 2024). Kwon *et al,* (2023), drawing on Comfort (2007) and Farazmand (2007) have highlighted three key components of state capacity for crisis governance – cognition, co-ordination, and capacity to implement (see Figure 1). These components enable us to explore how governments managed and coordinated responses to the crisis, as well as the institutional capacity for implementing public policies to address the risk.

Cognition is the ability to recognise an emerging risk and understand its nature, size and potential impact across different aspects of society and everyday life, policy arenas and their interaction based on processing detected information (Comfort, 2007) representing the first line of defence in protecting human security. The ability to co-ordinate among different government agencies, the private and voluntary sectors as well as citizens groups and a range of stakeholders is the next crucial element (Comfort and Haase, 2006) to support an inclusive people-centred approach, which is sensitive to and informed by different values and perspectives which address issues of gender, ethnicity, socio-economic status, disability, and age, for example, in decision-making. The third component is state capacity for implementation (Waugh, 1994) and adaptability. Among the three components of state capacity, coordination is crucial for addressing systemic risks, as their complexity requires diverse actors across sectors to collaborate effectively, emphasising robust intergovernmental relations and cross-sector partnerships.

The COVID-19 pandemic has demonstrated the importance of understanding and integrating inclusive risk governance with state capacity and human security, and thus adopting a more 'people-centred' approach to risk governance. This approach aims to enhance transparency and collaboration and reinforce the 'integrated, holistic, and structured approaches' (Renn, 2008: 5). Inclusive risk governance builds upon these principles by integrating diverse perspectives and actively involving multiple stakeholders – governments, private sectors, scientific communities, and civil society – throughout all phases of risk management. This approach prioritises equity, transparency, and moral acceptability, aiming to ensure that governance processes are not only effective but also inclusive and adaptive (Renn and Schweizer, 2009).

As illustrated in Figure 1, our framework integrates the dimensions of critical human security into risk governance, emphasising intersectionality and co-production to ensure inclusive decision-making and management for addressing risk.

The dimension of state capacity for crisis management underscores the institutional and operational capabilities required for effective crisis management. Critical human security focuses on protecting individuals and communities from existential threats, emphasising human-centric aspects of security such as economic, health, food, environmental, and political security. Coordination serves as the central mechanism that integrates state capacity and human security, harmonising resources, policies, and actions across various actors and levels of governance. The integration of these dimensions is underpinned by cross-cutting principles of risk governance, which provide a foundation for effective risk management for human security.

Among the cross-cutting principles of risk governance, this study focuses on two of them – stakeholder engagement and adaptation – offering insights for strengthening the state's coordination capacity for risk management. Stakeholder engagement involves all relevant actors, such as government agencies, the private sector, civil society, and local communities, in decision-

making and implementation processes (Denny, 2022). Adaptability refers to the ability of systems, institutions, and stakeholders to adjust policies, plans, and practices in response to changing circumstances. Together, these principles reinforce the government's coordination capacity: stakeholder engagement integrates diverse perspectives, resources, and expertise, while adaptability ensures that risk management systems can flexibly respond to evolving risks.

As the nature of risks evolves, it becomes crucial to adapt risk governance structures, particularly by expanding the scope of participants involved. While simple risks can often be addressed by experts alone, complex and uncertain risks necessitate the inclusion of diverse stakeholders to ensure effective responses (Renn, 2015). Broadening participation and adaptively modifying governance structures are fundamental to the government's ability to coordinate and respond to crises effectively.

Research question and methodology

While the pandemic exposed nearly all countries to health crises, some managed to address risks effectively with minimal impacts on human security and well-being, whereas others faced greater challenges. Various studies have attributed these differences to factors such as social trust, leadership, social cohesion, and public sector capacity (Lofredo 2020; Mazzucato and Kattel 2020; Tourish 2020; Fukuyama and Lopez-Calva, 2021). This research seeks to contribute to and advance these debates by exploring how institutions, political choices, and policy frameworks shaped the evolution of risk governance in the United Kingdom and South Korea as well as identifying strategies for integrating a human security lens and multi-sectoral and citizen stakeholder perspective into inclusive risk governance.

This article draws on research conducted as part of a broader UKRI funded project on Critical Human Security and Post-Covid Challenges in South Korea and the UK between February 2021 and August 2022. The study itself focuses on a critical timeframe from early 2020, marking the onset of the pandemic, through 2022, when vaccination programmes were widely implemented, and societies began transitioning 'beyond COVID-19'.

The research began by mapping how the risk governance systems of the UK and South Korea contrasted in their response to the pandemic and the dynamics influencing the different approaches. The next stage was to further explore the relationship between risk governance, state capacity, and human security in both countries. The final element of the research was to propose a framework for integrating state capacity and a human security lens into an inclusive risk governance framework (see Figure 1) to better protect society against systemic risk post-COVID-19.

To address the different stages of the research the methodology includes a review of existing literature and debates from across disciplines focusing on key terms such as 'risk', 'systemic risk', 'human security', 'state capacity', 'pandemic', 'COVID-19', 'crisis management', and 'risk governance'. It also drew on a range of existing international, national and local secondary data, reports and other grey documents. In combination, these approaches helped identify key concepts relevant to the cross-national nature and scope of the study.

The research methodology also involved three international collaborative workshops to facilitate engagement with the research teams and relevant stakeholders from both the UK and South Korea in order to deepen and develop our understanding of the issues, further enhance conceptual clarity and consistency (Ørngreen and Levinsen, 2017; Hu, 2024) and establish the key elements of the inclusive governance framework. The collaborative workshops were held in 2022 (two in Seoul, Korea (one hybrid) and one in Bristol, UK (hybrid)). By exploring the decision-making processes, policy responses, and the roles of various stakeholders – ranging from government agencies and scientific experts to civil society – the analysis sheds light on the dynamics of inclusive risk governance and the relevance of broadening our understanding and

interpretation of state capacity to incorporate a human security lens. The international collaborative research has also enabled us to highlight the specificity and particularity of these connections and dynamics within national and local contexts.

Ethical approval for the study was obtained from the Faculty of Social Sciences and Law Research Ethics Committee, University of Bristol, UK.

Institutional contexts and policy responses in the early stage of COVID-19

The next section of the article will outline risk governance in both countries by focusing on policy responses to COVID-19 in its early stage. This analysis will provide insights into the institutional and policy contexts that shaped each country's approach to managing the crisis and subsequent systemic risks.

Prior to the pandemic, the Global Health Security (GHS) Index ranked the UK second, just behind the USA, with South Korea in ninth place (GHS, 2019), with both the UK and South Korea well-respected globally in terms of risk governance approaches and preparedness. Whilst South Korean governments have long emphasised decentralisation reforms (Bae *et al.*, 2016), its risk governance structure remains highly centralised, partly because of its history of a strong state bureaucracy, with decision-making concentrated at the national level. In the UK whilst devolution has been instituted, granting powers to Scotland, Wales, and Norther Ireland, Westminster Parliament retains sovereignty (Masterman, 2022). Despite the *integrated emergency management*, which at a formal level delegates clear responsibilities to regional and local levels, risk governance in the UK remained largely centralised, a feature that particularly limited local governance influence during the pandemic (Diamond and Laffin, 2022).

In the UK, crisis management involves collaboration among ministries, public institutions, and local governments, with the Civil Contingencies Secretariat in the Cabinet Office overseeing major emergency planning. The Civil Contingencies Committee (COBR) brings together high-level ministers and representatives from devolved nations to coordinate, make decisions and disseminate information during crises. The Civil Contingencies Act 2004 designates Category 1 agencies, such as local governments and health organisations, to form Local Resilience Forums (LRFs) for risk assessment, while Category 2 agencies, such as utility providers, support these efforts by sharing information and collaborating with Category 1 responders (UK Parliament, 2022).

In the UK, Prime Minister Boris Johnson missed the first five COVID-19 meetings in January and February 2020 and was subsequently ill with COVID-19 until early April, during which time the Health Secretary chaired the meetings. The Scientific Advisory Group on Emergencies (SAGE), an expert group activated in the case of an emergency and composed of government Chief Scientific Advisor and departmental chief scientific offers, academics, and industry specialists, provided scientific and technical advice to COBR. The Cabinet Office maintains the National Risk Assessment (NRA) and the National Risk Register (NRR) to which SAGE also contributes (Institute for Government, 2020).

In the process of responding to COVID 19, the UK established the UK Health Security Agency (HSA) under the Department of Health and Social Care which has been responsible for public health protection and infectious diseases in England since 2021. This Agency replaced Public Health England and increased the centralisation of healthcare during the pandemic with Matt Hancock, Health Secretary, stating that England's public health system 'would learn from South Korea … where their health protection agencies have a huge, primary focus on pandemic responses' (Tolhurst, 2020), and where the Disease Control and Prevention Agency (CDC) was given increased autonomy, status, and funding in 2020.

South Korea's crisis management system is structured under the guiding policies of the 'Framework Act on the Management of Disaster and Safety' and the National Safety Management

Basic Plan. This framework reflects a centralised approach, which is generally seen as optimal for coordinating national capabilities in emergencies. The Ministry of Interior and Safety (MOIS) leads this coordination, leveraging its central role to ensure unified efforts across agencies and levels of government (Ministry of Interior, 2020; Framework Act on the Management of Disasters and Safety).

South Korea's crisis management system features a whole-of-government approach, with all relevant ministries and agencies collaborating for cohesive responses (Choi *et al.,* 2020). During large-scale disasters, the Central Disaster and Safety Countermeasures Headquarters coordinates nationwide efforts, ensuring efficient resource allocation and agency cooperation. Local governments complement this system through Local Disaster and Safety Countermeasures Offices, tailoring responses to regional needs while adhering to national guidelines. This centralised yet multilevel structure ensures consistency, continuity, and rapid mobilisation of resources across the country (Government of Republic of Korea, 2020: 26–34).

According to the framework act, the Central Disaster and Safety Countermeasures Headquarters, the highest-level government emergency response body, is overseen by the Ministry of the Interior and Safety. However, the COVID-19 Emergency Response Headquarters marked the first instance of the Prime Minister heading this body since the system was centralised under the Emergency Response Headquarters in 2003 (Bae, 2020; Government of Republic of Korea, 2020: 30). In addition, in June 2020, the Korea Center for Disease Control and Prevention was upgraded to the Korea Disease Control and Prevention Agency, gaining professional personnel and budget authority, enabling it to effectively oversee infectious disease policy and implementation (Kim, 2020).

Both countries adopted a common approach of leveraging existing crisis management systems during the early stage of COVID-19 with subsequent adaptations and establishing of new governmental organisations to address health insecurities. Whilst the UKs crisis management system was originally formally decentralised, with various stakeholders fulfilling distinct roles while the government primarily acted as a coordinator, when faced with an unprecedented health crisis like COVID-19, key aspects of risk governance (see Figure 1) around communication, deliberation, stakeholder engagement, and adaptability fell short. Experts took a leading role in framing the understanding of the pandemic and responses to it with only limited engagement with the predefined roles and coordination among multiple stakeholders (Martin *et al.,* 2023) which in turn impacted national, local, and sectoral capacity to gather and disseminate information and data, and coordinate and implement appropriate policy responses in recognition of the different impacts of the pandemic experienced across society.

South Korea effectively employed a centralised crisis management system in its initial response to COVID-19. It operates as a hierarchical structure, with all the central government's relevant ministries actively participating in the Central Disaster and Safety Countermeasures Headquarters to make critical decisions. These decisions are then implemented by the seventeen provincial governments. This hierarchical framework facilitated cooperation between central and local governments, enabling a swift and effective response to COVID-19, particularly during its early stages. Civil society and the private sector aligned with government policies, contributing their own resources to support strict contact tracing efforts. This collaborative network-based governance approach within hierarchical model proved highly efficient during the critical early stages of the COVID-19 health crisis (Oh *et al.,* 2020), as collective societal efforts converged to address the health crisis.

Evolution of risk governance during the pandemic in the UK and South Korea

As mentioned earlier, risk characteristics can be described as complex, uncertain, and ambiguous (Renn, 2015; IRGC, 2020). Before the vaccine was developed, the risk was complex due to the lack of information about the links between causal agents and specific observed effects. With the

introduction and implementation of the vaccine programme in both the UK and South Korea, uncertainty related to the health crisis was reduced with the availability of clear solutions to the pandemic itself. However, risks remained uncertain and ambiguous, with the complexity of causal relationships persisting in other domains where the pandemic's impact transcended.

In December 2020, the UK became the first country to approve a COVID-19 vaccine, reaching a 64 per cent vaccination rate by March 2021 (Our World in Data, 2024). Despite the Delta variant, the UK lifted social distancing by July 2021 and introduced a 'with COVID-19' policy by September. In contrast, South Korea, though slower to start its vaccination programme, quickly reached nearly 80 per cent coverage by late September 2021 (Our World in Data, 2024) but tightened restrictions in response to Delta mutation virus, leading to prolonged measures and growing social tensions. In both countries, debates over vaccines, social distancing, and pandemic strategies intensified, reflecting shifts in the cognition of risk. By mid-2021, as vaccines became widely available, the focus shifted from managing the virus to addressing the broader social and economic ripple effects, revealing inequalities and sparking debates on the best path forward. These shifting risk perceptions drove changes in risk governance in both the UK and South Korea as they faced increasingly uncertain and ambiguous social and economic challenges.

In both the UK and South Korea, the initial trust in national political leadership supported strong measures to counter the pandemic and civil liberties concerns were relatively muted. However, in the UK political trust began to deteriorate as early as the summer of 2020, particularly as prominent politicians transgressed COVID-19 rules (Davies *et al.*, 2021), reaching an all-time low in the latter half of 2021 in the context of ambiguous risk, as criticism of political leadership and decision making in the media and from opposition parties became widespread.

In the UK various strong preventive and control measures had been taken, particularly during the earlier stage of the pandemic, and had been accompanied by the uneven temporal and spatial dynamics and mutation of the virus shaping the accumulation of uncertainly and insecurity in people's everyday lives. In the UK, despite various incidents and pandemic simulation exercises focused on influenza preparedness, many lessons were not integrated into infrastructure and capabilities. A respondent to a government inquiry highlighted those countries like South Korea, having experienced SARS and MERS, effectively applying lessons from past outbreaks by enhancing hospital capacities and establishing rapid response systems. By January 2020, they were already detecting and responding to cases. In contrast, Professor Dame Sally Davies, former chief medical officer for England, noted that 'groupthink' and a sense of British exceptionalism led experts to underestimate the likelihood of SARS or similar outbreaks reaching the UK (UK Parliament, 2021).

In addition, Diamond and Laffin (2022) point to the serious problems experienced by central government of coordinating services across entrenched departmental and multi-level boundaries, whilst the UK government's preparedness for exit from the European Union also influenced capacity and decision-making. Whilst it was reported that it created some benefits for enhanced crisis capabilities, overall, it resulted in the redirection and reduction in capacity, time and resources. The reallocation of fifty-six of its ninety-four full-time equivalent staff to prepare for potential disruption associated with a no-deal exit undermined the governments capacity to operationalise inclusive risk governance in response to the systemic risk.

In the early stages of the pandemic, it was governmental bodies, experts, and researchers who were the main actors in advisory and decision-making roles. Whilst calls for greater public engagement beyond the high-level government cadres, advisory bodies and health specialists, and government ministers were widespread throughout the pandemic (Rajan *et al.*, 2020), it was particularly the case in the UK where there was a sense of a blurring between these different bodies contributing to a politicisation of policy making, implementation and overall risk governance. According to Richards and Scowcroft (2020) the COVID-19 pandemic saw statutory policy commitments to patient and public involvement and shared decision making abandoned. They go on to state:

Decisions had to be made fast, but policy makers' choice of expert advisers excluded those with expertise rooted in lived experience – patients, families, and frontline health and social care professionals. This was regrettable. Their input would have helped to mitigate the predictable adverse effects of massive service reconfiguration and lockdown and emphasised the need for clarity on which services would be suspended.

The societal consequences of COVID-19 responses and concern regarding recovery strategies became more prominent as trust in government declined. In 2021 a report by the Nuffield Council on Bio-Ethics highlighted the whilst the UK has a public that has much to say, there is 'no opportunity to say it' as there was limited consultation beyond government and the civil service and other agencies had limited capacity to run more deliberative forms of public engagement activities and citizens assemblies. In addition, Joyce (2021) points to the numerous concerns raised by elected mayors and local government leaders, and to the partial and deteriorating engagement with the devolved nations in decision making as it became less and less meaningful as the nature of the risk changed. Local government, non-governmental organisations, and citizen groups nevertheless 'took the lead in providing information, advice and support for their communities' (Richards and Scowcroft, 2020). The capacity of the public sector was often constrained by poor communication from local government, along with concerns during the period of ambiguous risk that public sector leaders would be 'blamed' as outcomes were more intensely scrutinised (National Leadership Centre, 2022).

In summary, despite the demands for more public engagement, decision-making remained largely centralised, with limited input from local governments, non-governmental organisations, and citizens, leading to criticisms of governance and collaboration. As the pandemic response continued, local entities and citizen groups took a more active role in supporting communities, highlighting gaps in national coordination and the need for more inclusive risk governance.

In South Korea, the role of 'crisis learning' (Comfort, 1988; Lee *et al*, 2020) with previous experience with infectious diseases, SARS and MERS, was crucial in shaping capacity, decision making, and implementation and their impacts on critical human security. South Korea's track-and-trace system, which shared individuals' travel details daily, raised privacy concerns, as data circulation led to stigma and online bullying (Kim, 2022), but was justified as 'for the public good'. This approach drew on precedents like the MERS 'social immunisation' effect and was enabled by advanced ICT and Confucian-rooted social norms (Kasdan and Campbell, 2020; Chung *et al.,* 2023). In the initial stages of the pandemic, a robust quarantine policy was implemented under a centralised management system, with widespread public compliance serving as a critical for its effectiveness. However, as the COVID-19 became protracted and its complexity shifted from primarily health-related challenges to broader socioeconomic implications, the demand among stakeholders for greater participation in risk governance progressively intensified.

Small business owners had been given only limited support but experienced the greatest damage from social distancing and quarantine measures, a cost that was often passed on to their employees most of whom would have been temporary, nonstandard, irregular workers (Korea Federation of Micro Enterprise, 2020; Yoon, 2021).This is particularly significant for economic security and well-being in the Korean context given that small- and medium-sized account for 99.9% of all domestic enterprises and almost 80 per cent of total employment in Korea (Yoon, 2024a). Approximately 10.74 million people were employed in micro enterprises and about 3.91 million in small enterprises (Yoon, 2024b). In response, organisations such as the *Korea Federation of Micro Enterprise (KFME)*, and the *Nation-wide emergency committee of small business owners* began to take collective action. As dissatisfaction and hardship intensified, these groups increasingly pushed for a more active role in the policy-making process.

In South Korea, the Central Headquarters of Disaster and Safety Countermeasure (CHDSC), led by the Prime Minister and involving government ministries, and local governments, initially managed disease control, policy coordination, and decision-making. As more groups affected by

the pandemic became involved in risk management, the Korean government established the Recovery Committee in October 2021 to support and enhance the CHDSC's decision-making. This new body included broader representation across four subcommittees: economic recovery, sociocultural recovery, prevention and health, and local and safety, the latter specifically involving provincial and municipal governments (Office for Government Policy Coordination, 2021).

The creation of the 'Recovery Committee' in South Korea represents a notable effort to include a broader set of stakeholders and affected vulnerable people in risk governance process. In response to growing public discontent, various small business associations and advocacy groups organised protests and submitted petitions to the government, demanding greater involvement in policy discussions and more substantial financial support to cope with losses. The Economic Recovery Committee sought input from representatives of small businesses and micro-enterprises, allowing them to participate in discussions on financial relief measures, subsidy programmes, and regulatory adjustments to support recovery. In response to feedback from affected business owners, the government introduced several financial aid packages, such as Emergency Relief Funds, Rent Support Programs, Low-interest Loans and Grants. Despite these measures, there were criticisms that the financial aid and support programmes were insufficient, especially for businesses that had been forced to shut down for extended periods (Lee and Koo, 2023). Business owners argued that while their concerns were heard through the Recovery Committee, their influence on actual policy decisions remained limited. Many felt that the government's response was still dominated by public health considerations, with insufficient weight given to the economic struggles of small businesses and their wider impacts. Some small business groups criticised the government for being slow to disburse financial aid and for not doing enough to prevent bankruptcies among micro-enterprises (Yi, 2021).

Non-governmental organisations have played a pivotal role in stepping in to provide services and local collaboration. They were particularly active in increasing awareness of and pressuring governments to respond to the negative impact of the pandemic on more vulnerable populations including low-income households, people with disabilities and the elderly, as well as migrants and undocumented residents (Choi, 2020). However, the decision-making process within the Recovery Committee was still largely driven by government officials and experts, with limited opportunities for genuine dialogue or collaborative policy formulation with civil society. The government's priority remained on economic recovery and public health measures, with less focus on addressing the social dimensions that civil society highlighted. Thus, many civil society representatives felt that the engagement was more of a consultative formality rather than a genuine partnership in decision-making.

The government's centralised approach, coupled with the urgency of addressing the pandemic's economic fallout, limited the engagement of affected people and civil society in inclusive risk governance. While the establishment of the Recovery Committee and the involvement of different groups groups, such as small business owners, represented a shift toward more inclusive risk governance, challenges remained in ensuring that these stakeholders had a meaningful impact on decision-making that could mitigate the societal consequences to human security of systemic risk represented by the global pandemic.

Conclusion

The pandemic has underscored the critical importance of recognising societal and contextual factors in systemic risk. To address the evolving characteristics of risk effectively, it is essential to adopt flexible and timely risk governance strategies. These strategies should prioritise multi-actor collaboration, as the objectives and functions of risk management adapt in response to efforts by governments and stakeholders to mitigate risks and enhance human security.

The existing literature and conceptual developments on risk governance have comprehensively defined the procedures for managing risks and have established the necessary elements for each stage of risk management. The former approach has limitations in that it tends to over-emphasise the technical aspects of risk management and not to explicitly address or recognise the importance of the integration of interlocking spheres of human security and social policy to risk governance in turbulent time. Therefore, this study argues that it is necessary to further consider the perspective of inclusive risk governance that comprehensively incorporate the state's capacity for human security and political decision-making with a specific focus on different dimensions of human security and everyday life including health, economic, food, personal, community, and political security.

We have drawn on the UK and South Korea as examples to explore and examine the nature of risk governance, state capacity and human security in the context of a systemic risk. Both the UK and South Korea initially relied on their existing crisis management systems to address the COVID-19 pandemic but adapted this system as the risk characteristics changed. The UK, whilst officially operating under a decentralised system, shifted to a more centralised approach during the unprecedented health crisis. In the early stages, it incorporated expert participation and established the Health Security Agency (HSA) to enhance efficiency through centralised crisis management. Conversely, South Korea, with an already centralised system, intensified its top-down approach as the Prime Minister directly presided over crisis response headquarters meetings for three years. It responded efficiently through a collaborative networked governance within a hierarchical model that engaged various government ministries and local governments. Additionally, the transformation of the Korea Centers for Disease Control and Prevention into the Korea Disease Control and Prevention Agency bolstered its capacity for managing public health crises effectively.

As vaccines were developed, the complexity of the health crisis diminished, but the ongoing COVID-19 situation introduced greater uncertainty and ambiguity in socio-economic dimensions, perpetuating systemic risk. This shift heightened the demand for broader stakeholder participation in risk governance. The UK, with its traditionally decentralised crisis management system allowing for stakeholder involvement, faced challenges as public trust in the government eroded during the pandemic. Stakeholder participation was further constrained by the redistribution of government capacity to other priorities following Brexit, limiting its ability to address the socio-economic crisis triggered by COVID-19 effectively.

In contrast, South Korea leveraged its prior experience with health crises such as SARS and MERS to respond agile and flexibly in the early stage. However, as the socio-economic dimensions of the risk grew more ambiguous, challenges in coordinating stakeholder demands became evident. While South Korea demonstrated elements of inclusive risk governance by institutionalising committees to incorporate diverse stakeholder perspectives, in practice, expert-driven health risk assessments and countermeasures often overshadowed considerations of socio-economic aspects of risk.

The differences in risk governance and coordination capacity between the two countries stem from their distinct institutional backgrounds and political choices. While this article does not explore the causes of these differences in detail, it highlights the need for future research to examine them in greater depth. As systemic risks become increasingly complex and intersect with various aspects of daily life, there is a growing need for inclusive risk governance that actively involves diverse stakeholders, enhances coordination capacity, and addresses the socio-economic disparities revealed during the pandemic. Therefore, identifying mechanisms to enable effective and socially inclusive stakeholder participation in risk governance for human security remains a critical area for further study.

Note

1 Risk refers a potential event or condition that might cause harm or disruption which involves the possibility of negative outcomes. Crisis is a situation that has already occurred, leading to immediate and significant disruption or harm. While COVID-19 may be characterised as a health crisis in this original conceptual framework, this study aims to address the broader instability in human security that has followed afterwards. Therefore, the term 'risk' was deliberately used to reflect this possibility of insecurities across society. We extend our gratitude to the anonymous reviewer who emphasised the importance of distinguishing between the concepts of 'risk' and 'crisis'.

References

Aven, T. and Renn, O. (2010) *Risk Management and Governance: Concepts, Guidelines and Applications*, Heidelberg: Springer Berlin.

Bae, J. (2020) 'COVID-19 and National Disaster Management System Korea Academy of Medical Science', E-Newsletter No.117, https://kams.or.kr/webzine/20vol117/sub02_1.php [accessed on 6.03.2024].

Bae, Y., Joo, Y. M. and Won, S. Y. (2016) 'Decentralization and collaborative disaster governance: Evidence from South Korea', *Habitat International*, **52**, 50–56.

Boin, A. and Lodge, M. (2021) 'The attractions and limitations of pragmatist crisis management: A discussion in light of COVID-19 experiences', *LSE Public Policy Review*, **1**, 4, 1–8. DOI: 10.31389/lseppr.22

Choi, Y., Oh, Y. K. and Yoon, D. K. (2020) 'An analysis of changes in organizational structure of disaster management in Korea', *Crisisonomy*, **16**, 10, 1–19.

Choi, Y. J. (2020) 'The power of collaborative governance: The case of South Korea responding to COVID-19 pandemic', *World Medical & Health Policy*, **12**, 4, 430–442. DOI: 10.1002/wmh3.376

Chung, J. B., Yeon, D. and Kim, M. K. (2023) 'Characteristics of victim blaming related to COVID-19 in South Korea', *Social Science & Medicine*, **320**, 115668.

Comfort, L. K. (1988) *Managing Disaster: Strategies and Policy Perspectives*, Durham, NC: Duke University Press.

Comfort, L. K. (2007) 'Crisis management in hindsight: Cognition, communication, coordination, and control', *Public Administration Review*, **67**, 189–197.

Comfort, L. K. and Haase, T. (2006) 'Communication, coherence, and collective action: The impact of Hurricane Katrina on communications infrastructure', *Public Works Management and Policy*, **10**, 4, 328–343.

Denny, E. K. (2022) 'Crisis, resilience, and civic engagement: Pandemic-era census completion', *Perspectives on Politics*, **20**, 2, 577–594. DOI: 10.1017/S1537592721002024

Davies, B., Lalot, F., Peitz, L., Heering, M.S., Ozkececi, H., Babolan, J., Davies Hayton, K., Broadwood, J. and Dominic, A. (2021) 'Changes in political trust in Britain during the COVID-19 pandemic in 2020: integrated public opinion evidence and implications', *Humanities and Social Sciences Communications*, **8**, 1. DOI: 10.1057/s41599-021-00850-6

Diamond, P. and Laffin, M. (2022) 'The United Kingdom and the pandemic: Problems of central control and coordination', *Local Government Studies*, **48**, 2, 211–231. DOI: 10.1080/03003930.2021.1997744

Farazmand, A. (2007) 'Learning from the Katrina crisis: A global and international perspective with implications for future crisis management', *Public Administration Review*, **67**, s1, 149–159.

Fawcett, P. and Marsh, D. (2014) 'Depoliticisation, governance and political participation', *Policy & Politics*, **42**, 2, 171–188.

Framework Act on the Management of Disasters and Safety. Seoul: Ministry of Interior and Safety. https://elaw.klri.re.kr/eng_service/lawView.do?hseq=46614&lang=ENG [accessed on 05.03.2024].

Fukuyama, F. and Lopez-Calva, L. P. (2021) 'Pandemic and political performance', *Project Syndicate* June 24, 2021. (project-syndicate.org) Pandemics and Political Performance by Francis Fukuyama & Luis Felipe López-Calva – Project Syndicate [accessed 23.11.2024].

GHS (2019) '2019 Global Health Security Index. Building Collective Action and Accountability October John Hopkins University and Nuclear Threat Initiative', *2019 Global Health Security Index* (ghsindex.org) 2019 Global Health Security Index [accessed 23.09.2024].

Giddens, A. (1999) *Runaway World: How Globalisation Is Reshaping Our Lives*, London: Pluto.

Government of Republic of Korea (2020) 'All about Korea's response to COVID-19', https://www.mofa.go.kr/eng/brd/m_22589/view.do?seq=35&page=1 [accessed 12.09.2023].

Goldin, I. and Vogel, T. (2010) 'Global governance and systemic risk in the 21st century: Lessons from the financial crisis', *Global Policy*, **1**, 4–15. DOI: 10.1111/j.1758-5899.2009.00011.x

Guter-Sandu, A. (2021) 'The governance of social risks: Nurturing social solidarity through social impact bonds?', *New Political Economy*, **26**, 6, 1062–1077. DOI: 10.1080/13563467.2021.1899151

Hu, A. (2024) 'The workshop as a research methodology: Lessons learned from workshops utilized as a participatory research method', in Grindheim, L.V., Borgen, J.S. and Birkeland, A. (Eds) *Metodetilnærminger og prosessuelle design i barnehageforskning*, **7**, 120–133.

Human Security Unit (2016) 'Human security handbook UN trust fund for human security' *United Nations*, h2.pdf [accessed 20.05.2024].

Institute for Government (2020) 'Scientific Advisory Group on Emergencies (SAGE)', https://www.instituteforgovernment.org.uk/article/explainer/scientific-advisory-group-emergencies-sage [accessed 10.05.2024].

International Standard Organization (2018) 'ISO 31000: 2018 Risk management-guidelines', https://www.iso.org/standard/65694.html [accessed 05.11.2024].

IRGC (2005) *Risk Governance: Towards an Integrative Approach White Paper No. 1*, Lausanne: Risk Governance Council.

IRGC (2020) *Involving Stakeholders in the Risk Governance Process*, Lausanne: EPFL International Risk Governance Center.

Joyce, P. (2021) 'Public governance, agility and pandemics: A case study of the UK response to COVID-19', *International Review of Administrative Sciences*, **87**, 3, 536–555. DOI: 10.1177/0020852320983406

Kasdan, D. O. and Campbell, J. W. (2020) 'Dataveillant collectivism and the coronavirus in Korea: Values, biases, and socio-cultural foundations of containment efforts', *Administrative Theory & Praxis*, **42**, 4, 604–613.

Kaufman, G. G. and Scott, K. E. (2003) 'What is systemic risk, and do bank regulators retard or contribute to it?', *The Independent Review*, **7**, 3, 371–391.

Kennett, P., Lee, S., Kwon, H. J. and Lutz, R. (2024) 'Vulnerability and critical human security in the era of COVID-19 and beyond in the UK and South Korea', *Social Policy & Society*, Published online 2024, 1–20. DOI: 10.1017/S1474746424000344

Kettell, S. and Kerr, P. (2022) '"Guided by the science": (De)politicising the UK government's response to the coronavirus crisis', *The British Journal of Politics and International Relations*, **24**, 1, 11–30. DOI: 10.1177/13691481211054957

Kim, Y. (2020) 'Korea Centers for Disease Control and Prevention, promoted to "Disease Control Agency" after 16 years', *Independent from Ministry of Health and Welfare*, Chosun Biz, https://biz.chosun.com/site/data/html_dir/2020/06/03/2020060301691.html [accessed on 20.09.2023].

Kim, Y. (2022) 'Uncertain future of privacy protection under the Korean public health emergency preparedness governance amid the COVID-19 pandemic', *Cogent Social Sciences*, **8**, 1, 1–24. DOI: 10.1080/23311886.2021.2006393

Korea Federation of Micro Enterprise (2020) 'Survey on the impact of COVID-19 on small business owners.' https://www.kfme.or.kr/kr/board/data.php?bgu=view&idx=16 [accessed 2.05.2024].

Kwon, H.-J., Ha, E.-H., Yang, K., Park, S. and Yi, S. (2023) 'Challenging the universal healthcare systems in Southeast Asia: COVID-19 crisis management in Indonesia and the Philippines' in Izuhara, M. (ed.), *A Research Agenda for East Asian Social Policy*, Cheltenham: Edward Elgar, 197–219.

Lee, S. and Koo, J. (2023) 'Current status, evaluation, and implications of small business support policies in response to COVID-19', 19, KIF Analysis Report 2023-08 (in Korean), Seoul: Korea Institute of Finance. https://www.kif.re.kr/kif4/publication/pub_detail?mid=14&nid=996&sid=996&vid=7134&cno=331063&pn=1 [accessed 16.10.2024].

Lee, S., Yeo, J. and Na, C. (2020) 'Learning before and during the COVID-19 outbreak: A comparative analysis of crisis learning in South Korea and the US', *International Review of Public Administration*, **25**, 4, 243–260. DOI: 10.1080/12294659.2020.1852715

Lofredo, M. P. P. (2020) 'Social cohesion, trust, and government action against pandemics', *Eubios Journal of Asian and International Bioethics*, **30**, 4, 182–188.

Martin, C., Kann, H. and Fink, M. (2023) *Crisis Preparation in the Age of Long Emergencies. What COVID-19 Teaches us About the Capacity, Capability and coordination Governments Need for Cross-Cutting Crises*, Oxford: Blavatnik School of Government, University of Oxford.

Masterman, R. (2022) 'Brexit and the United Kingdom's devolutionary constitution', *Global Policy*, **13**, 58–68. DOI: 10.1111/1758-5899.13064

Mazzucato, M. and Kattel, R. (2020) 'COVID-19 and public-sector capacity', *Oxford Review of Economic Policy* **36**, Supplement_1, S256–S269.

Ministry of Interior (2020) *National Safety Management Basic Plan 2020–2025*, Seoul, South Korea: Government of Korea.

National Leadership Centre (2022) *Leading Public Services through COVID-19 Leadership College for Government and National Leadership Centre*, London: HMSO, Leading Public Services through Covid-19 HTML – GOV.UK [accessed 04.05.2024].

Office for Government Policy Coordination (2021) 'Policy briefing – Launch of the recovery committee. A 'step-by-step roadmap for daily recovery' emerges', https://www.korea.kr/briefing/policyBriefingView.do?newsId=148894226 [accessed 04.05.2024].

Oh, Y., Ryu, H., Hur, J., Kim, H. and Kim, D. (2020) *Issues in Infectious Disease Disaster Response and Policy Implications: Insights from COVID-19 Cases*, KIPA Issue paper 2020-2, Seoul: Korea Institute of Public Administration. (in Korean) https://www.kipa.re.kr/site/kipa/research/selectPublishView.do?gubun=IS&pblcteId=PUBL_000000000000483 [accessed 11.05.2024].

Ørngreen, R. and Levinsen, K. T. (2017) 'Workshops as a research methodology', *Electronic Journal of E-Learning*, **15**, 1, 70–81, [569]. Available at Microsoft Word – 006_Orngreen [accessed 19.02.2025].

Our World in Data. https://ourworldindata.org/covid-stringency-index [accessed 05.04.2024].

Our World in Data. https://ourworldindata.org/grapher/share-people-fully-vaccinated-covid [accessed 05.04.2024].

Rajan, D., Koch, K., Rohrer, K., Bajnoczki, C., Socha, A., Voss, M., Nicod, M., Ridde, V. and Koonin, J. (2020) 'Governance of the Covid-19 response: A call for more inclusive and transparent decision-making', *BMJ Global Health*, **5**, e002655. DOI: 10.1136/bmjgh-2020-002655 [accessed 28.09.2024].

Ramia, G. and Perrone, L. (2023) 'Crisis management, policy reform, and institutions: The social policy response to COVID-19 in Australia', *Social Policy and Society*, **22**, 3, 562–576. DOI: 10.1017/S1474746421000427

Renn, O. (2008) *Risk Governance: Coping with Uncertainty in a Complex World*, London: Earthscan Publications.

Renn, O. (2015) 'Stakeholder and public involvement in risk governance', *International Journal of Disaster Risk Science*, **6**, 8–20. DOI: 10.1007/s13753-015-0037-6

Renn, O. and Klinke, A. (2013) 'A framework of adaptive risk governance for Urban planning', *Sustainability*, **5**, 5, 2036–2059. DOI: 10.3390/su5052036

Renn, O., Lucas, K., Haas, A. and Jaeger, C. (2017) 'Things are different today: The challenge of global systemic risks', *Journal of Risk Research*, **22**, 4, 401–415. DOI: 10.1080/13669877.2017.1409252

Renn, O. and Schweizer, P. J. (2009) 'Inclusive risk governance: concepts and application to environmental policy making', *Environmental Policy and Governance*, **19**, 3, 174–185.

Richards, T. and Scowcroft, H. (2020) 'Patient and Public involvement in COVID-19 policy making. Absent in the early stages of the pandemic it must now take centre stage', *BMJ*, 370m2575. Patient and public involvement in covid-19 policy making Patient and public involvement in covid-19 policy making – PubMed) [Accessed on 19.02.2025].

Schweizer, P. (2021) 'Systemic risks – concepts and challenges for risk governance', *Journal of Risk Research*, **24**, 1, 78–93. DOI: 10.1080/13669877.2019.1687574

Schweizer, P., Goble, R. and Renn, O. (2022) 'Social perception of systemic risks', *Risk Analysis*, **42**, 7, 1455–1471. DOI: 10.1111/risa.13831

Tolhurst, A. (2020) 'Mat Hancock confirms Public Health England axed with Test and Trace Boss Baroness Hardy to lead replacement body', *PoliticsHome*, 18 August. Matt Hancock confirms Public Health England axed with Test and Trace boss Baroness Harding to lead replacement body [accessed 19.02.2025].

Tourish, D. (2020) 'Introduction to the special issue: Why the coronavirus crisis is also a crisis of leadership', *Leadership*, **16**, 3, 261–272.

UK Parliament (2021) 'Coronavirus: Lessons learned to date London: HMSO', Coronavirus: lessons learned to date – Health and Social Care, and Science and Technology Committees – House of Commons.

UK Parliament (2022) *Report of the Post Implementation Review of the Civil Contingencies Act (2004)*, London: HMSO. assets.publishing.service.gov.uk/media/6283a1a6d3bf7f1f3ef4838d/cca-pir-2022.pdf [accessed 19.02.2025].

Van Asselt, M. B. A. and Renn, O. (2011) 'Risk governance', *Journal of Risk Research*, **14**, 4, 431–449.

Waugh, W. L. (1994) 'Regionalizing emergency management: Counties as state and local government', *Public Administration Review*, **54**, 3, 253–258.

Weiss, L. and Thurbon, E. (2022) 'Explaining divergent national responses to Covid-19: An enhanced state capacity framework', *New Political Economy*, **27**, 4, 697–712.

Wernli, D., Böttcher, L., Vanackere, F., Kaspiarovich, Y., Masood, M. and Levrat, N. (2023) 'Understanding and governing global systemic crises in the 21st century: A complexity perspective', *Global Policy*, **14**, 207–228. DOI: 10.1111/1758-5899.13192

Williams, F. (2021) *Social Policy. A Critical and Intersectional Analysis*, Cambridge, MA: Polity Press.

Yi, J. H. (2021). 'Whats are the characteristics of the Moon Jae-in Government's self-employment policy?', *Journal of the Korean Social Trend and Perspective*, **113**, 114–142.

Yoon, L. (2024a) 'Share of employees South Korea 2022 by size of enterprise', *Statista*, October 24, South Korea: share of employees at enterprises by size | Statista [accessed 20.02.2025].

Yoon, L. (2024b) 'Number of people by SME South Korea 2022 by size', *Statista*, October 24, South Korea: SME employment by size | Statista [accessed 20.02.2025].

Yoon, Y. H. (2021) 'The macroeconomic implications of the COVID-19 economic crisis: The case of South Korea', *Investigación Económica*, **80**, 316, 5–31. DOI: 10.22201/fe.01851667p.2021.316.78971