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LANDSCAPES OF OUR UNCERTAIN FUTURES

Towards mapping and understanding crisis-related
concepts and definitions

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PREFACE

Uncertainty is a fundamental dimension of the human condition. In all ages, people have been confronted with natural disasters, illness, violent conflicts, and societal turmoil – crises of different origin, severity, duration and character. Humankind reacted with a variety of either blind or well-reasoned coping strategies from denial and fatalism to religious belief and more or less rational management approaches.

What makes our age different is the scope and diversity of risks and ruptures, strategic surprises and disruptions. Environmental risks have outgrown a local and regional level and gained a global dimension, economic globalisation has found its mirror image in supply chain vulnerabilities, the pace of innovations has increased, producing shocks in established industries. At the global level, crises seem to occur with increasing frequency, just think about the financial crisis of 2008, the Coronavirus pandemic and the Russian aggression of the Ukraine – not to forget the alarming number of climate-related natural disasters like forest fires, droughts, and inundations.

From the perspective of futures research and crisis management, we need a comprehensive understanding of interacting sources and root causes for the whole variety of crises; we need as well more inter- and transdisciplinary theory building in the field. Clearly defined concepts and an appropriate terminology are a fundamental requirement for both. Only with a shared vocabulary of basic terms one can safeguard quality of studies, methodological rigour and practical relevance.

The present eBook provides a decisive step in this direction. It is based on a broad literature review within and far beyond the foresight field and on a deep analysis of outstanding “classics” in the field – and it provides an ambitious mapping of crisis-related concepts and terms, with their origins, their core characteristics, and their theoretical background. In effect, it showcases an astonishing and overwhelming richness of sometimes competing concepts from catastrophe, chaos and collapse to X-events; concepts that stem from quite different branches of research. Some concepts that started years ago as mere metaphors – like wild cards or black swans – have over time grown into (almost) mature disciplinary notions. Other terms that operate at first glance on a purely abstract, systemic level – like discontinuity or disruption – have gained rich specific interpretations. Looking from a historical perspective, the field of crisis-related terms seems to be by itself subject to the main characteristics of our age: The field is volatile (e. g. in view of changing terminological predilections), at least in parts uncertain, surely very complex and sometimes plagued (or benefitting from?) ambiguity. Acknowledging this, mapping efforts become even more relevant.

This eBook originated in the context of the RESCUE project and has therefore a certain focus on cities. It is, however, not at all confined to this specific focus but valuable for all research addressing uncertainty in its many dimensions and forms.

Berlin 26th June, 2022

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ABSTRACT

This report "Landscapes of Our Uncertain Futures. Towards mapping and understanding crisis-related concepts and definitions" is published as a result of a literature review and related conceptual analysis conducted within the RESCUE Project (Real Estate in Sustainable Crisis Management in Urban Environments). In early stages of the project it became evident that in order to achieve efficient results in research and policy action efforts for sustainable urban development and crisis management, mutual understanding of key concepts and their definitions is needed. This is because identifying and grasping the major phenomena at play in our turbulent world – crisis society – may be varied, and besides there are several different definitions of them used in the literature. If, however, preliminary discussions and analyses can open up the contents and meanings of such phenomena, joint work and concluding recommendations are supported and expedited on the basis of shared understanding. A key theme in this conceptual analysis is 'crisis' and crisis-related phenomena, within the framework of the now present VUCA world. The landscapes of our uncertain futures are thus depicted, and replenished via a literature review and its key findings. These insights are meant to help paving the way for the process of creating resilient cities.

RESUME

Ce rapport "Paysages de nos futurs incertains. Vers une cartographie et une compréhension des concepts et des définitions liés à la crise" est publié à la suite d'une revue de la littérature et d'une analyse conceptuelle connexe menées dans le cadre du projet RESCUE (Immobilier dans la gestion durable des crises en milieu urbain). Au début du projet, il est devenu évident que pour obtenir des résultats efficaces dans les efforts de recherche et d'action politique pour aborder le développement urbain durable et la gestion des crises, une compréhension mutuelle des concepts clés et de leurs définitions est nécessaire. En effet, identifier et appréhender les phénomènes majeurs en jeu dans notre monde turbulent – la "société de crise" – peut être varié, et il en existe d'ailleurs plusieurs définitions différentes dans la littérature. Si, cependant, des discussions et des analyses préliminaires sont faites pour ouvrir le contenu et les significations de ces phénomènes, le travail conjoint et les recommandations finales sont soutenus et accélérés sur la base d'une compréhension mutuelle. Une notion clé dans cette analyse conceptuelle est la "crise" et les concepts liés à la crise, dans le cadre du monde VUCA actuel. Les paysages de nos avenir incertains sont ainsi dépeints et reconstitués grâce à la revue de la littérature et ses conclusions principales. Ces nouvelles découvertes sont destinées à ouvrir la voie au processus de création de villes résilientes.

RESUMEN

Este informe "Paisajes de nuestros futuros inciertos. Hacia el mapeo y la comprensión de conceptos y definiciones relacionados con la crisis" se publica como resultado de una revisión de la literatura y un análisis relacionado realizado dentro del Proyecto RESCUE (Real Estate in Sustainable Crisis Management in Urban Environments). En las primeras etapas del proyecto se hizo evidente que para lograr resultados eficientes en los esfuerzos de investigación y acción política para abordar el desarrollo urbano sostenible y la gestión de crisis, se necesita una comprensión mutua de los conceptos clave y sus definiciones. Esto se debe a que la identificación y comprensión de los principales fenómenos en juego en nuestro mundo turbulento, la sociedad de crisis, puede ser variada y, además, hay varias definiciones diferentes de ellos que se utilizan en la literatura. Sin embargo, si se llevan a cabo discusiones y análisis preliminares para aclarar los contenidos y significados de tales fenómenos, el trabajo conjunto y las recomendaciones finales se apoyan y aceleran sobre la base de la comprensión mutua. Un concepto clave en este análisis conceptual es el de 'crisis' y conceptos relacionados con la crisis, en el marco del actual mundo VUCA. Los paisajes de nuestros futuros inciertos se describen y reponen a través de una revisión de la literatura y sus hallazgos clave. Estas ideas están destinadas a allanar el camino para el proceso de creación de ciudades resilientes.

1. INTRODUCTION AND THE RATIONALE

We are living in an increasingly turbulent and fuzzy world. Futures scholars have labelled it a VUCA world where volatility (=V), uncertainty (=U), complexity (=C) and ambiguity (=A) are dominating characteristics. (See e.g. Kaivo-oja & Lauraeus 2018). It is symptomatic that the VUCA phenomenon was introduced in strategic and military field from the end of the Cold War era, United States Army War College, and has ever since been taken up in businesses and strategy planning. These four elements of the VUCA world compel us to struggle – even fight – for making sense of the changes happening around us.¹ Therefore, in the VUCA world it is even more important to develop foresight capacity (Buder 2020) and futures literacy (Miller 2018). Futures literacy means the skill to imagine, identify and use futures. You can learn it to master the various ways the futures are used in the present i.e. to use futures for today's decision-making. It should also be deepened in the form of exploration of improbable and uncertain trajectories and as proactive preparation for futures. We should not, however, panic or become paralysed in confronting the challenges of the VUCA world. On the contrary, we should boldly embrace change and uncertainty. We must drill into the trajectories of the unknown if we want to survive. One can even ask: "Is uncertainty the key to understanding futures?"

Our claim is that learning to embrace and live with uncertainty instead of attempting to evade or annihilate it, is a key to futures resilience (Heinonen 2022; Karjalainen et al. 2022). Starting from building foresight capacity, into achieving futures literacy will posit us in the ultimate challenge and opportunity of **futures resilience**. Futures resilience is conceived as a capacity to survive emerging challenges, obstacles, risks and crises, to come out from them relatively unharmed, even learning from them.²

Understanding futures means understanding that the **Future is about uncertainties**. Living with uncertainty while assuming futures resilience can be attained with the following steps:

- By admitting that we can release our power to identify key factors that increase or deepen uncertainties.
- By focusing our attention to uncertainties and to their underlying factors we may proactively acquire foresight knowledge especially about discontinuities and emerging futures.
- By this kind of uncertainty-focused horizon scanning we can drill into uncertainties and diminish their blinding effect. For this, use of peripheral vision (Day & Schoemaker 2006) is recommended.
- By realising that instead of linearities more attention should be focused on discontinuities and disruptions.

Defining and opening up the VUCA and other related concepts, as well as their interconnections, yields a better common understanding and prerequisites for a more transparent and comprehensive cognitive and

¹ A similar expression for the changing world is used by futures researchers in Oxford – they call it a TUNA world, full of turbulence, uncertainty, novelty and ambiguity (Wilkinson & Ramirez 2006).

² For further reading for the Finnish audience, FUTURA journal, quarterly published by the Finnish Society for Futures Studies, produced a Special Issue that deals with crisis awareness and futures resilience 4/2021, guest-edited by Sirkka Heinonen and Saija Toivonen from the RESCUE project (in Finnish: "Kriisitietoisuus ja tulevaisuusresilienssi").

physical construction of futures. In other words, appropriate anticipation requires a clear grasp of the relevant concepts and of the various driving factors around them. This is the foundation for a proactive design of futures (e.g. future cities), leading subsequently to physically 'building' futures. In constructing futures, one can bear in mind that the built environment forms a substantial part of everyday life of the public and private sector, and of governments and citizens. It is also an economic investment and a central platform for human beings and nature. Therefore, **it is of crucial importance to adapt the built environment as a hub for resilience.**

RESCUE (Real Estate and Sustainable Crisis Management in Urban Environments)³ is a three-year interdisciplinary project funded by the Academy of Finland (2020–2023) and led by Aalto University, Department of Built environment. The project consortium includes partners from Aalto University, the Department of Architecture as well as University of Turku and Tampere University. The study is multidisciplinary, a combination of futures studies, architecture, land use and spatial planning, as well as real estate economics. Societies are facing many different crises that are either previously recognized or unexpected (e.g. pandemic, climate change, terrorism, fires, floods etc.) to a growing degree. Consequently, it is important to identify and prepare for them. This project addresses the role of real estate in crisis management and preparedness as a way to manage crises. The built environment (be it a home or workplace) has a significant influence on people's wellbeing, ecological environment, and the economy. The aim of this research is to identify and investigate the impacts of different crises on people's wellbeing, land and space use, and find practical tools and solutions for resilient planning, constructing, occupying, and managing the built environment. Concrete crisis preparedness policies are searched for and proposed to enable a more resilient built environment now and in the future.

The importance of futures thinking has been established. Even the importance of academic futures research is now recognised – at the University of Turku, School of Economics, we have both a master's programme and a doctoral programme in futures studies, along with other academic futures courses provided by Finland Futures Academy (FFA). Worldwide a few other academic institutions also provide education in this field. Futures research has already been practiced ever since the 1940s-60s. It had its origin within strategic, military studies, business management, operational analysis, cybernetics and system analysis. Among the earlier institutes engaged in futures studies were RAND and the Hudson Institute. One of the prominent, yet polemic, figures was Herman Kahn (1922-1983). He wrote the book "Thinking About the Unthinkable" (1962) and "The Next 200 years" (1976).

Alvin Toffler wrote the book "Future Shock" (1970) where he claimed that the very pace of change is shocking us and our ability to anticipate futures or to adjust to the transformation it brings. Transition from industrial society into super-industrial society simply means that too much change takes place in too short a period of time, resulting in the shock from rapid change. Around that time "The Limits to Growth" report to the Club of Rome was also published (Meadows et al. 1972) which served as a wake-up call to see the imminent risks of limitless growth on our limited planet.

³ For the RESCUE project, please see more at <https://rescue-finland.com>, <https://www.utu.fi/en/university/turku-school-of-economics/finland-futures-research-centre/research/rescue>

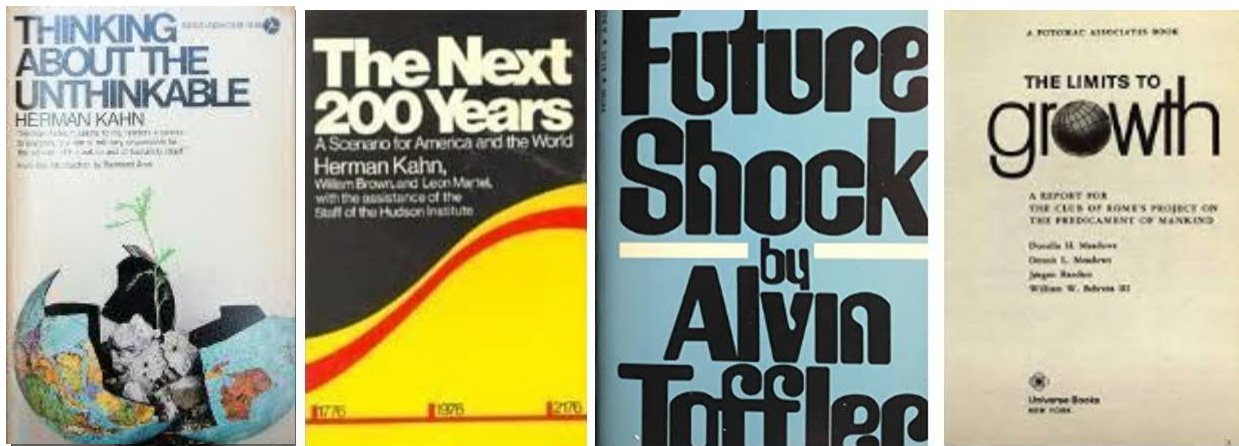


Figure 1. Books by Herman Kahn and Alvin Toffler disseminated futures thinking to a larger audience, and the Limits to Growth report to the Club of Rome raised awareness of the hazards of limitless growth.

If we want to explore futures openly and yet not to be crippled by the shocks therein, more attention should be given to 'the other side of the coin' – i.e. “un-futures”. In normative school of futures thought, preferred futures are being sought after. However, the opposite of preferred futures – undesirable futures – should also be studied and anticipated. This is because it is the only way not to be excessively surprised or shocked. More foresight and insight of undesirable futures makes us aware of them and prepared to look for measures and actions to prevent them from happening. Seeds for both desirable and undesirable futures are located in these invisible “un-futures”. Therefore, the following 8 “un-futures” merit closer inspection.

1. unlikely	
2. unexpected	
3. uncertain	
4. uncommon	
5. unknown	
6. unspoken	
7. unthinkable	
8. undesirable	

Figure 2. The 8 “un-futures” – or the 'other sides' – to be addressed when thinking about futures.

These kind of “un-futures” are ignored, hidden or forbidden futures. The very nature of attention to their existence may give rise to sudden surprises, discontinuities, disruptions and crises. **Uncertainties** and the above described **un-futures** harbour strategic threats. Therefore, we recommend that they are also explored in futures studies. In the same vein, they contain opportunities for better futures that may, if not addressed, remain unnoticed and unused.

This report *Landscapes of Our Uncertain Futures. Towards mapping and understanding crisis-related concepts and definitions* is published through the above-described RESCUE Project, on the initiative of the research team from Finland Futures Research Centre (FFRC), University of Turku. In the early stages of the project it became evident that in order to achieve efficient results in research and policy action efforts to approach sustainable urban development and crisis management, mutual understanding of key concepts and their definitions are needed. This is because identifying and grasping the major phenomena at play in our turbulent world – crisis society – may be varied, and besides there are several different definitions loosely used in the literature. If, however, preliminary discussions and analyses are made to open up the contents and meanings of such phenomena, joint work is supported. Accordingly, conclusions and recommendations can better be expediated on the basis of mutual understanding. A key concept in this conceptual analysis is 'crisis' and its crisis-related phenomena, within the framework of the now present VUCA world. The landscapes of our uncertain futures are thus depicted, and replenished via a literature review and its key findings in the following chapters. First, to anchor our contribution, we provide a short overview of classical and contemporary literature on crises in Chapter 2. Drawing on futures studies literature and contemporary foresight reports, the key findings of a literature review are presented in Chapter 3. Then finally in Chapter 4 crisis-related concepts and their definitions are given, to be followed by brief concluding remarks in Chapter 5.

Recent years have revealed for society a number of disruptive events and trajectories which have generated transformational impacts on society. Therefore, this conceptual analysis is focused on crisis and disruptive crisis-related concepts so that a common language supports our efforts to anticipate, analyse, understand, and prepare for them and to find resilience to overcome them.

Ideally, there may even be ways to learn from crises. Surprises may lead to crises, but it is better to embrace crises, not to shy away and not to panic (Heinonen et al. 2017). In the coronavirus pandemic, the patterns of life/work, mobility, and spatial interactions, were altered, some temporarily, others permanently. The COVID-19 pandemic challenged ways of organising our lives, the built environment, our socio-technical systems, and their resulting interactions, which were considered as "normal". Some lessons from the crisis are already informing crisis recovery strategies of the future. It also opened up a space to re-think our hopes and desires, life choices as well as how we relate to places (Karjalainen et al. 2022; see also Karjalainen 2021). These may be useful, with the challenges posed by a wide range of trends. Even assumptions of cities becoming "smart" does not automatically make them flourish. A city that is liveable and sustainable should align with the Sustainable Development Goals, internationally agreed environmental goals; and demonstrate an ability to reverse the negative trends of long-term unsustainability, even under future crises.

2. CRISES IN LITERATURE

To begin the landscape mapping with classical and popular literature on crises, this section presents an overview of three sub-themes: i) economic/financial crises, ii) COVID-19 pandemic books, as well as iii) more contemporary titles. The purpose of presenting these main strands is to help chart what may be understood as **a popular understanding of how crises are framed and understood** in society. Available and related popular knowledge may be a proxy of our present understanding. A search on popular titles charts authors and titles of primarily Anglo-American scholarly understanding, and the list should not be considered as exhaustive, but rather as an illustrative sample of the abundant menu of crisis-related literature. Each sub-section presents the titles in order of date of appearance.

2.1 Classics and contemporaries on crises

Classically, crises have been a subject of interest to philosophers, social scientists as well as ecologists. The crisis literature is intimately about **a changing society**, and in many cases, of **the effects of technology on their development as well as on the environment**. A key prerequisite for diminishing negative impacts on our environment is awareness of them as already Carson (1962) pointed out in “Silent Spring”. Some modern classics are associated to futures, business and management studies as well as strategy literature, as exemplified in Peter Drucker (1968) and Alvin Toffler's (1970) works. Toffler argued that the rapid change with which society is evolving results in future shock, as people become overwhelmed with change. Another lineage points to **the growth in complexity**, and relates to historical analyses of collapses in societies, exemplified in anthropologist and historian Joseph Tainter's work (1988). Similarly, development scholar, environmental historian and geographer Jared Diamond considered complexity as one reason for collapses (2005). In the 1990s, a major scholarly contribution by Ulrich Beck (1992; 1999) concerned the ways in which modern society organises in response to risk.

Carson, Rachel (1962) *Silent Spring*. Houghton Mifflin.

Drucker, Peter (1968) *The Age of Discontinuity: Guidelines to Our Changing Society*. Harper and Row, New York.

Toffler, Alvin (1970) *Future shock*. Random House.

Tainter, Joseph A. (1988) *The Collapse of Complex Societies*. Cambridge University Press.

Beck, Ulrich (1992). *Risk Society: Towards a New Modernity*. Translated by Ritter, Mark. London: Sage Publications.

Petersen, John L. (1997) *Out of the blue: Wild cards and other big future surprises: how to anticipate and respond to profound change*. Arlington Institute.

Beck, Ulrich (1999). *World risk society*. Cambridge, UK: Polity Press.

Diamond, Jared (2005) *Collapse: How Societies Choose to Fail or Succeed*. Viking Press.

The underlying analysis for many books aimed at popular audiences stems from scholarly work published in academic journals as peer-reviewed articles over the years, as illustrated by these examples below of the evolution of scientific understanding of **uncertainty** and **surprises**. Judgment and human psychology remind us of our cognitive ability, and its limitations in understanding the world, affecting our risk and crisis mindset. Of late, foresight and futures scholars have directed their attention to unexpected events (see Section 2.4).

Tversky, Amos & Kahneman, Daniel (1974) Judgment under Uncertainty: Heuristics and Biases. *Science*. 27, 185, 4157, 1124-1131. DOI: 10.1126/science.185.4157.1124

Rockfellow, John (1994) Wild Cards: Preparing for the Big One. *The Futurist*. 1: 14-19. [Article link](#).

Buchak's (2014) work is an example of a recent contribution in economics and philosophy, as an account of **decision-making under risk circumstances**. As a starting point, building on rational choice theory, any individual has to consider a choice, associated trade offs, how it may turn out under different circumstances, and that the choice could turn out well – or poorly. In addition, risk-weighted expected utility theory attends to **worst-case and best-case scenarios** to capture the preferences of a decision-maker. How to make sense of radical uncertainty is a recurrent theme also for management scholars, as raised by Mack et al. (2015) as well as Kay & King (2020). In the event that a risk is realised, **crisis communication in multiple languages** is one facet of crises, as noted by Federici & O'Brien (2019) who draw on disaster studies.

Goldstein, Bruce Evan (ed.) (2012) *Collaborative Resilience: Moving Through Crisis to Opportunity*. The MIT Press, 424 p.

Buchak, L. (2014) *Risk and Rationality*. Oxford: Oxford University Press.

Mack, O., Khare, A., Krämer, A. & Burgartz, T. (eds.) (2015) *Managing in a VUCA world*. Springer Books.

Federici, F.M., & O'Brien, S. (eds.) (2019) *Translation in Cascading Crises (1st ed.)*. Routledge.

Kay, J. & King, M. (2020) *Radical Uncertainty: Decision-Making Beyond the Numbers*. W. W. Norton & Company: NY and London.

Brunnemeier, Markus (2021) *The Resilient Society*. Endeavor Literary Press.

As a starting point, attention ought to be paid to the nexus of the social and the ecological (Goldstein et al. 2012). Instead of risk preparedness, Brunnemeier (2021) argues that the only way to protect social and economic institutions is to **build resilience**, as the “smart” handling of uncertainty and the shocks from surprises. When a continuity, e.g. a trend is broken, and something really different from the past, as a discontinuity, emerges, resilience is needed. Two strategies are proposed: 1) an extensive study of weak signals to explore such breaks, and 2) “social contracts” between relevant stakeholders for these situations. Recovery from sudden shocks implies the use of policies, as mechanisms, which must be thought of and invested in beforehand.

2.2 Economic crises

A specific crisis literature strand is concerned with economic crises. Analysing the dynamics of the economic system and volatility, is a part of popular knowledge. An economic crisis disrupts the markets, and often means a social crisis due to its many wide-reaching consequences and impacts. **“A bubble bursting”** is an often-used metaphor. In a history of financial crises over the centuries, Kindleberger & Aliber (2015) argue that global financial crises are not independent events, but rather symptoms of inherent instability in the international system. Quinn & Turner (2020) posit that a bubble can develop when investors and speculators react to new technology or political initiatives.

Kindleberger, Charles P. & Aliber, Robert (2015) *Manias, Panics, and Crashes: A History of Financial Crises*. 7th Edition. Palgrave Macmillan.

Tooze, Adam (2018) *Crashed: How a Decade of Financial Crises Changed the World*. Viking.

Quinn, William & Turner, John D. (2020) *Boom and Bust: A Global History of Financial Bubbles*. Cambridge University Press.

The 2008 global financial crisis and its aftermath have been widely investigated. Economic historian Adam Tooze (2018) investigated its root causes to explain how a sub-prime mortgage crisis in the U.S. transformed into a global financial crisis through interlinkages of the global banking and financial sector. Financial innovation and growing complexity in the sector were drivers that were not balanced with political oversight. A space was opened up for free market actors to act recklessly, systemic risk started to accumulate, and although a bubble started to develop. In the absence of checks and balances, the signs of a crisis were initially observed by very few. The risk, and a chance for a crisis, were belittled by the financial and insurance sector gatekeepers and incumbents.

Once the bubble burst, a local crisis, owing to a digitalised, financialised and globalised world, transformed into a national, and soon a global one, with a dramatic aftershock, which has a long legacy. This also catalysed efforts to scheme new economic orders such as the model of the doughnut economics by Kate Raworth (2012), based on sustainability combining the concept of planetary boundaries with the notion of social boundaries.

2.3 COVID-19 pandemic books

During and after the coronavirus pandemic, no shortage of popular books appeared in airport bookstore shelves aimed at the grand audience (see e.g. Galloway 2020; Levy 2020). Some have claimed the pandemic to be nature's revenge, considering of the way we live now, which is practically an invitation for animal viruses to infect humans. The following books speak to the COVID-19 crisis and its patterns, and exemplify early lessons and reflections from a local health crisis that transformed into a global one with multiple facets.

Galloway, Scott (2020) *Post Corona: From Crisis to Opportunity*. Portfolio.

Levy, Bernard-Henri (2020) *The Virus in the Age of Madness*. Yale University Press.

Zakaria, Fareed (2020) *Ten Lessons for a Post-Pandemic World*. W. W. Norton & Company; 1st edition.

Talwar, Rohit, Wells, Steve & Whittington, Alexandra (eds.) (2021) *Aftershocks and Opportunities 2.0. Navigating the next horizon*. Fast Futures Publishing. UK.

In his title, Zakaria (2020) a media reporter, offers a systems view, drawing on history, with geopolitical and economical orientation, carrying a voice that resembles that of a futures researcher. Fear, denial and adaptation are common sentiments during a crisis. Zakaria encourages us to start thinking small, for instance microbes, although traditionally, humans have proven to be good at imagining big, traditional dangers. New outbreaks of other diseases are virtually certain to occur, at some point in the future. Further, he claims that bioterror is an important, yet underdiscussed danger that humanity may face.

Building on Jared Cohen's idea about computer networks, it is claimed that in any system, one can have only two of the three characteristics – open, fast, and/or stable. This is a **trilemma**. If everything is open and fast-moving, a system can spin dangerously out of control. It is argued that we have a world that is always in overdrive. In the book, the 9/11 attacks, the global financial crisis, and COVID-19 are considered as **asymmetric shocks**, as they start out small, but end up sending seismic waves around the world. **Butterfly Effect** is about a minor change, which can have major consequences. **Cascading failure** is one that can occur in power grids or computer networks: if a tiny element breaks and then shifts its load to another, which then breaks, a chain reaction that grows even larger is produced, like a ripple that becomes a roaring wave.

The ten lessons, which highlight a wide range of perspectives, from Zakaria's book are the following:

1. A need to prepare for shocks and crises
2. The quality of governance (government) matters more than quantity
3. Markets alone are not enough
4. People should listen to experts, and experts should listen to people
5. Life is digital and hybrid (with pros and cons)
6. Human beings are social animals
7. Inequalities matter
8. Globalisation can assume different and diverse forms
9. Bi-polar world of US-China
10. Realism as idealism

Despite disastrous health and economic effects, the COVID-19 pandemic has created a possibility for change and reform. As systemic responses, and a sign of a shift in economic thinking, governments have opened up their coffers in unimaginable ways. To learn from the crisis, governments should equip people with skills and security they need in an age of bewildering change. More global governance and cooperation are necessary. Growth, openness and innovation, as the traditional recipes for success, could be complemented with new focus areas, such as **security, resilience, and antifragility**. In light of mitigating inequalities, success stems from managing and gaining strength from diversity. The use of digital infrastructures has not compensated for interpersonal interactions. As we could build 21st century infrastructure, we could consider many of **those who are most threatened by new technologies**.

Talwar's (2021) work compiles views from 37 futures researchers and thinkers from 16 different countries around the globe. Offering a timeframe of 5–10 years, as a fairly short one for futures studies, the interconnectedness of pandemic-induced impacts (e.g. on national security) is observed. It raises the issue of **a post-crisis future**, and how to navigate into a sustainable path through manifold opportunities and risks arising from a crisis. Even during the global pandemic, there have been innovations and positive progress. In this sense, a crisis also points to innovations that would be needed.⁴

⁴ Besides numerous popular books on the pandemic, there are several reports and articles on the topic. See e.g. scenarios by the Millennium project at <https://www.millennium-project.org/covid-19/>

2.4 Futures contributions

An interest in **global catastrophic risks** is discussed by Turchin (2008) and Bostrom & Cirkovic (2011). The latter discuss key methodological, ethical, and policy issues, with contributions from experts and thinkers. For some time, the field of futures studies has been interested in the study of wild cards, extreme events and black swans, arguing that **surprises deserve more attention**. In his work on black swans, Taleb claimed that "the world is most changed by surprises" (2007). An interest in highly improbable, yet highly impactful events runs across authors concerned with futures, including in Wilenius et al. (2011) as well as Casti's (2013) views on X-events. Bostrom (2014) was interested in what happens in the event that machines were to surpass humans in general intelligence. Unthinkable events that take everyone by surprise might be perceived as "unknown unknowns". Ugo Bardi (2017), a specialist in resource analysis and system dynamics, writes of how growth can be slow, but ruin is rapid.

Taleb, Nassim Nicolas (2007) *The Black Swan: The Impact of the Highly Improbable*. New York: Random House and Penguin Books.

Turchin, Alexei (2008) *Structure of The Global Catastrophe: Risks of human extinction in the XXI century*. lulu.com, 516 p

Bostrom, N. & Cirkovic, M.M. (2011) (eds.) *Global Catastrophic Risks*. Oxford University Press

Wilenius, Markku, Casti, John, Ilmola, Leena & Rouvinen, Petri (2011) *Extreme Events*. Taloustieto Oy

Goldstein, Bruce Evan (ed.) (2012) *Collaborative Resilience: Moving Through Crisis to Opportunity*. The MIT Press, 424 p.

Casti, John L. (2013) *X-events: Complexity Overload and the Collapse of Everything*. New York: HarperCollins.

Bostrom, Nick (2014) *Superintelligence: Paths, Dangers, Strategies*. Oxford University Press.

Bardi, Ugo (2017) *The Seneca Effect – Why Growth is Slow but Ruin is Rapid*. Springer, 210 p.

Beech, Amanda et al. (ed.) (2020) *Construction Site for Possible Worlds*. Urbanomic.

Diamandis, Peter H. & Kotler, Steven (2020) *The Future Is Faster Than You Think: How Converging Technologies Are Transforming Business, Industries, and Our Lives* (Exponential Technology Series). Simon & Schuster.

Halal, Willian (2021) *Beyond Knowledge: How Technology is Driving an Age of Consciousness*. Foresight Books.

Bardi, Ugo & Alvarez Pereira, C. (eds.) (2022) *Limits and Beyond: 50 years on from The Limits to Growth, what did we learn and what's next?* A Report to the Club of Rome. Exapt Press.

Diamandis & Kotler (2020) treat the accelerating waves of change from converging technologies through society, which impact our daily lives and activities in virtually all sectors (education, health, entertainment, transport, shopping, food). The scope of impacts and sectors is widened to energy, environment, security, and government. Dozens of industries are expected to be transformed – from architecture and artistry to aviation and accounting. Vision, prevention (adaptability and agility) and governance are necessary. According to Beech et al. (2020), conceptualizing alternate realities means deviating from the official, 'normal reality' and calls for overcoming a fear of imagining possible new and compelling futures. Halal (2021) claims we are living not only an age of crises – but that of mega-crises. The only way to survive the Global Mega-Crisis is to transform a way of life that no longer works, for our world to grow up and develop a sustainable global order as the Age of Consciousness – or perish. A 2022 report to the Club of Rome (Bardi & Pereira 2022) revisits the influential "The Limits to Growth" report on infinite growth on a finite planet, asking what lessons humanity has learned, and has yet to learn, as well as what to do about our present challenges.

2.5 Existential and planetary risk – a cosmic perspective

A more recent intellectual strand expresses an interest in **existential risks to humanity**, in the works of Thomas Moynihan and Toby Ord. The concept of **the Anthropocene** makes us face the almost infinitely growing footprint of human species on Earth, as wariness to accelerating biodiversity loss, climate change, and a wide range of environmental effects, illustrated in Kolbert's work.

Kolbert, Elizabeth (2014) *The Sixth Extinction: An Unnatural History*. Henry Holt and Company, 319 p.

Moynihan, Thomas (2020) *X-Risk: How Humanity Discovered Its Own Extinction*. The MIT Press.

Ord, Toby (2020) *The Precipice: Existential Risk and the Future of Humanity*. Hachette Books.

Kolbert, Elizabeth (2021) *Under a White Sky: The Nature of the Future*. Crown.

Moynihan (2020) writes a history of humans thinking about human extinction. Moynihan proposes that the mere conceptualisation of existential risk or X-risk, is a fairly recent thought for humanity, and claims it to be a groundbreaking discovery, as an intellectual milestone. It is argued that such concern demonstrates intellectual maturity. A philosophical account assumes a **cosmic and planetary standpoint** to life on earth, to contextualise our existence, offering historical and civilisational perspectives. In the process, a timeline of risk perceptions in human history is provided. The uncertainty of future events, owing to a complex world, undermines a deeply-held characteristic of the Modern Age, namely probabilistic thinking, as calculus, and its predictive, forecasting techniques. A range of helpful arguments and concepts are offered that broaden our ability to reflect our place in humanity's history and future. A range of useful vocabulary is provided. As a demonstration of such reflections conceptual historian Koselleck differentiated '**spaces of experience**' as historical and present ones from the '**horizons of expectations**', which point to a future that is open and unwritten, an object of hope and anxiety. In the present day, we can expand our mindset and to have radical hopes and think of radical risks (p. 206). **Mental time travel**, also known by palaeoanthropologists and psychologists, appears in the lexicon of futures scholars, too. In other words, we can imagine and visit hypothetical futures (Michaelian et al. 2016; Cuhls 2017). Moynihan advocates for humans to come to terms about their own agency, as a moral imperative, an ability and a duty, concerning their own futures. Why? This gives ourselves a reason to survive and keep on existing. After all, human beings are "the only entity we know of that has a *history* [sic] in the sense of escaping and atoning for the errors of the past" (p. 423) and merely realising this points to the fact that "*there is at least potential for the world to become astronomically better*" (p. 424).

As a difference to Moynihan's intellectual history, for Ord (2020), '**Precipice**' is an **Age when the risk of humankind destroying herself is very high**. Even though not directly futures studies, this book is about futures – about existential risks threatening it and about ways to survive. Understanding the interconnectedness of things and the holistic systems view is present in the book and in the field of futures studies. As a novel approach in risk studies, the book pays special attention to combinations and comparisons of risks, as well to their quantification. **The risk landscape comprises all risks**. We will face numerous now hidden or invisible risks in the next one hundred years period, for example, a deliberately induced pandemic. Actors that could aim at realising dystopic futures are distinguished. The book opens up the concept of existential risk – its origin, nature and various implications. An existential risk can be evaded through some premeditated measures – such as a huge asteroid collision. Ord argues for the protection of the future of humankind, as a key challenge. A grand strategy for such protection could be prepared. In principle, risks

point to security, advanced through peace, education and prosperity. If there is indeed a gap between power and wisdom, what more could be done to bridge this gap? In the book, Ord makes an observation that us, humans, tend to emphasise risks and threats more than opportunities. Would changing this provide any new avenues? At Anthropogenic age, the massive impacts that us humans collectively, as a species, are having on the environment imply (at least) harnessing technology into safe trajectories. Like Moynihan who speaks of a moral responsibility of human beings to preserve their own species, Ord points to the importance of each individual in seeking to accomplish **the long-term potential of humanity**.

American journalist Elizabeth Kolbert (2014) investigates the "**Sixth Extinction**" in her non-fiction book, as the human-induced loss of species. The extinction or near-extinction of many different species is what the present day is about, as humanity is crossing the so-called **planetary boundaries**. An innocent vocabulary of 'global change' is hiding **a biodiversity crisis**, in terms of accelerating rates of species losses, which point to disappearing biodiversity and potential for ecosystems collapses in different parts of the world. The amount of available undeveloped land is declining, global temperature is rising, acidification of oceans is increasing, and so on. For most of the history, humans have not understood when some animals are going extinct. Arguably, in real terms, this is still very much the case today. Losses invisible to the human eye are shaping our world, as we know it, and its future, with incredible pace. It is important to analyse the situation clearly to identify and make sense of the situation at hand, as a starting point. Only from such premises would it be possible to explore solutions, include thinking of suitable messages of hope, given that humans, for all their power to transform the environment, can also preserve, nurture, and protect it.

In a more recent title, "Under the White Sky: The Nature of the Future" (2021) she builds on the theme from a human habitat perspective. In past centuries, human ingenuity has translated to engineering efforts, as a strategy to fight the forces of nature, and underlying ecosystemic interactions. Examples in the book, many from the U.S., are about people trying to solve problems created by people who had been trying to solve problems. In other words, **partial optimisation and unforeseen impacts from interventions**. For example, the flow of Chicago River was reversed, so that Lake Michigan would not be polluted (only so that the waste would flow down the Mississippi River into the Caribbean, and ultimately, the Atlantic.) Further down south, the Mississippi Delta waterways have been diverted and heaps of land moved to keep New Orleans afloat. Another part of the story is in how seemingly **innovative solutions introduce novel problems**. The introduction of carps, as a fish species, was a nature-based solution to purify water pollutants from the Mississippi, but only it was understood that humans in the process created a new, invasive species problem. All in all, some urban systems with their built environments, are in very vulnerable locations. In the case of New Orleans, the circumstances for the famous Hurricane Katrina (2005) did not even amount to **a worst-case scenario**. A geophysical standpoint provides a far more critical lens on the construction and location of some cities.

In other words, when becoming aware of risks, humans may decide to aim to engineer themselves out of foreseeable crisis situations. The book raises **social-scientific issues** (discourse, framing, mindset, political reality) as well as those that speak to **socio-environmental, socio-technical** and **systems perspectives** (feedback loops, gradual environmental change, human-nature systems, legacy infrastructure, path dependency, system modelling with flows, stocks, etc.). Further issues are raised: What systems do we

include (or exclude) as part of our analyses and frameworks? In consequence, how are issues and problems framed, and how do those framings affect resulting recommendations and proposed solutions? One can choose a) the built environment as a starting point, to "control" nature, or b) assume nature and ecosystems as a starting point, to make sense of the design of built environments.

A pessimist image of the future emerges from an interview with belated environmentalist-futurist Ruth Gates: "*A future is coming where nature is no longer natural.*" (p. 94). Inhabited by future generations in urban and rural areas, as the human footprint continues to magnify and a wide range of other on-going changes are shaping our environments, what are their positive images of the future? One example are dream-like engineering solutions, some of them complex mega-projects, which have exorbitant price tags and considerable uncertainty of success. Another example points to market mechanisms, as the costs of some technological innovations are assumed to decrease in the future. Geo-engineering and climate-engineering are niche imaginaries, as a last resort, verging on techno-fatalism. When we think of accumulating change in ecosystems, environments and nature of the future, as a backdrop to **our built environments in 2050, 2100 or 2200**, what in such a world makes us live in harmony?

3. CRISES AND THE FUTURES FIELD

This section presents a literature review on crises from the perspective of futures studies, for fresh scholarly insights on our topic. The section presents how a literature review was conducted, to document the related steps, keywords, journals, timing, scope, resulting outputs, and outcomes. Our literature illustrates a fundamental difference between risk and uncertainty. Drawing on Derbyshire (2017, 81), “for most – or even all – crucial aspects of the future, a full set of possible outcomes is not known, and can never be known, in advance”.⁵ An element of disbelief is about the recognition of uncertainty or even deep uncertainty. Understanding the element of surprise speaks to the latest developments in futures studies methodology, and can offer theoretical justification, for example, for scenario planners. As a limitation, articles in non-futures studies and foresight journals on crises and risks, including communication and management perspectives were excluded.

3.1 Literature review

The literature review about risks, crises, shocks, X-events and black swans addressed articles published in seven main international futures studies and foresight journals between January 2015 and May 2021.

The following journals were covered accordingly:

- European Journal of Futures Research
- Foresight
- Futures
- Futures & Foresight Science
- Journal of Futures Studies
- Technological Forecasting and Social Change
- World Futures Review

The keywords for Scopus were:

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TITLE-ABS-KEY(risk OR crisis OR shock OR "black swan" OR "X-event") SRCTITLE(Futures OR Foresight OR European Journal of Futures Research OR "Technological forecasting" OR "World Futures Review" OR "Futures & Foresight Science" OR "Journal of Futures Studies")
```

Since not all seven journals are listed in Scopus, articles in the other journals between 2015 and early 2021 were manually scanned. MS Excel was used to document the process, outputs and the results. As outputs, the most articles were retrieved from *Technological Forecasting and Social Change* with 114 articles out of 1,156 document results, partly mirroring the volume of scholarly articles published in the journal. *Futures* yielded 54 articles from 348 document results. Out of 38 issues in *Foresight*, published six times per year, yielded 29 articles. *World Futures Review* yielded 11 articles as well as two Special Issues.

⁵ This follows the principle that future is not predictable as presented by Amara as early as 1981.

The three other journals (*European Journal for Futures Research*, *Futures & Foresight Science* and *Journal of Futures Studies*) only provided individual hits on crises. In addition, a special Issue in *Futura* (2017), the Finnish journal for futures studies dealing with urban futures is worth mentioning.

At this stage, a total of 208 articles had been filtered for further analysis. As the next step, the titles and abstracts of these articles were scanned. After this, the most interesting abstracts were read. As a result, altogether 20 articles were selected as the most relevant ones for this study. Articles that dealt with individual or sectoral risks were considered intriguing, but not many made the list of the most interesting articles. The twenty most appropriate articles for our purposes primarily deal with **the intellectual history, nature, and categorisation of crises, with related theorisations**. Bearing in mind the original search string, for future purposes, selected articles that specifically deal with the aspects and role of governance in crises, disasters and under complexity as well as urban development were saved.

3.2 Key insights from top publications in futures studies and foresight

The most interesting articles were co-assessed by three different researchers using a framework in five categories⁶: 1) the key messages of the article, 2) the key implications for our project theme, 3) argumentation, novelties, surprises and room for further thought, 4) state-of-the-art for futures field, and 5) relevance/other comments. Here, we present and discuss the key articles and their contributions.

Labaka, L., Hernantes, J., & Sarriegi, J. M. (2016). A holistic framework for building critical infrastructure resilience. *Technological Forecasting and Social Change*, 103, 21-33. <https://doi.org/10.1016/j.techfore.2015.11.005>

As societies are more and more dependent on the proper functioning of critical infrastructures, Labaka et al. (2016) call for a holistic framework for building critical infrastructure resilience, as crises that affect them usually aggravate their impact on society. If literature provides several resilience frameworks, actual implementation is at early stages. In this article, the dimensions of resilience are: 1) technical, 2) organisational, 3) economic, 4) social. The main features of resilience are: i) robustness, ii) redundancy, iii) resourcefulness, and iv) rapidity. Their work argues for a move from discussing resilience to **implementation of resilience**. An influence table assesses the influence of policies at prevention, absorption and recovery stages, which resembles an Impact Matrix (futures table). The authors agree that although we can do foresight, we cannot predict the future.

Liu, H. et al. (2018). Governing Boring Apocalypses: A new typology of existential vulnerabilities and exposures for existential risk research. *Futures* 102, 6–19. <https://doi.org/10.1016/j.futures.2018.04.009>

Liu et al. (2018) draw on risk research, academic and popular titles, to define risks as a function of hazard, vulnerability and exposure (**hazard * vulnerability * exposure = risk**). A taxonomy is proposed of 1)

⁶ The relevance of the articles was assessed by the authors of this eBook as internal desktop exercise.

vulnerabilities and of 2) **exposures**, which contribute to existential risks. Critical common global infrastructures (the internet, energy markets, and cultural and scientific harmonization) are examples of exposures, instead of vulnerabilities, because these reveal new interfaces between hazards and vulnerabilities. It is noted that **a risk in achieving ‘safety’ lies in its ‘symbolic’ nature**. As a collective, we may think that “we are all clear”, when in fact we could be all the more fragile. The authors claim that even catastrophic ‘existential outcomes’ may arise from various sources and social vulnerabilities, through the complex interactions of disparate social, cultural and natural processes. Arguably, in isolation, many of them may not be seen as globally catastrophic, let alone existential risks. Hence, the term **‘boring apocalypses’**, and the necessity for **‘Governing Boring Apocalypses’**. The origin of an existential hazard may be technological, but legal and policy tools could be deployed to build resilience and robust responses.

Beard, Simon, Rowe, Thomas & Fox, James (2020), An analysis and evaluation of methods currently used to quantify the likelihood of existential hazards, *Futures*, 115, 102469, <https://doi.org/10.1016/j.futures.2019.102469>.

Improving our understanding about the analysis and evaluation of methods used to consider risks and crises, Beard et al. (2020) discuss just that for **the assessment of what methods can be used to study existential hazards**. They write that currently, many methods exist, and therefore, it is important to know what hammer is used for which nail, and with what limitations. They classify current method portfolio based on four criteria: rigour, uncertainty, accessibility, utility. The current state of the art on existential risk research is largely based on mathematical logic, including Bayesian thinking. Currently at existential risk research, no method is perfect. Therefore, they call for a more critical approach to methodology. As the Existential Risk field is widening, it is open to new frontiers. For example, qualitative futures studies methods, such as variations of the Delphi method, could enrich the existential Risk studies community.

Torres, P. (2019) Facing disaster: the great challenges framework, *Foresight* 21 (1), 4–34. <https://doi.org/10.1108/FS-04-2018-0040>

Torres (2019) acknowledges that the nature of catastrophic crises, as existential risks, as a side of futures has not previously been well explored. Building a typology, the most pressing global-scale risks to human survival and prosperity are highlighted, with a special emphasis is on the combinations or clusters of these events. All categories have highly causal and underlying aspects, and the paper concludes with Black Swan like categories futures scholars are familiar with. The long term as well as evolution of humans (or lack of evolving) is considered. Complexity is a constant aspect linked to possible futures as well as factors that hinder getting to ‘good healthy’ futures (or just surviving). Many categories consider unintended consequences that might be omitted from a normative view, like Existential Risk Singularity – which he calls as ‘monsters’ (unknown unknowns) or types of doomsday scenarios. A consideration of **the cosmic scale** helps contextualise planetary, societal and personal threats, as it pushes our thinking one step further.

Jurgilevich, A. (2021) Governance modes and epistemologies of future-oriented vulnerability assessments: Example of a mixed-methods approach. *Futures*, 128, 102717. <https://doi.org/10.1016/j.futures.2021.102717>

After all, the assumptions of what is constituted as knowledge, what we focus on, and how we do it, fundamentally matter, pertaining to issues of epistemology. This point is repeated by Jurgilevich (2021), in her study of climate change adaptation, who claims that **future-oriented vulnerability assessments are rare**, although vulnerability and risk assessments are common. Investigating the causes of future vulnerability

and understanding what socioeconomic processes are driving it is a call for overcoming conceptual and methodological gaps. In terms of methodological advancement, steps away from solely quantitative approaches are recommended. In the light of recent literature from the perspectives of science and practice, with an aim to investigate the mechanisms of future vulnerability development in Helsinki, Finland, for year 2050, presenting a novel mixed methods approach. Understanding what underlying epistemology informs future-oriented vulnerability assessments could have implications for practice (praxis), including the governance modes where the findings of such assessments shape society.

For further reading, issue 121 in *Technological Forecasting and Social Change* (2017) has a Special section "Moving forward to Disaster Resilience", which deals with city and community resilience under disasters and risks. An article-collection in *Futures* (2015) deals with existential risks.

3.3 International reports on risks and crises

Building on Ahvenharju et al. (2021, 69–72) who list a range of reports produced by international expert bodies that deal with future thematics and foresight work, 37 international policy reports on crises and risks were identified. A number of international, and some domestic reports concerning crises and risks have been produced by knowledge producing bodies and policy actors and informing bodies, some annually, others less frequently. Primarily, they have been authored by international bodies such as the Atlantic Council, the Organisation for Economic Co-operation and Development (OECD) and the World Economic Forum (WEF) as well as the UN Environment's work, as a more recent example. Authored during roughly a ten-year period, the large majority are from 2014–2020, with earliest report stemming from the year 2008. Selected additional titles have been added.

As a short overview, these reports deal with risks and crises from the perspective of:

- Global **perceptions on risks** (Atlantic Council)
- **Complexity, systems change** as well as **discontinuities** (JRC, Forum for the Future, Futuribles, Ipsos, RAND Corporation)
- The planetary emergency (Club of Rome), Earth-affecting risks (Future Earth) and global environmental threats (UNEP)
- Drivers of **global catastrophic risks** and **existential risks**, including those deriving from technology (Centre for the Study of Existential Risk, Future of Humanity Institute, Global Priorities Project, Open Philanthropy, Pamlin and Armstrong, UK Government Office for Science)
- **Governing or managing crises** (OECD) as well as dealing with crises that seem unpredictable and unmanageable from a '**what if?**' perspective (EU Institute for Security Studies)

Table 1. International reports on crises and risks (adapted from Ahvenharju et al. 2021, 69–72).

Author	Report	Year
Atlantic Council	Global risks 2035 update: Decline or new renaissance?	2019
Atlantic Council	Global risks 2035: the search for a new normal	2016
Atlantic Council / IMEMO	Global System on the Brink: Pathways toward a new normal	2016
Centre for the Study of Existential Risk (Cambridge)	Identifying and Assessing the Drivers of Global Catastrophic Risk	2020
Centre for Long-Term Resilience. Co-authored by Toby Ord, 2021	Future Proof: The opportunity to transform the UK's resilience to extreme risks	2021
Club of Rome	Planetary emergency 2.0	2020
EU Institute for Security Studies (EUISS)	What if.. Conceivable crises: unpredictable in 2017, unmanageable in 2020?	2017
EU JRC	Managing Complexity (and chaos) in times of crisis	2021
Forum for the Future	Driving Systems Change in Turbulent Times	2019
Future Earth	Future Earth Risks Perceptions Report 2020	2020
Future of Humanity Institute	Record of the Workshop on Policy Foresight and Global Catastrophic Risk	2008
Future of Humanity Institute	Unprecedented Technological Risks	2014
Futuribles	Scénarios de rupture à l'horizon 2040-2050. Rapport Vigie	2020
Global Priorities Project	Existential Risks: Diplomacy and Governance	2017
Government Office for Science (UK)	Managing existential risks from emerging technologies	2014
Ipsos	Global Trends 2020: Understanding Complexity	2020
OECD	9th OECD High Level Risk Forum	2019
OECD	OECD Science, Technology and Innovation Outlook 2021: Times of Crisis and Opportunity	2021
OECD	OECD Science, Technology and Innovation Outlook 2018: Adapting to Societal Disruption	2018
OECD	The Changing Face of Strategic Crisis Management, OECD Reviews of Risk Management Policies, OECD Publishing, Paris	2015
OECD	Future Global Shocks: Improving Risk Governance	2011
Open Philanthropy	Global Catastrophic Risks	2014
Pamlin, Dennis & Armstrong, Stuart	12 Risks that threaten human civilisation: The case for a new risk category. Global Challenges Foundation.	2015
RAND Corporation	Global Health and Security: Threats and opportunities	2019
RAND Corporation	Speed and Security: Promises, Perils, and Paradoxes of Accelerating Everything	2018
RAND Europe	Discontinuities and Distractions — Rethinking Security for the Year 2040: Findings from a RAND Corporation Workshop	2018
UNEP	Frontiers 2022: Noise, Blazes and Mismatches	2022
UNEP	Frontiers 2018/19: Emerging issues of environmental concern	2019
UNEP	Frontiers 2017: Emerging issues of environmental concern	2017

UNEP	Frontiers 2016: Emerging issues of environmental concern	2016
UNEP	Global Environmental Outlook 6 (GEO-6)	2019
UNEP	21 Issues for the 21st Century: Result of the UNEP Foresight Process on Emerging Environmental Issues.	2012
World Economic Forum	Global Risks Report 2022	2022
World Economic Forum	Global Risks Report 2021	2021
World Economic Forum	Global Risks Report 2020	2020
World Economic Forum	Global Risks Report 2019	2019
World Economic Forum	Global Risks Report 2018	2018

An annual Global Risks Report is published by the World Economic Forum. The latest, 2022 report, presents their Global Risks Perception Survey results. Globally, for the next 2 year-horizon, societal risks (livelihoods, social cohesion, mental health) dominate. For the next 5 years, respondents signal societal and environmental risks as the most concerning ones. Over a 10-year time horizon, risks on the health of the planet (biodiversity loss, climate action failure, extreme weather) dominate. Technological risks, such as digital inequality and cybersecurity failure, may be blind spots of contemporary risk perceptions. **International risk mitigation efforts not yet started or still in early stages** are about in artificial intelligence, space exploitation, cross-border cyberattacks and misinformation as well as migration and refugees. Nationally, for 124 economies, perceptions of TOP 5 risks are presented for each country, based on an Executive Opinion Survey asked for top five risks in one's own country from 12,000 leaders.

The UN Environment publishes a Frontiers series of **'emerging' environmental issues based on new scientific information and knowledge**, pointing to new methods of addressing existing issues, or mounting impacts of existing issues. The Frontiers reports attend to local, seemingly small-scale issues, which could become regional and global issues, deeply affecting the environment and people's livelihoods. These novel knowledge products complement the traditional Global Environmental Outlook volumes. The GEO-6 (2019), as an authoritative report comprises many types of data on the deterioration of the global environmental situation. GEO-6 embeds results from a foresight process in early 2010s, and its '21 Issues for the 21st Century' (2012) under five sub-themes: 1) food, biodiversity and land; 2) freshwaters and marine life; 3) climate change; 4) energy, technology and waste; as well as 5) cross-cutting areas of action.

An exploration of possible futures and disruptions is provided by by the Futuribles team, of 24 authors, with other experts, based on a scenario work, which started in 2019 (Désaunay and de Jouvenel 2020)⁷. Disruptions (as rupture scenarios) are described as scenarios and analysed through a systemic analysing three-fold framework of 1) a planet with limited resources in rapid degeneration; 2) the limits to global capitalism; 3) and geopolitics, new division of power, and governance. The work entails 50 mini-scenarios in the three main fields. The framework raises interesting questions: What is a trend scenario? What is a disruption scenario 2040–2050? What heavy trends could lead to disruption scenario? What events could increase the probability of this scenario? How could a disruption scenario roll out? And, finally, what implications could arise from a disruptive scenario? An exploration of possible futures and disruptions is now needed more than ever in order to **prepare both for the very probable transformational ruptures and**

⁷ See more on this in Ch 4.1.

for uncertainties. A time horizon 2040-2050 visualises the foresight material, as an appealing example of science communication in futures studies. Lack of crisis foresight results in blindness, voluntary or unintended. However, to anticipate crises is not enough in order to prepare for them.

In their Joint Research Centre (JRC) report, Rancati & Snowden (2021), propose a **four-stage approach**, called Cynefin, so that one can: 1) assess the type of crisis and initiate a response; 2) adapt to the new pace and start building sensing networks to inform decisions; 3) repurpose existing structures and working methods to generate radical innovation; 4) transcend the crisis, formalise lessons learnt and increase resilience.

3.4 Domestic reports on crises and risks

In addition to these international reports on crises and risks, five domestic reports that deal with Finland, published in Finnish language, were identified (Table 1 and Table 2). The list is a useful starting point to the theme, and does not claim to be a comprehensive one.

Table 2. Domestic reports on crises and risks (adapted from Ahvenharju et al. 2021, 69–72).

Author	Report	Year
Sisäministeriö	Kansallinen riskiarvio 2015	2015
Sisäministeriö	Kansallinen riskiarvio 2018	2018
Sitra	Megatrendit koronan valossa	2020
VNK	Ilmastokestävä Suomi – Toimintamalli sää- ja ilmatoriskien arviointien järjestämiseksi	2018
Winland-hankkeen julkaisu	Failand 2040 – Kuinka Suomen kokonaisturvallisuus voisi romahtaa tulevaisuudessa	2017

Two of these reports are about national risk assessments (2015; 2018), published by Ministry of the Interior (Sisäministeriö). One discusses the impacts of a crisis on megatrends (Sitra, the Finnish Innovation Fund, 2020). One by the Prime Minister's Office is about a climate resilient Finland (2018). Finally, one by an academic research project deals with comprehensive resilience (2017).

4. CONCEPTUAL MINDMAP OF THE VUCA WORLD

This chapter presents the conceptual landscapes of the phenomena and concepts that we consider relevant in studying the societal transformation where we are currently living in, accentuated by various risks and crises. Such opening up the “mine-field” of crises in that landscape is assumed to help in steering change through turbulence. The key concepts are given with succinct definitions and backed up by some illustrative key references. First the framework of the VUCA World and its four dimensions is opened up (4.1): Then relevant VUCA related concepts are discussed (4.2). A third group of concepts consists of “stunning” futures signals (4.3). The last cluster of concepts addressed is about various types of change and responsive approaches to it (4.4)

4.1 Four dimensions of the VUCA world

The VUCA world (e.g. Kaivo-oja & Lauraeus 2018; Heinonen et al. 2017b) = our world increasingly filled with **V**olatility, **U**ncertainty, **C**omplexity and **A**mbiguity (Figure 3). We can apply the concept in any context, in urban planning as well. For example, Goel et al. (2021) in their book on “Self-sustainable smart cities: Socio-spatial society using participative bottom-up and cognitive top-down approach” describe how “the 5G will become a leading driving force in the VUCA world, affecting every end user, global economy and the entire society.”

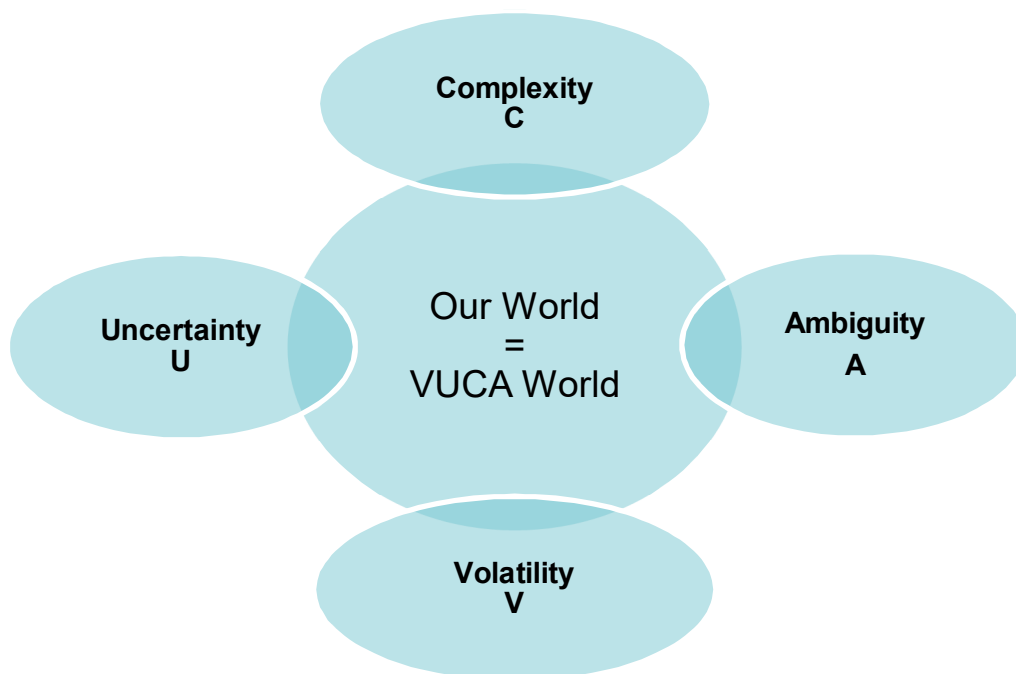


Figure 3. Conceptual mindmap of the VUCA world.

The four dimensions of the VUCA world in the above mindmap are further opened up in the following table.

Table 3. The VUCA world as briefly described.

Descriptions of the four VUCA dimensions		Examples
Volatility	= increased dynamics in many fields characterized by changing directions of change, by a high frequency of ups and downs, by more rapid disruptions of trends	Stock markets today are more volatile than before
Uncertainty	= the probabilities of either likelihoods or outcomes are not known, in situations that involve imperfect or unknown information, also concerning future events	Are societies equipped for accelerating uncertainties across domains?
Complexity	= the quality or state of being complex , a whole made up of complicated or inter-related parts	The complexity of living systems and human societies
Ambiguity	= a situation in which probabilities are known but outcomes are unknown, as a distinct type of uncertainty	This is a first step toward clarifying things, but there are many ambiguities , making interpretations vary

Volatility is a common concept in finance. It refers to the degree of variation of a trading price series over time, usually measured by the standard deviation of logarithmic returns. (Wikipedia). Historic volatility measures a time series of past market prices. In general use, volatility means the rapid changes of a phenomenon over time, often with unexpected turns or periods. Originally, volatility is a statistical measure of the dispersion of returns for a given security or market index. In most cases, the higher the volatility, the riskier the security. For example, when the stock market rises and falls more than one percent over a sustained period of time, it is called a "volatile" market. In the VUCA world context, volatility means the nature, speed, volume and magnitude of change that is not in a predictable pattern (Lawrence, 2013, Sullivan, 2012; Kaivo-oja & Lauraeus 2018). Volatility manifests as turbulence, a phenomenon that is occurring more frequently than in the past.

Uncertainty, where we do not know the probabilities of either likelihoods or outcomes, is different to the term risk. The implications of uncertainty are explored in Scoones (2019) through five different ways of thinking about uncertainty, from highly diverse literatures encompassing societal, political, cultural, practice and individual perspectives. Knowledge about uncertainty is co-constituted with social, institutional and political orders, so it really matters how we understand and respond to the multiple conditions of uncertainty. Helga Nowotny, in her book, "The Cunning of Uncertainty", argues that uncertainty is 'written into the script of life' (2015: 1). A fundamental condition that has been met in all ages. The lack of predictability has become more prominent due to the impact of innovations, political developments, and lifestyle shifts.

There are long traditions of reflecting on uncertainty. These include philosophical traditions of scepticism and creativity, ranging from Socrates to Erasmus to de Montaigne (Ravetz 2008); the quantum view of physics, from Heisenberg to Schrodinger (Buckman 2008); and perspectives in economics, from Keynes to von Hayek to Marx (Diamond & Rothschild 2014). In different ways, all point to the challenges of human control and technocratic management, and so confront a Cartesian and modernist rationalism. Nobel prize-winning physicist Richard Feynman neatly captured the ambitions of science to embrace uncertainty: "It is

imperative in science to doubt; it is absolutely necessary, for progress in science, to have uncertainty as a fundamental part of your inner nature. To make progress in understanding, we must remain modest and allow that we do not know. Nothing is certain or proved beyond all doubt. You investigate for curiosity, because it is *unknown*, not because you know the answer". (Feynman 1956/2001: 247–8). We must bear in mind, though, that uncertainty in science, and science in general, may be interpreted differently in the public sphere than in the scientific community.

Complexity theory is used by many authors to critique the use of reductionist science to guide decision-making, and is used to encourage more pragmatic, humble, reflexive and adaptive approaches to policy making.⁸ Varied readings to be recommended include Kauffman (1995), Rosen (1991), Schneider & Kay (1995), Sole & Goodwin (2000), Weaver (1948), and Weber (2010). One definition by Johnson (2001, 19) characterises complexity as the behaviour of a system or model whose components interact in multiple ways and follow local rules, meaning there is no reasonable higher instruction to define the various possible interactions.

When we talk about complexity, we talk about systems. Complexity is a property of systems. (Byrne & Callaghan 2014). Therefore, complexity thinking is akin to systems thinking. There are diverse schools of complexity thinking. Scholars have used these ideas in a multiplicity of ways, ranging from health inequalities to the organization of large-scale firms. Some understand complexity as emergence from the rule-based interactions of simple agents and explore it through agent-based modelling. Others, however, argue against such 'restricted complexity' and for the development of case-based narratives employing a much wider set of approaches and techniques. Casti (2013) warns about the collapse of everything due to complexity overload. Masini (1993) on the other hand, reminds us that complexity is not necessarily a limitation, but may also be a positive quality. We should live in complexity, with complexity and not try to manage it. Thus we might better understand what society is in relation to each human being. According to Masini this would lead to understanding that society is much more than the sum of individuals who compose it. Especially for futures studies the concept of complexity is crucial, close to the two other key concepts in futures field i.e. holistic thinking and systems thinking (see e.g. Meadows 2008). Interconnectedness and emergence are further elements related to complexity and communities as described by Johnson (2001). For urban planning, cities indeed represent complexity as a prime example (Batty 2009; Portugali 2011).

Ambiguity, according to Stirling (2007), is defined as a situation in which probabilities are known but outcomes are unknown. The ambiguity of outcomes is not necessarily due to lack of knowledge, but to the fact that one cannot predict which of the known outcomes will be realized. Ambiguity occurs when signs bear multiple (legitimate) interpretations in a language or a system of signs (Sennet 2021). Ambiguity thus results in many various interpretations of a phenomenon and its development potential. Dictionary defines ambiguity as the quality of being open to more than one interpretation; inexactness. Thus, in a way, ambiguity is part of uncertainty, but its nature is amoeba-like vagueness. Ambiguity is related to hybridization, which is an increasing phenomenon in society. Urban planning is concerned with hybrid spaces, which are ambiguous i.e. in need of critical analysis whether they are resilient in times of crises. In futures studies,

⁸ <https://plato.stanford.edu/entries/life/>

ambiguity is especially intertwined with interpretations. A topic becomes ambiguous and fuzzy, due to various, sometimes contradictory interpretations. An example in place is weak signals, which may represent very different things to different stakeholders.

4.2 VUCA related concepts

The VUCA world is a world of vulnerability. Vulnerability means openness to various disadvantages and calamities. In this section the following VUCA related concepts that add to vulnerability are provided: *Risk, Threat, Hazard, Global Challenges, Crisis, Catastrophe, Disaster, Collapse, Chaos, Emergency, Shock and Surprise*.

Vulnerability is a key characteristic as related to risks, crises and other adversaries. It refers to the quality of being vulnerable and to the state of being easily hurt, influenced, or attacked, either physically or emotionally. Vulnerability can be concerned with health, economic or political issues. For example, global inequality also increases the political, economic, and environmental vulnerability of especially small states and less developed countries, due to their lack of financial capacity. (Cambridge Dictionary) According to Liu (2018) risks are a function of hazard, vulnerability and exposure. A taxonomy is proposed of 1) vulnerabilities and of 2) exposures which contribute to existential risks. Social vulnerability and human-driven (anthropogenic) exposure require improved governance and coordination for adaptation strategies. Importance of law and governance approaches, even where the origin of the existential hazard itself is technological. Law and policy tools might be more productively deployed as a means to building resilience and robustness. Future is accounted in different ways in vulnerability assessments, as described by Jurgilevich (2021). If one is bold enough to take risks, this is bound to create vulnerability. Thus, vulnerability is also related to the quality of boldness in action. On the other hand, vulnerability may be due to structural or infrastructural reasons. A concrete example is the lack of sufficient number of bomb shelters for citizens during a war.

As a landscape of vulnerability, the following Figure 4 depicts the relation of crisis and crisis-related phenomena and their impacts in the VUCA World.

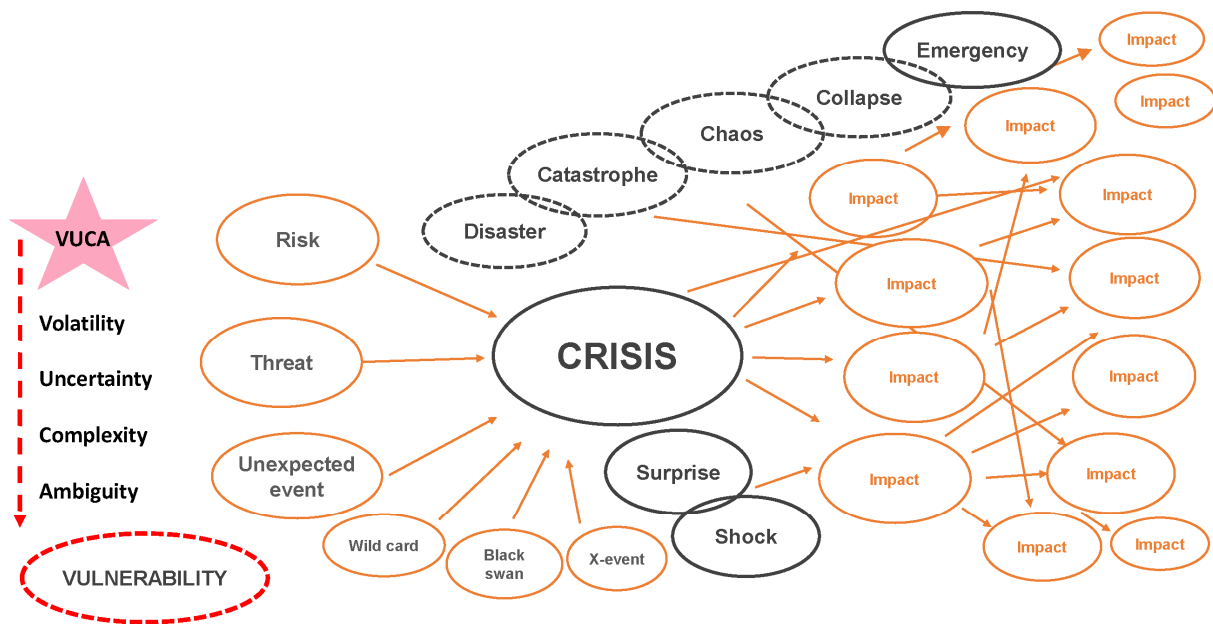


Figure 4. The relation of crisis and crisis-related phenomena and their impacts in the VUCA World.

Risk means exposure to the possibility of loss, injury, or other adverse or unwelcome circumstance; a chance or situation involving such a possibility (Oxford English Dictionary). “Risk is the possibility of something bad happening.” Risk involves uncertainty about the effects/implications of an activity with respect to something that humans value (e.g. health, well-being, wealth, property or the environment), often focusing on negative, undesirable consequences. The international standard definition of risk for common understanding in different applications is “effect of uncertainty on objectives”. Many different definitions have been proposed.

The understanding of risk, the methods to assess and manage, the descriptions and the definitions of risk differ in different areas (business, economics, environment, finance, information technology, health, insurance, safety, security etc). ISO 31000 provides a common approach to managing any type of risk. (Wikipedia). Ulrich Beck (1992) coined Risk Society, as “a systematic way of dealing with hazards and insecurities induced and introduced by modernisation itself”. Anthony Giddens (1990), on the other hand, defines it as “a society increasingly preoccupied with the future (and also with safety), which generates the notion of risk“. It is worthwhile to bear in mind that risk as such is not yet a crisis, when it is realized, it may lead to a crisis (but not always).

According to Hansson (2021) there are five types of risks:

1. risk = an *unwanted event* which may or may not occur.
2. risk = the *cause* of an unwanted event which may or may not occur.
3. risk = the *probability* of an unwanted event which may or may not occur.
4. risk = the *statistical expectation value* of an unwanted event which may or may not occur.
5. risk = the fact that a decision is made under conditions of *known probabilities* (“decision under risk” as opposed to “decision under uncertainty”).

Risks occupy a whole field of risk assessment, risk management, et cetera. However, Renn et al. (2011) criticize the reduction of risk to calculable probabilities for this concept may lead to the use of “technocratic, decisionistic and economic models of risk assessment and management” (p. 234).

There are different types of risks (see Moynihan 2020). One can also see risks differently. Risk can be considered as a threat or an opportunity. **Sudden risks** are risks coming out of the blue. **Cascading risks** are risks that are accumulating. Realisation of one risk may imply systemic related risks. **Creeping risks** are those that are gradually strengthening and may escape our notion. **Existential risks** are the heaviest category of risks. Liu (2018) has a formula for them: Existential risk = Hazard * Vulnerability * Exposure. In their study on existential risks Steinmüller & Gerhold (2021) introduce a novel concept of ‘avoidability’.

Moynihan (2020) reminds of the first probabilistic forecast of an X-risk: the French astronomer Lalande calculated in 1773 the odds of Earth’s deadly intersection with a comet as ‘76 mille contre un’. Provoked panic on the streets of Paris due to sensationalised reporting in newspapers. Moynihan (ibid.) argues that with taxonomic self-awareness comes consequent awareness of taxonomic precariousness. Thinking of ourselves as a species, we became able to think about our dying out as a species. Bayesian view: our own ignorance concerning ‘unknown unknowns’ can itself be a measurable threat. Risk, reason, and responsibility are all intimately entwined. He claims that “self-conscious representation of oncoming dangers is possibly uniquely human. This strengthens our ability to talk about the possible and the impossible. This also allows us to mentally simulate the future and manipulate such simulations, i.e. to embark on ‘*Proscopic chronostheisa*’ = mental time travel.

An emerging field of scientifically serious study focuses on our possible extinction, and historical trajectories to it. A massive handbook of existential risks by Ord (2021) defines and describes them in detail and in classification. According to Ord (ibid.), the Anthropogenic Age is the era when humans have huge impacts on the environment, whereas the Age of the Precipice is the era when humankind has a high risk of destroying itself. The existential risks threaten not only to destroy the present, but the future as well, and betray the legacy of the past. He claims that not enough attention has been given to existential risks by states, academia, or civil society. A small group of scientists, mainly philosophers, from Oxford (Future of Humanity Institute) and Cambridge University (Cambridge Centre for the Study of Existential Risks CSER) have been focused on such studies. Ord proposes as a key challenge to humankind to protect the future of humanity. A pragmatic grand strategy should be prepared for that.

Threat is the possibility of trouble, danger or disaster (Oxford English Dictionary). “There is a real threat of war. There is a constant threat of disease.” Threat of something is looming. Here one has to remember that – like in the case of risks – a threat as such is not yet a crisis → when it is realized, it may lead to a crisis (but not always). On the other hand, threats as such may cause a lot of stress, resulting in e.g. mental health problems, even though the issue that is threatening were never to happen.

Hazard is a threat of various nature. A natural hazard is the threat of an event that will likely have a negative impact. A natural disaster is the negative impact following an actual occurrence of natural hazard in the event that it significantly harms a community. Natural hazards may relate to management of water (sea, lakes, rivers, snow etc), GeoScience, seismology, climate change, wars, and environment.

Global/Grand Challenges are widescale challenges for humankind to address. The Millennium Project has a framework of 15 Global Challenges that can be used for analysing what has been achieved so far and what obstacles there are (Glenn et al. 2019).⁹ Then, these arbitrations can be subjected to local contexts in order to find ways and measures needed for facing such challenges. A similar framework is given in the form of United Nations' Sustainable Development Goals, goals that the UN set for sustainable development globally (Figure 5).

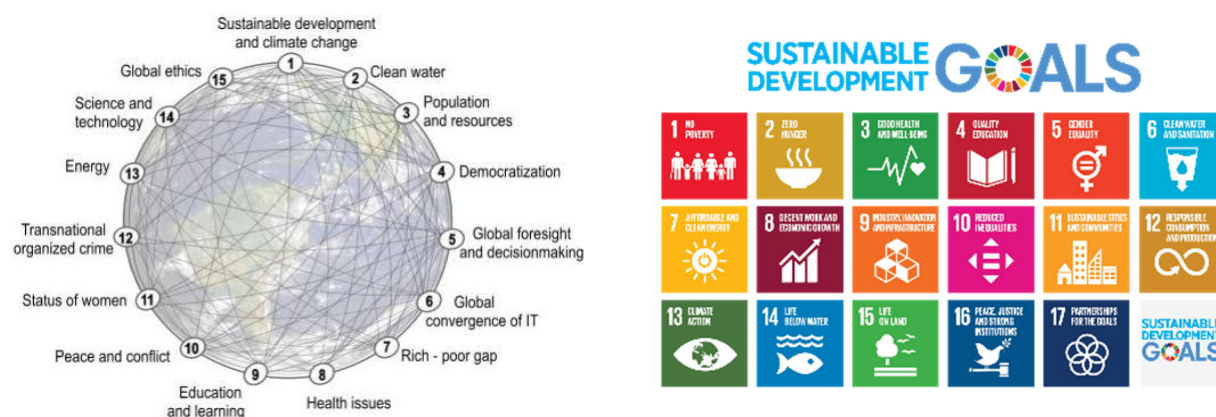


Figure 5. Frameworks of the Millennium Project 15 Global Challenges and the UN Sustainable Development Goals.

Crisis is any event or period that will lead, or may lead, to an unstable and dangerous situation affecting an individual, group, or all of society. Crises are negative changes in the human or environmental affairs, especially when they occur abruptly, with little or no warning. More loosely, a crisis is a testing time or an emergency. Crisis is a sequence of sudden disturbing events harming the organization, people, society. Crisis generally arises on a short notice. Crisis triggers a feeling of fear and threat amongst the individuals. In English, crisis was first used in a medical context, for the time in the development of a disease when a change indicates either recovery or death, that is, a turning-point. It was also used for a major change in the development of a disease. By the mid-seventeenth century, it took on the figurative meaning of a "vitaly important or decisive stage in the progress of anything", especially a period of uncertainty or difficulty, without necessarily having the implication of a decision-point.

The process of handling unexpected and sudden changes in organization culture is called as crisis management. In the RESCUE project the first phase was on identifying, clustering and analysing various crises (a total of 153) and their impacts (Tähtinen et al. 2022). The Chinese character describing 'crisis' has been claimed to refer to both 'threat' and 'opportunity'. More recent commentators argue that this could be a

⁹ Since 1997, The Millennium Project has published 19 editions of *The State of Future* in 8 languages. See <https://www.millennium-project.org/>

translation error by Western scholars, and the second, highly polysemous, character jī (机; 機) does not mean "opportunity" in isolation, but something more like "change point".¹⁰

Catastrophe is an event causing great and usually sudden damage or suffering; a disaster, a devastating event. The term comes from the Greek κατά (kata) = down + στροφή (strophē) = turning (Greek: καταστροφή). A sudden event that causes very great trouble or destruction (Cambridge Dictionary). Typically "an environmental/ecological catastrophe", such as an earthquake, eruption of a volcano, tsunami, hurricane, flood...A disaster to the natural environment can be due to human activity, e.g. Chernobyl catastrophe that took place in 1986. Impending climatic catastrophe means conjectured runaway climate change resulting from a rise in the average temperature of the Earth's climate system. It may also refer to cosmic catastrophe e.g. thought experiment about what would happen if the sun were to suddenly disappear. Catastrophe can also refer to a Malthusian catastrophe i.e. prognosis of a forced return to subsistence-level conditions once population growth has outpaced agricultural production.

Disaster is an event causing great and usually sudden damage or suffering; closely synonymous to catastrophe (Cambridge Dictionary)¹¹. "News of the *disaster* shocked the whole world. The plane narrowly avoided *disaster* when one of the engines cut out on take-off." It refers to an event that results in great harm, damage, or death, or serious difficulty. The destruction of the rain forests is an *ecological disaster*. Floods and earthquakes are *natural disasters*. Humanity should brace itself for shocks following a global disaster, whether natural or anthropogenic in origin (Torres 2019, 23).

Collapse is an instance of a structure falling down or giving away.¹² Collapse means a sudden failure of a system, organization, business, etc. massive destruction (for various types of collapses, see e.g. Bardi 2020). Bardi (2018) defines such collapses as the Seneca Effect. The Ancient Stoic philosopher Seneca¹³ compared how the the growth and building of cities is slow, but how rapidly their collapse and destruction can take place. Jared Diamond (2005) traced the patterns of catastrophe, including the collapse of the Easter Island population, and weaves an all-encompassing global claim through a series of fascinating historical-cultural narratives. Rise and Fall (i.e. collapse) of the Roman Empire is an evergreen topic for studies. The collapse of communism changed East-West relations. Tainter (1988) paints a thorough portrayal of collapse in society due to their complexity. See also: *tipping point*, which may precede collapses. Futures signals (see more in Ch 4.3) may indicate direct or indirect causes for an imminent collapse. Collapse is also labelled as one of the four archetypes of futures in Jim Dator's (2009) classification (growth, collapse, discipline, transformation). Furthermore, Casti (2013) explains the collapse of a civilization to be human nature's way of reducing complexity overload.

¹⁰ Popular understanding on the debate: https://en.wikipedia.org/wiki/Chinese_word_for_%22crisis%22
<https://www.linkedin.com/pulse/chinese-word-crisis-emily-chang/>

<https://www.quora.com/Is-this-true-that-as-stated-by-JFK-When-written-in-Chinese-the-word-crisis-is-composed-of-two-characters-One-represents-danger-and-the-other-represents-opportunity>

¹¹ See more at <https://dictionary.cambridge.org/dictionary/english/disaster>

¹² See more at <https://dictionary.cambridge.org/dictionary/english/collapse>.

¹³ For Seneca's ideas of progress and moral values see also Heinonen 2000.

Chaos is a synonyme for complete disorder and confusion. A concrete example, “*snow caused chaos in the region.*” In physics, chaos is the property of a complex system whose behaviour is so unpredictable as to appear random, owing to great sensitivity to small changes in conditions. Chaos theory, originally in mechanics and mathematics, is the study of apparently random or unpredictable behaviour in systems governed by deterministic laws. A more accurate term, deterministic chaos, suggests a paradox because it connects two notions that are familiar and commonly regarded as incompatible. Deterministic chaos is one form of chaos, by contrast to local microscopic chaos (Portugali 2011). **Chaos theory** is frequently used in futures studies. It is an interdisciplinary scientific theory and branch of mathematics focused on underlying patterns and deterministic laws highly sensitive to initial conditions in dynamical systems that were thought to have completely random states of disorder and irregularities. Chaotic behavior exists in many natural systems, including fluid flow, heartbeat irregularities, weather and climate. It also occurs spontaneously in some systems with artificial components, such as the stock market and road traffic. (Wikipedia)¹⁴ The origins of chaos theory can be traced back to Henri Poincaré in the 1880s. It has become one of the leading complexity theories. Portugali (2011) points out its different uses: when a proponent of postmodern, poststructuralist and deconstruction approach says ‘chaos’ it is usually meant to refer to the opposite of ‘order’. When a complexity theorist uses the term ‘chaos’, it means ‘deterministic chaos’.

Emergency is considered as something dangerous or serious, such as an accident that happens suddenly or unexpectedly and needs fast action in order to avoid harmful results (Cambridge Dictionary).¹⁵ “*How would disabled people escape in an emergency? Is the emergency exit suitable for wheelchairs? The pilot of the aircraft was forced to make an emergency landing on Lake Geneva.*” A state of emergency can be declared. A growing number of experts argue that we are in a Climate Emergency. The vocabulary must be used in a way that reflects the ‘urgency’ of the looming situation that humanity is facing. The Club of Rome (2018) has not only declared climate emergency but prepared a concrete Climate Emergency Plan “A Collaborative Call for Action”¹⁶. The root cause for climate emergency is in the neglect of the limits to growth. The Club of Rome’s Limits to Growth report aroused a lot of interest and awakening to the environmental and ecological issues when it was published in 1972, but the main message went unheeded. Therefore, the Club of Rome (Bardi & Alvarez Pereira 2022) published a new book to highlight the message and what can be done now before humankind exceeds the planetary limits irreversibly.

Shock is (the emotional or physical reaction to) a sudden, unexpected, and usually unpleasant event or experience (Cambridge English Dictionary). Shock means a strong surprise. The American futurist Alvin Toffler (1928–2016) wrote the book “Future Shock” together with his spouse Adelaide Farrell, in which the authors define the term “*future shock*” as a certain psychological state of individuals and entire societies. The shortest definition for the term in the book is a personal perception of “too much change in too short a period of time”. According to Toffler, society is undergoing an enormous structural change, a revolution from an industrial society to a “super-industrial society”. This change overwhelms people. He argues that the accelerated rate of technological and social change leaves people disconnected and suffering from “shattering stress and disorientation”–*future shocked*. Toffler stated that the majority of social problems

¹⁴ See more at <https://www.britannica.com>

¹⁵ See more at <https://dictionary.cambridge.org/dictionary/english/emergency>

¹⁶ See more at <https://www.clubofrome.org/publication/the-climate-emergency-plan/>

are symptoms of future shock. In his discussion of the components of such shock he popularized the term "information overload." Other books by Toffler with popular influence in the field of futures studies include "Third Wave" and "Powershift". On the other hand, shocks can be beneficial if they do not create havoc but lead to learning something crucial.

Surprise is an unexpected or astonishing event, fact, etc. A simple example of everyday life is "This information came as a complete surprise" (Cambridge English Dictionary). The surprise can be positive or negative, unexpectedness is the key characteristic of a surprise. It can be considered as a brief emotional state experienced as the result of an unexpected significant event. Cf. shock = strong surprise. Surprise in futures studies relates especially to wild cards, black swans and x-events (generic term to these specific terms). In terms of ecosystems, according to Filbee-Dexter et al. (2017), an ecological surprise is a situation where human expectations or predictions of natural system behaviour deviate from observed ecosystem behaviour.

Then we have a small cluster of concepts referring to a temporal point or period of change or direction of the trajectories of change. These are: *Discontinuity*, *Tipping Point*, and *Disruption*. The following Figure 6 further gives a conceptual mindmap positioning discontinuities and their impacts in the VUCA World.

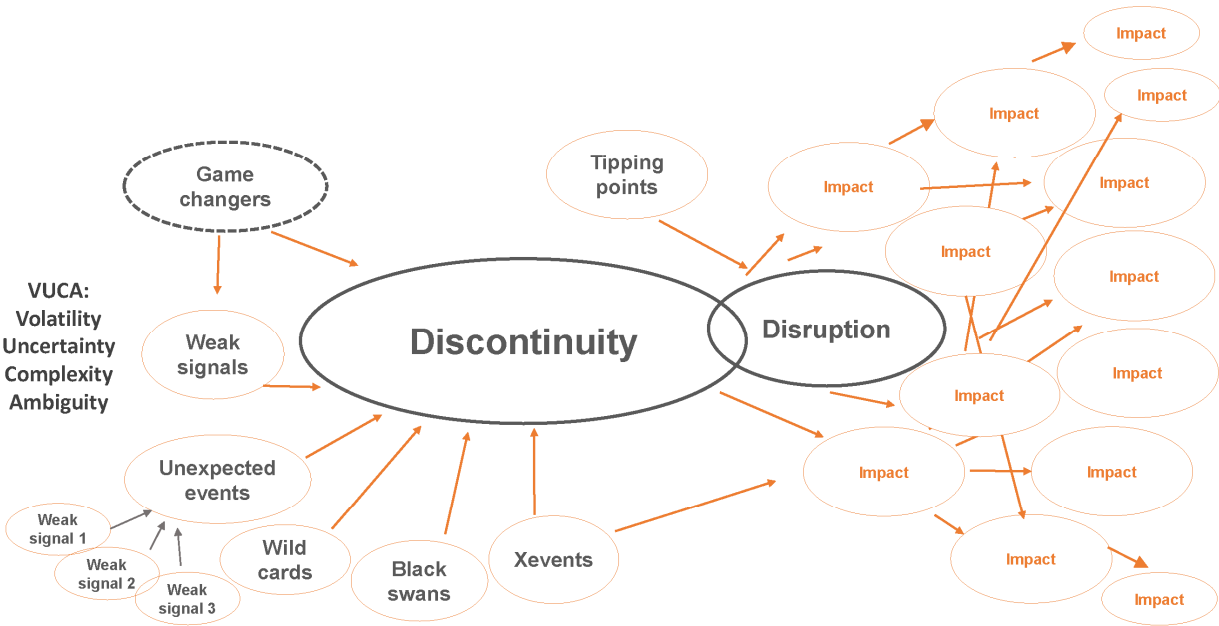


Figure 6. Conceptual Mindmap of Discontinuities and their Impacts in the VUCA World.

Discontinuity is non-linear development. The fact that something changes or stops rather than continuing in the same way; a change or stop that means something does not continue in the same way (*Cambridge dictionary*).¹⁷ Already Drucker (1968) described the forces of change that are transforming the economic landscape and creating tomorrow's society. Trends will stop or change their course when a discontinuity happens. Trend extrapolation was a much-used method in early futures studies. However, it is not any more considered as valid, since it usually does not anticipate any discontinuities, but projects linear developments. It may be possible to scan for developments, and identify sources of discontinuities (Viljakainen & Toivonen 2015). Their work identifies seven trends in the chosen context and analyses their impacts and discontinuities.

Tipping point is the critical point in an evolving situation that leads to a new and irreversible development. The term is said to have originated in the field of epidemiology when an infectious disease reaches a point beyond any local ability to control it from spreading more widely. A tipping point is often considered to be a turning point. Equally, there is ongoing debate on the drivers and pressures for ecological systems, and *ecological* tipping points. Tipping points are used when speaking of various peaks, for example the debated peak oil. Furthermore, there is a book on peaks of different kinds (Heinberg 2007).

Disruption is disturbance or problems which interrupt an event, activity, or process; radical change to an existing industry or market due to a technological innovation. Technologically, the history of societies is filled with disruptions that have shaped various sectors. Disruptions take place in the economy and markets when a transformation in a certain sector, perhaps due to a new innovation, begins to topple old practices and to replace them with new ones. Disruptive technologies and innovations can create new kind of value. At best, this new value is financial, social and environmental. There are claims that 'clean disruption' could be a force that shapes the future (Seba 2014). In innovation studies, Christensen (2007) dwells on innovator's dilemma which is created when new technologies cause successful firms to fail. According to Blume et al. (2020), because disruption cannot be directly observed *ex ante*, we have to collect signals. See also Désaunay & de Jovenel (2020).

The dynamics of drivers turning continuities into discontinuities is given in the following figure.

¹⁷ See more at <https://dictionary.cambridge.org/dictionary/english/discontinuity>

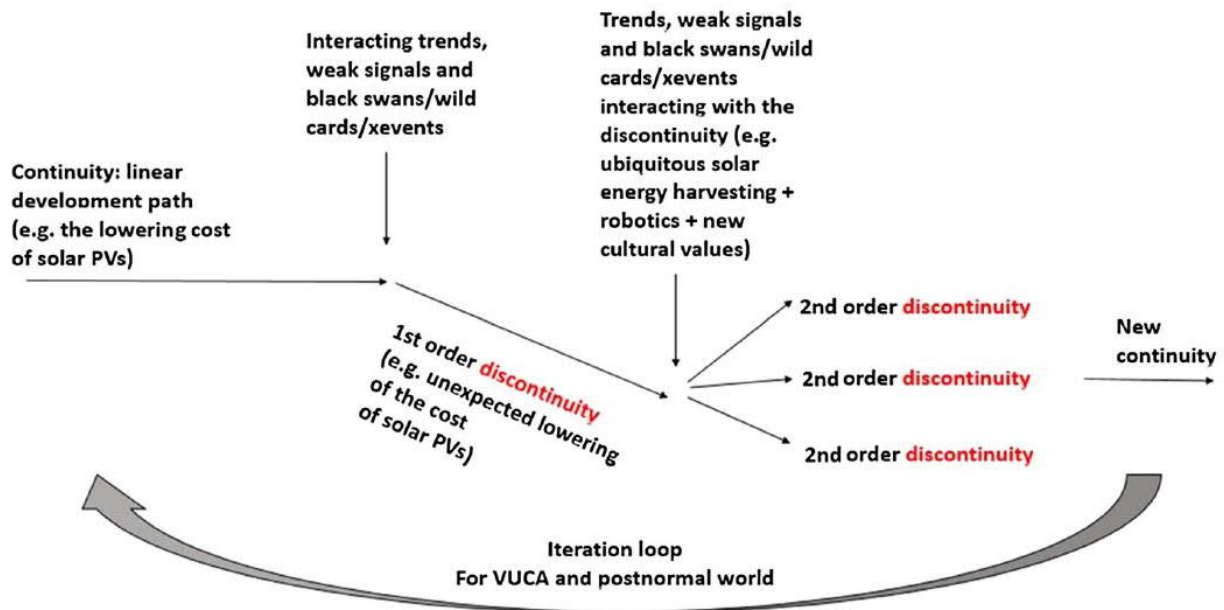


Figure 7. Drivers of change with a view to continuity/discontinuity (Heinonen et al. 2017b).

Global disruptions can also be presented in the form of cartography of crises as the French futures scholars have done (Désaunay & de Jovenel 2020). Here, the landscape of disruptions can be approached as a map. Drivers for change and eventual disruption are blowing from different directions. In the following figure, the drivers come from four directions which partly represent the typical PESTEC framework (P= political, E = ecological, S = social, T = technological, E = environmental/ecological, C = cultural, customer), except that social and cultural dimensions are not specifically indicated. What is interesting in the French scholars' crises map is that the geopolitics is raised into a key role and given momentum from two corners (directions) – regional and global.

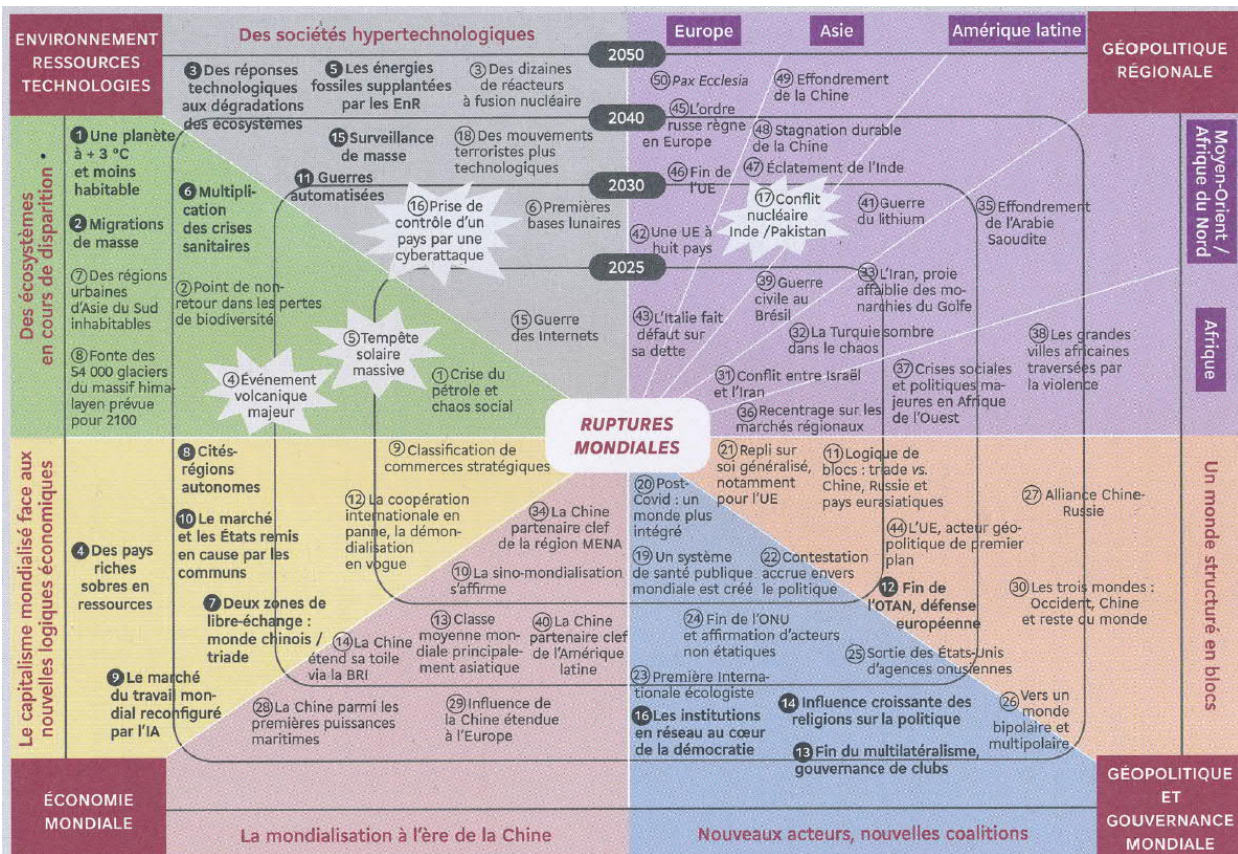


Figure 8. Global disruptions as cartography.

In the above figures 6, 7, and 8 one can see the dynamics of generation of crises and crises related phenomena, as well as occurrence of discontinuities frequently due to several concepts that are widely discussed, anticipated and analysed in futures studies. These are either unexpected events or weak signals, both categories featuring as specifically the so-called **futures signals** (see e.g. Hiltunen 2010; Kuusi & Hiltunen 2007). The unexpected event is called in futures studies a *wild card*, *black swan* or an *extreme event* (X-event). They are all referring to unexpected events, with some variations in the definition. The other group is representing *weak signals* (one type of futures signals). Accordingly, the next section deals with futures signals.

4.3 Stunning futures signals

This chapter addresses futures signals that may be relevant in giving rise to crises as such, in combinations, or in a sequence. The following concepts are discussed: *Unexpected event*, *Wild card*, *Black swan*, *Extreme event (X-event)* and *Weak signal*. Such futures signals as megatrends and trends that are stronger and therefore more obvious in generating change are left out of this group of concepts.

Unexpected event is an event that comes as a surprise. It is unexpected and rare. Different types and categories of unexpected events by their nature and unthinkability. In futures studies, unexpected events can be wild cards, black swans or extreme events (x-events). They are similar concepts but not synonymous. See the following specific definitions. Unexpected event that happens as such is not yet a crisis → when it takes place, it may lead to a crisis (but not always). Unexpected event may be a negative or a positive one.

Wild card is an event that comes as a surprise. It is unexpected and rare. A wild card is a surprising and rare event that is not (directly) human-made and would change the recent direction of development. The probability of a wild card is very low, but if realized, its impacts on the future development would be considerable. According to Petersen (1997), wild card is a “low-probability, high-impact event that happens quickly”. In futures studies, a growing interest in wild cards appears to have emerged in the early 2000s (Rockfellow 1994, Petersen 1997, Mendonça et al. 2004, Barber 2006, Hiltunen 2006, Steinmüller 2007).

Black swan is a more recent concept launched by Nassim Taleb (2007). As an unexpected event, a black swan is a similar concept to wild card, but with stricter boundaries. Taleb defines it as an extreme event, improbable, unpredictable and with dramatic impacts (unknown unknowns). The difference with a wild card is that by definition black swans are unpredictable whereas of wild cards some enlightened foresight practitioners can have ‘pre-knowledge’. Black swans are outliers, which usually appear out of the blue (COVID-19 was not a black swan, but it was a surprise) (Black & Inayatullah 2020).

Taleb (2007) perceives the Black swans as rare and unpredictable outlier events which have an extreme impact – and the human tendency is to find simplistic explanations for these events, retrospectively. The metaphor for the black swan derives from the 1600s view when in the Old world (Western world) all swans were thought to be white until observations for Australia’s black swans species enlarged the awareness of the existence of black swans, too. This meant simply knowledge that did not exist before (surprise concerning knowledge).

Extreme event is still another description of a surprising, unexpected and rare event. Casti (2013) launched this term to refer to extreme events that may trigger the collapse of the modern world, from pandemic viruses to nuclear apocalypse to robot uprisings. Accordingly, the impact of an extreme event or ‘X-Event’ is devastating. In the 21st century, our world has become impossibly complicated, relying on ever more advanced technology that is developing at an exponential rate. Yet it is a mathematical fact that higher and higher levels of complexity lead to systems that are increasingly fragile and susceptible to sudden, spectacular collapse.

Casti argues that today's advanced, overly complex societies have grown highly vulnerable to extreme events that will ultimately topple civilization like a house of cards. He warns about civilized society's inability to recover from a global catastrophe. Casti sees the world teetering on the brink of collapse, and a population under constant threat from pandemic viruses, worldwide communication breakdowns, nuclear winter, or any number of unforeseeable 'X-Events'. He provides a provocative tour of the catastrophic outlier scenarios that could quickly send us crashing back to the preindustrial age – and shows that they may not be as far-fetched as they seem.

While wild cards, black swans and extreme events all designate sudden unexpected events with dramatic consequences, there is another type of futures signals that can, if strengthened or if combined with another weak signal, trend or unexpected event, also act as driver for change and for eventual discontinuity. **Weak signal** is an early sign anticipating or pointing to possibly emerging issues, which are not yet confirmed or strengthened (into a trend). Weak signal is the first indicator of change or an arising issue that may (or may not) become significant in the future. Weak signals can be used to challenge assumptions made about the future, expand future scenarios and create a more practical view of the future using examples (Kuusi & Hiltunen 2007; Hiltunen 2010; Sitra 2022). Weak signals can typically be used in horizon scanning to pay special attention to marginal and strange phenomena that may start to grow. Weak signals as such are not events, but they can include events, new technologies or practices – pointing to a new phenomenon, which can either strengthen into a strong signal or wither away as time passes (cf wild cards/black swans that are always events). Weak signals are subjective by nature, they can be totally unfamiliar to a person, while another person may know them already. Identification and analysis make one of the most polemic areas in futures studies, because of their ambiguous and invisible nature. One can, however, learn to practice peripheral vision (Day & Schoemaker 2006) so that weak signals could be better identified and acknowledged in corporate strategies.

4.4 Change – various types and responsive stances to it

This chapter highlights change as a key characteristic and even a theoretical framework for futures. First the concepts of *change*, *transition* and *transformation* are addressed. Then the concepts of *survivalism*, *anti-fragility* and *futures resilience* are opened up as responsive stances and approaches to change. Through them there is a possibility to survive the VUCA world and even learn from it and come out of it as renewed.

Future is about **change**, crises are manifestations of change in action. For such change there are a few terms in futures studies used to connote fundamental change. Transition and transformation are frequently used for that. **Change** simply means that someone or something becomes different; is altered or modified.

Transition implies a shift from one state or condition to another, usually complex, deep, lengthy, and non-linear processes. A growing interest is seen in sustainability transitions, with a diverse community of transition scholars (Köhler et al. 2019; see also Vähäkari et al. 2020). Transition may directly refer to a whole-of-society paradigm shift. For example, the transition of urban energy systems is intertwined with social,

geographical, technical and economic dimensions of urban settings that have to be acknowledged and integrated into future planning and decision-making (Ram et al. 2022).

Transformation means complete change in the appearance or character of something or someone, especially so that that thing or person is improved (Cambridge Dictionary). Various overlapping definitions of transition vs. transformation exist. However, the main difference is in the transient nature of transition – a border is crossed, something is transiting into something else or into a new phase or cycle (of industry, technology, culture, society). Transformation on the other hand literally means metamorphosis, the form and structure of something (industry, technology, culture, society) is fundamentally changed and turned into something new. Transformation is one of the four archetypes of Jim Dator's (2009) scenario typology. It is the most radical in implying profound change. An example of a scenario project where all the four scenarios constructed were made to represent Dator's transformation category is in Heinonen et al. (2017a).

Now when the crises, catastrophes and change have happened there is a state or condition that exists for society. It may be collapse as described earlier or survival and even flourishing, owing to anti-fragility or resilience. Survival simply means capacity to stay alive, opposite of dying or extinction. **Survivalism** is a social movement of individuals or groups who proactively prepare for emergencies, including natural disasters, as well as disruptions to social, political, or economic order (Parkkinen 2021).¹⁸ Preparations of survivalists or preppers may anticipate short-term scenarios or long-term, on scales ranging from personal adversity, to local disruption of services, to international or global catastrophe. Ordinary households are also given instructions concerning supply security. Various manuals, often for off-grid living, exist, e.g. McBay (2006). In *Survival* (2021) Stern asks what texts, what institutions, and what traditions have made survival a recognizable element of our current political vocabulary. Today, survivalism is no more an extreme niche, because due to several crises the national security for supply has emerged as a high priority.

A more robust state of merely surviving is **anti-fragility**. Taleb (2013) has written a whole book on this compelling capacity which gains from disorder. Anti-fragility is the capacity to not only to stay alive but even flourish in times of crises and catastrophes. Taleb turns uncertainty on its head, making it desirable, even necessary. The antifragile is beyond the resilient or robust. The resilient resists shocks and stays the same; the antifragile gets better and better. According to him, antifragile are things that not only gain from chaos but need it in order to survive and flourish. Anti-fragility is a blueprint for living in a Black Swan world.

We claim that **futures resilience** is needed most in these turbulent times of the VUCA world we are living in. Futures resilience is a capacity to survive in the face of emerging challenges, obstacles, threats and risks, even in crises, and to learn from them in confronting any futures. It is a capacity to overcome hardships and manage the uncertainties, challenges, obstacles, surprises, threats and risks, and crises that are an inherent part of all futures, to emerge as renewed and to learn from them. Of course, we can address resilience in general, and then expand the concept farther into the future horizon from the present.

¹⁸ Survivalism <https://en.wikipedia.org/wiki/Survivalism>

Survivalist terminology https://en.wikipedia.org/wiki/Survivalism#Survivalist_terminology

Labaka et al. (2016) propose four dimensions and four key characteristics to **resilience**: 1) technical, 2) organisational, 3) economic, 4) social. Main features of resilience: i) robustness, ii) redundancy, iii) resourcefulness, and iv) rapidity. Several resilience frameworks exist in literature, but implementation of them is incipient only. We – in the RESCUE project – could benchmark and test this framework: 1) set of resilience policies; 2) influence table that assesses the influence of policies on prevention, absorption and recovery stages; 3) implementation methodology that defines the temporal order in which the policies should be implemented. This practical and holistic resilience framework for improving the resilience of CIs (critical infrastructures) is taking into account the external agents. (Labaka et al. 2016).

Now we should move from discussing resilience to presenting **implementation of resilience**. Labaka et al.'s (2016) influence table resembles futures studies Impact Matrix (futures table). An enabling step towards Futures Resilience is Futures Literacy, as “the skill to read, understand, use and co-create futures” (Miller 2015). Futures literacy generates the futures usage competence level, but it does not suffice as such. Futures resilience is achieved only after operational, experiential, and preparatory robustness levels and crisis awareness. About various approaches and perceptions of resilience see the special thematic issue of FUTURA (4/2021) by the Finnish Society for Futures Studies.

Resilience should be supported by policy-making. The term ‘resilience’ has increasingly featured in foreign and security policy discourse (Dewaele & Lucas 2022), appearing in the 2016 European Union Global Strategy, the 2017 US National Security Strategy, and most recently in the UK’s 2021 Integrated Review. These strategies highlight the importance of preparing for, responding to, and recovering from crises that could affect civilian society. These strategies agree on the importance of building resilience. However, they do not specify the concrete policies that would be required to do so. How can we measure resilience? What criteria are there for example for resilient cities? Dewaele & Lucas (2022) advocate that countries should anticipate emerging trends and future threats to enhance their resilience in an increasingly complex and dangerous security environment.

An illuminating parallel of resilience is given by Lovins & Lovins (2001) between resilient, distributed data processing systems and resilient, distributed energy systems. The design principles that emerge from these two examples and from biological and engineering resilience can be summarized as follows:

- A resilient system is made of relatively small modules, dispersed in space, and each having a low cost of failure.
- Failed components can be detected and isolated early.
- Modules are richly interconnected so that failed nodes or links can be bypassed and heavy dependence on particular nodes or links is avoided.
- Links are as short as possible (consistent with the dispersion of the modules) so as to minimize their exposure to hazard.
- Numerically or functionally redundant modules can substitute for failed ones, and modules isolated by failed links can continue to work autonomously until reconnected.
- Components are diverse (to combat common-mode and common-cause failures), but compatible with each other and with varying working conditions.
- Components are organized in the hierarchy so that each successive level of function is little affected by failures or substitutions among components at lower levels.
- Buffer storage makes failures occur gradually rather than abruptly: components are coupled loosely in time, not tightly.

- Components are simple, understandable, maintainable, reproducible, capable of rapid evolution, and socially compatible.

This shows that there can be clear checklists for resilience. As for security, we need an overall approach, comprehensive model for resilience. For the RESCUE project we are especially interested in the resilience of cities in a comprehensive model. A larger context is naturally present as the whole-of society view (Brunnemeier 2021). **Resilient city** has many definitions. We use the following definition because of this clarity: *Resilience means the capacity of cities to function, so that people living and working in cities – particularly the poor and vulnerable – survive and thrive no matter what stresses or shocks they encounter* (ARUP 2014).¹⁹ Eraydin & Tasan-Kok (2013) discuss the characteristics of a new theoretical approach to planning which may help in creating resilient cities capable of adapting to both slow changes and major pressures and hazards.

A city's resilience depends on its physical assets as well as its policies, social capital and institutions. Very often a city's resilience is tightly connected to its nature-based solutions and availability of the green capital. Tabibian & Movahed (2016) claim that resilience should be embedded in the context of sustainability. This is crucial, but long-term sustainability objectives may sometimes remain too abstract as an end goal. Resilience, on the other hand specifically embraces the present day turbulence with direct consequences in mind concerning future conditions. Resilience is about learning with the spectrum of risks that exist in the interface of people, the economy, and the environment. Becoming resilient is an adaptive process which requires continual improvement of the decisions taken and the action implemented. (Ibid.) We perceive resilience as a capacity, skill, characteristic, objective and a comprehensive process to be integrated into governance and decision-making at all levels of society.

¹⁹ Sometimes, the preparatory element in resilience is emphasised. For example, the World Bank defines a resilient city as 'one that is prepared for existing and future impacts, thereby limiting their magnitude and severity'. The definition of a resilient city can also be very narrow defining it as 'the ability of a city to expand its production base'. (Such various definitions are referred to by Tabibian & Movahed 2016).

5. CONCLUDING REMARKS

In futures studies, by identifying and analysing the so-called futures signals you are closer to the coming futures and their implications. Correspondingly, an ability to read the signals for crises could enhance preparation for future occurrences. This is, however, not enough. We also need to analyse and interpret the signs and foresight pre-knowledge in order to get better argumentation and enlightened evidence to support decision-making. Responding to crises is needed, but the ultimate goal is to go beyond crisis response and aim for crisis resilience. Such crisis resilience is an integral and often missing part of futures literacy. Crisis resilience added to futures literacy gives rise to **futures resilience**. This would be a major building block for transitioning from the Age of Mega-Crises into the Age of Global Consciousness as Halal (2021) envisions.

Crises represent an **interdisciplinary arena**. They can be studied in risk analyses and risk management, but likewise in environmental, economic and political studies. For social sciences, cognitive sciences and futures research risks provide a fertile topic. One can take various angles to risks. Building-up of crises can go under the radar for risk analysts. Environmental scholars' work reminds of the perils of a growing human footprint on Earth. Geo-political studies instead can take game theories and power play into consideration. Internalising these different aspects may be important for developing a big picture view, of how risks and crises can be analytically approached, including with a normative aim to enhance urban resilience.

Once a crisis is realised, a reactive mode may catalyse a blame game. In some cases, the causes for a crises remain unaddressed and the actors responsible of crises do not face consequences. Unless the structural ingredients of a crisis are addressed, there is a possibility that they are repeated. Root causes for a crisis inside a system should be traced. Furthermore, not just anticipating crises and creating effective responses to them is essential, but measures for alleviating crises or altogether evading them are needed. Illustrating how crises do not remain only in the sphere they originate from discusses its wider implications.

Implications for urban resilience are compelling. Building on Diamandis & Kotler (2020), unplanned urbanisation is a recipe for calamities and environmental degradation, whereas some techno-optimistic views claim that we could achieve 70 percent of the UN's SDGs merely by transitioning to smart cities, if visionary technology is matched with visionary governance and civic cooperation. Unless urbanisation is transformed into a solution, we'll have a 'messopolis' at our hands. In the COVID-19 pandemic, some cities turned avenues into pedestrian walkways and sidewalks into cafés overnight, while dealing with pandemic restrictions. The lessons from the pandemic could be analysed and reflected with a view on the built infrastructure. For example, inequalities are also an issue for the urban space and the built environment. In the future, technologies such as AI, VR, and sensors may become real-estate brokers. Real estate is also a concern of other novelties such as 3D printing, autonomous cars, aerial taxis, and floating cities. Globally, 500 coastal cities are threatened by global warming. In futures studies, floating cities are often claimed as novel urban systems in light of rising sea levels, skyrocketing populations, and threatened eco-systems for flood-proof, tsunami-proof, and hurricane-proof living. New finance, insurance and technologies could transform real estate. Adaptability and agility are seen as the ultimate measures of prevention.

Points to governance are found in Labaka et al. (2016) i.e. more work could be conducted to study sets of policies aimed at resilience; assess the influence of policies at prevention, absorption and recovery stages; and consider a methodology to define a temporal order in which policies should be implemented.

The lessons from the literature could be examined further, with an applied view on urban systems as well as the built environment. Eleonora Masini (1993) emphasised that the concept of living in uncertainty and of living in a complex world highlights the role of futures studies to try to **understand continuous dynamic changes**. Our topic of crises has its own existing and emerging language and rich concepts that live within futures studies, in the realm of risk and crises, and outside them. This conceptual landscape we opened up makes a contribution, but this is just a taste and call for further discussions around crises and resilience. These concepts and their definitions are ready to use, but they must also be re-interpreted and repurposed for new and uncertain futures. The most important thing to remember is to explicitly indicate in which meaning a concept is being used. We need a common language to enter this landscape and reach desired horizons. Thus, shared understanding of the premises and challenges embedded in these VUCA-related concepts can be reached, providing tools for governance and decision-making. Often the themes presented in this report deal with complexity, systems and networks, while others consider ramifications and secondary impacts, systems to see beyond the initial future shock. This subject is at the core of futures studies' historical origins, and never more relevant than now. We hope that the readers will find the conceptual analysis useful and apply it further.

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