ANTICIPATION IN EMERGENCY MANAGEMENT

Shifting from Crisis Response to Shaping Future Resilience

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" The illiterate of the 21st century will not be those who cannot read or write, but those who cannot learn, unlearn and relearn"

Alvin Toffler, Future Shock

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Abstract

There is a need for the field of emergency/disaster management to shift from managing disasters, to managing current and future risks and cultivation of resilience-building as core targets to be reached by 2030. This is an evolutionary paradigm shift. Disasters frequently exacerbate social inequalities and existing power dynamics, and exposure and vulnerability are on the increase. Extreme weather events and the risk of failure of mitigation and adaptation by government and businesses are growing concerns. Anticipating future risks and engaging in disaster risk reduction behavior is critical for human survival. Paradigm shifts are a conceptual transformation, and can be viewed as a prototype for revolutionary reorientation. This research project presents a paradigm analysis based on a survey completed by those in emergency management. This report identifies four archetypal patterns with systemic anomalies, explores postnormal potentiality and levels of uncertainty as a diagnostic to highlight emerging policy issues, and opportunities to evolve the system's structure towards stability and building resilience. In addition, the internal paradigm perspective was explored to understand the anticipatory narrative, futures literacy and mental model. This report introduces a potential pathway for a transformed paradigm, with discussion for change that proposes a first step to expand perspectives by building new mindsets and skill-sets to support the emerging paradigm of resilience. This report concludes on the critical need to shift from reactive thinking and actions, to consciously proactive thinking in order to address system anomalies, and reimagine new potential and possibilities to transform structures to support long-term fundamental solutions.

Acknowledgements

This research project has been both a personal and professional journey in my quest to make a meaningful contribution to the field of emergency management and futures studies. The Covid-19 pandemic has highlighted many vulnerabilities within our system. Crisis can spark a turning point for change, and can provide valuable insights into the parts of our system that are no longer sustainable. A deep understanding of system anomalies can reveal the shape and structure of the emerging paradigm, and opportunities for change and transformation.

My interest in foresight and systems thinking started the first day I walked into a provincial Emergency Operations Centre, that was in 2009 during the H1N1 pandemic. The level of complexity and uncertainty was exceptionally high. My search to acquire new skills led me to OCAD University's Strategic Foresight & Innovation Program. This program planted many seeds that transformed my thinking and opened up a world of new possibilities. I'm so grateful for the opportunity to have been a student in this program, and I would like to extend my appreciation to all the program faculty.

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Glossary

Paradigm - A term commonly used to mean a model, theory, perception or frame of reference. It is the mindset out of which the system arises - its goals, structure, rules, delays and parameters.

Paradigm Shift - A concept identified by the American physicist and philosopher Thomas Kuhn, is a fundamental change in the basic concepts and experimental practices of a scientific discipline.

Futures Literacy (FL) - FL is a capability. It is the skill that allows people to better understand the role of the future in what they see and do. Being futures literate empowers the imagination, enhances our ability to prepare, recover and invent as changes occur. UNESCO has identified Futures Literacy as an essential competency for the 21st century.

Anticipation for the Future (AfF) - AfF is the future as a goal - a planned/desired future that people bet on.

Anticipation for Emergence (AfE) - AfE is in a sense a non-future from the dominant AfF perspective. AfE is a disposable construct, a non-goal that is not constrained by probability or desirability. AfE helps to deconstruct those aspects of the present that are held in place as repetition.

Presence - Considered as deep listening, of being open beyond one's preconceptions and historical ways of making sense. Aspects of presence are seen as leading to a state of "letting come", of consciously participating in a larger field for change. Presence is believed to be a core capacity needed to access the field of the future. This concept was developed by Peter Senge, Otto Scharmer, Joseph Jaworski and Betty Sue Flowers.

Causal Layered Analysis (CLA) - is an approach and a technique used in foresight to shape the future more effectively. CLA may be used when debating all types of issues, collectively or individually. It works by identifying different levels of analysis to create coherent new futures. The technique was pioneered by Sohail Inayatullah.

Postnormal Times - Postnormal times is a concept developed by Ziauddin Sardar as a development of post-normal science. Sardar describes the present as postnormal times, in an "in-between period where old orthodoxies are dying, new ones have yet to be born, and very few things seem to make sense."

Postnormal Science (PNS) - represents a novel approach for the use of science on issues where "facts [are] uncertain, values in dispute, stakes high and decisions urgent". PNS was developed in the 1990's by Silvio Funtowicz and Jerome R. Ravetz.

Postnormal Times (PNT) Theory - At the heart of PNT theory, one finds the 3C's: complexity, chaos, and contradictions. Complexity is a property of certain systems distinguished from those that are simple or just complicated. Complex systems have substantial uncertainties that cannot be managed as 'risks'; and they have a multiplicity of legitimate perspectives. Chaos is the outcome of great many independent variables interacting in many different ways in a networked complex system. A complex system has many positions that are logically inconsistent. Contradictions are irreconcilable views and

perspectives and cannot be resolved: they can only be transcended.

Systems Theory - Is the interdisciplinary study of systems. A system is a cohesive conglomeration of interrelated and interdependent parts which can be natural or human-made. Every system is bounded by space and time, influenced by its environment, defined by its structure and purpose, and expressed through its functioning. A system may be more than the sum of its parts if it expresses synergy or emergent behavior.

Feedback Loops - Feedback loops are typically used to accomplish regulation and control. A feedback loop is like an input, but its origin is from within the system itself, not from outside the system. In many systems, the output reenters the system as another input. There are two main types of feedback loops, positive and negative. Positive feedback loops, in which a change in a given direction causes additional change in the same direction. Negative feedback loops, in which a change in a given direction causes change in the opposite direction.

Stock and Flows - Are the building blocks from which every dynamic system is constructed. The ability to identify, map, and understand the dynamics of the networks of stocks and flows in a system is essential to understanding the processes of interest in any modeling effort.

System Archetypes - Are patterns of behavior of a system. Systems expressed by circles of causality have therefore similar structure. Identifying a system archetype and finding the leverage enables efficient changes in a system.

Leverage Points - Places in the system where a small change could lead to a large shift in behaviour. The twelve leverage points to intervene in a system were proposed by Donella Meadows, a scientist and system analyst who studied environmental limits to economic growth.

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Introduction

The coronavirus (Covid-19) is a reminder that hazards do not exist in isolation, but within a complex and dynamic global landscape which can affect peoples' lives, livelihoods and health. This broad range of hazards are becoming increasingly interconnected and complex in nature, with cascading effects that can impact health, social, economic, financial and political subsystems. The Covid-19 pandemic has revealed the devastating impact of an acute hazard exposure, on an unprepared system with underlying chronic and increasing systemic vulnerabilities.

The Covid-19 pandemic is not a Black Swan event. Some countries conducted simulations that were very close to what has transpired, and yet despite this, the measures recommended were not adopted. We cannot say we did not know. Inaction prevailed [Gordon, 2020].

The complex interactions and feedback loops between climate change trends, ecosystem fragility, disease outbreaks, rapid urbanization, mass displacement and geopolitical instability, fuelled by the interconnectivity of communications, trade, financial systems and politics mean that shocks and stresses from crisis events can reverberate globally [Mizutori, 2019]. The increasing frequency and intensity of emergency events, potentially escalating to disaster situations with slow recovery significantly impedes progress towards sustainable development. Advancement in disaster risk management and resilience building are essential for our collective future.

The structure that supports public safety and assists to protect communities during emergencies and disasters is known as the emergency management system. In Canada, the emergency management system is comprised of a network of partnerships across federal government institutions, provincial and territorial emergency management organizations, first responders (police, fire, paramedics), first receivers (hospitals), public health, non-governmental organizations, voluntary organizations, and community stakeholders.

The field of emergency management and civil protection grew out of civil defence. Early development of civil defence in the 1940's focused on air raid precautions and running shelters, care and safeguarding of non-combatants, civilian management of war wounded, paramilitary organizations, urban search and rescue and putting out fires. From 1948 onwards civil defence changed. During the Cold War it focused on preparations for thermonuclear exchange. In the 1990's civil protection shifted with a change in strategic priorities, and increased emphasis on peacetime activities. During the same time the United Nations inaugurated the International Decade for Natural Disaster Reduction, this put cooperation to manage disasters on an international agenda [Alexander, 2020]. This was the start of the demilitarization of emergency management, to differentiate between civilian forces and armed forces and transfer responsibility to civil authorities for administration.

Emergency management now responds to a broad range of different types of hazards such as environmental hazards, agricultural and food emergencies, extra-terrestrial debris, hazardous materials, health hazards, public safety, structural,

supply and distribution and transportation. To uncover deeper insights into hazards and their potential impacts, the following cross-cutting themes are important considerations such as, inter-jurisdictional nature, social risk factors, critical infrastructure, digital networks, climate change and ecosystem disruption.

As outlined in the Emergency Management Framework for Canada, the ultimate purpose of emergency management is to save lives, preserve the environment and protect property and the economy. The protection of life is of paramount importance. Emergency management consists of four interdependent components that function as pillars within a cycle: prevention/mitigation, preparedness, response and recovery.

The emergency management system is facing one of the most significant drivers of change and global challenges of our lifetime – climate change which has been identified as being the "single biggest threat to life, security and prosperity on earth"[1]. The World Economic Forum's (WEF) 2020 Global Risks Report identified that severe threats to our climate account for the report's top long-term risks, with "economic confrontations" and "domestic political polarization" recognized as significant short-term risks in 2020 [World Economic Forum, 2020]. The report also warns that geopolitical turbulence and shifts from multilateralism threatens the ability to address shared and critical global risks. Urgent attention is needed to repair societal divisions and drive sustainable economic growth in order to address systemic threats.

For the first time in the survey's 10-year outlook, the top five global risks in terms of likelihood are all environmental. The 2020 WEF Global Risks Report sounds the alarm on:

- Extreme weather events with major damage to property, infrastructure and loss of human life;
- Failure of climate-change mitigation and adaptation by governments and businesses;
- Human-made environmental damage and disasters, including environmental crime, such as oil spills, and radioactive contamination;
- Major biodiversity loss and ecosystem collapse (terrestrial or marine) with irreversible consequences for the environment, resulting in severely depleted resources for humankind as well as industries; and
- Major natural disasters such as earthquakes, tsunamis, volcanic eruptions, and geomagnetic storms.

Emergency managers are on the front-lines of climate change, they are a broad group of the professionals having to manage the systemic and potential cascading impacts from climate change and ecosystem disruption such as extreme weather events, decline of life-sustaining ecosystems, biodiversity loss, food security and stores of fresh water. Top scientists have warned that an overlapping environmental crisis could tip the planet into "global systemic collapse" [Hood, 2020].

Questions have been raised in relation to the environment and COVID-19. While there is no direct evidence of climate change influencing the spread of COVID-19, we do know that climate change alters how we relate to other species on Earth and that matters to our health and our risk for infections. Many of the root causes of climate change also increase the risk of pandemics [C-CHANGE, 2020].

In our efforts to manage the emergence and contain the spread of the Covid-19 virus, there continues to be a number of system conflicts. As part of pandemic recovery, we will need a postnormal science understanding of the pandemic as essentially a complex entity where the social, ethical and ideological dimensions interact strongly, sometimes decisively, with the biological [Ravetz, 2020].

[1] *Patricia Expoinosa, UN Climate Change Executive Secretary, as quoted in UN Climate Change Annual Report 2017*

Paradigm Shift

The Sendai Framework for Disaster Risk Reduction 2015–2030 ('the Sendai Framework') is one of three landmark agreements adopted by the United Nations in 2015. The other two being the 2030 Sustainable Development Goals and the Paris Agreement on Climate Change. The Sendai Framework has four priority areas for focused actions.

The four priority areas include:

1. Understanding disaster risk and systemic risk
2. Strengthening disaster risk governance to manage disaster risk
3. Investing in disaster risk reduction for resilience
4. Enhancing disaster preparedness for effective response and to build back better in recovery, rehabilitation and reconstruction

The Sendai Framework highlights the need for an evolutionary paradigm shift from managing disasters to managing current and future risks, and bringing in resilience-building as the core target to be reached by 2030. This direction requires the capability to manage both short and long time horizons to address immediate needs and vulnerabilities (the "known"), anticipate potential future change, disruption and to work with uncertainty (the "unknown"), and to identify opportunities to enhance adaptive capacity to build a resilient future. At the heart of the approach of the UN Office for Disaster Risk Reduction (UNDRR) is the recognition that resilience is not just about bouncing back, and that investment is not about preparing for a disaster and building back better afterwards, but also about building a resilient and prosperous future [Mizutori, 2019].

The recognition that resilience is not just about bouncing back is important to note. The UNDRR states that a shift in mind-set is required, and risk-informed investments in social, economic and environmental challenges need to be part of normal behaviour. The UNDRR states that radical structural transformation is needed in terms of financing priorities, systems and aid funding, with more investment made at the prevention end of the emergency/disaster response cycle. If we truly believe and understand that prevention is worth more than a pound of cure, why hasn't the shift happened already? What are the historical barriers inhibiting change and movement towards investing in risk reduction and building resilience? Why are we not able to let go and release outdated processes and structures in order to make space for new ideas and approaches?

Thomas Kuhn who wrote about the greatest paradigm shifts in science, stated that a "gestalt shift" or "shift in perception" is a useful elementary prototype to describe for what occurs in a full-scale paradigm shift [Kuhn, 1970]. In terms of mindset, he also stated that *"the scientist does not preserve the gestalt subject's freedom to switch back and forth between ways of seeing",* meaning between having the ability to see between the current paradigm, and perceiving the emerging paradigm. This is relevant for emergency management, in terms of the current culture and approach to risk (i.e. command and control and scientific modelling), the ability to understand the changing environment, and level of futures literacy to embrace, support and create space for the emerging paradigm.

Building Future Resilience

It's important to note that paradigm shifts result in a conceptual transformation that can be destructive of a previously established paradigm, and can be viewed as a prototype for revolutionary reorientations. This revolutionary reorientation is a displacement of the conceptual network through which one views the world [Kuhn, 1970].

The scientist in crisis will constantly try to generate speculative theories that, if successful, may disclose the road to a new paradigm. Crisis can loosen the stereotypes and provide the data necessary for a fundamental paradigm shift. Sometimes the shape of the new paradigm is foreshadowed in the structure that extraordinary research has given to the anomaly [Kuhn, 1970].

There is growing concern of the impacts of extreme weather events on ecosystems, communities, and infrastructure across the world. The field of emergency management had identified widespread community preparedness challenges, and long recovery periods post emergency events.

The path towards building future resilience requires unprecedented cooperation and collaboration to engage a whole-of-society approach to address vulnerability, and manage emerging risks and emergency events. It requires the ability to leverage resources and capacities at all levels. According to Public Safety Canada, all citizens have a role in building resilient communities. These new principles and values set a new direction for the future, and may conflict and displace the traditional structure. This narrative of a paradigm shift towards resilience suggests the need for a reorientation in emergency management's perception towards the future, as well as the system's current structure and hierarchy to meet the emerging paradigm's goals for a whole-of-society approach.

This raises the importance of the term resilience, where the definition can range from bouncing back/recovery to adaptation, transformation and building a prosperous future. Does emergency management have a vision of this preferred future? Is there a common understanding across emergency management of what it means to build towards a resilient future?

Linear Thinking in a Complex World

The operating environment of the 21st century is increasingly becoming more complex and dynamic, with drivers of change creating conditions commonly known as a VUCA environment (volatility, uncertainty, complexity and ambiguity). The VUCA operating environment will be to some extent 'unknown' [Van der Wal, 2017]. The system complexity and growing uncertainty signals the importance of building new mindsets and skills to understand complex adaptive systems, as well as build anticipatory and adaptive leadership capabilities moving into the future.

Futures Literacy and the ability to anticipate has been identified as a key leadership skill for the 21st century to navigate today's world. Anticipatory thinking in the field of disaster risk reduction is fairly new and is not fully developed [van Niekerk et al, 2017]. In many instances, anticipation is likened to predictability, foresight, early warning and preparedness, with scenarios linked to a set of variables which are consistent with a given worldview and beliefs [van Niekerk et al, 2017].

There is growing recognition of the systemic and interconnected nature of risk, and a need to shift from linear thinking to a more holistic and anticipatory approach to manage complexity and uncertainty.

Statement of the Problem

The Sendai Framework highlights the need for an evolutionary paradigm shift from managing disasters to managing current and future risks, and bringing in resilience-building as the core target to be reached by 2030. The UNDRR has also stated that radical system transformation is needed, with more investment made at the prevention end of the emergency/disaster response cycle.

Why is this paradigm shift needed? The World Economic Forum's 2020 Global Risks Report identified the top five global risks in terms of likelihood to be all environmental. The report also raises the alarm of concerns such as extreme weather events and the risk of failure of climate-change mitigation and adaptation by government and businesses. In addition, the United Nations' Global Assessment Report (GAR) on Disaster Risk Reduction (2019) acknowledged that change is happening more quickly and across multiple dimensions and scales than ever thought possible. Progress has been slow on achieving risk reduction goals.

The challenges we face are significant, and exposure and vulnerability are on the increase [Mizutori, 2019]. The context of risk and vulnerability can transform an incident into a disaster. Poverty and vulnerability will define ever more closely the areas of greatest susceptibility to disasters [Alexander, n.d.]. Moreover, disasters frequently exacerbate social inequalities and existing power dynamics, constraining people's ability to escape poverty and leaving the most marginalized at even greater risk of being left behind [Diwakar, 2019]. Anticipating future risks and engaging in disaster risk reduction behavior is becoming key to human survival [van Nierkerk, 2017].

There is an unconscious tendency to see risk as a threat and risk reduction and prevention as a cost, instead of looking at the new opportunities that resilience building affords [Mizutori, 2019]. Losses in disasters will continue to increase steeply [Alexander, n.d.] There is a lack of understanding of the value of futures literacy, the discipline of anticipation and use of knowledge systems that work with emergence and uncertainty.

Then there is the concept of resilience. The definition of resilience in emergency management is focused on the ability to bounce back and recover from stress/shocks, which is important but limiting. Resilience is a much bigger concept that embodies a growth mindset. It includes the ability to learn and evolve in order to take advantage of emerging opportunities, but it requires the willingness to break with tradition, explore and change the parts of the structure that is no longer working or sustainable. We know that at the world scale, one or more great events will cause a drastic reorganization of disaster preparedness [Alexander, n.d.]

A new paradigm of resilience requires a fundamental shift and self-organization of the system. This starts with an awareness of the anomalies of the current paradigm, an understanding of our mental models and worldview, and a vision of transformation. This leads to the question: can you have an evolutionary paradigm shift if the system's mental model is still the same? To date the focus has largely been on external system transformation, with little emphasis on the internal transformation and the shifts in mindset needed to create this new future.

To support the movements towards an evolutionary resilience paradigm there is a need to have:

- An understand the current paradigm's anomalies and conflicts to identify opportunities for re-orientation;
- a vision of the new emerging paradigm to consciously navigate actions towards; and
- a clear definition of resilience, with the skill sets and methods needed to support the process to achieve it.

Purpose of the Study

This research seeks to bridge the field of futures studies with emergency management. It provides a unique opportunity to take a subjective approach to understand the perspectives and experience of emergency managers navigating evolving risk, complexity and an uncertain future.

The purpose of this research is to understand the emergency management paradigm, worldview, and how those in the system approach the future. This research seeks to develop insights to support opportunities for the field of emergency management in its evolution towards building resilience, and introduce participants to relevant futures/foresight and design concepts to support their work in navigating a complex and uncertain world.

This MRP is a journey of understanding of the emergency management paradigm, including:

- systemic behaviours, patterns, anomalies and turbulence to understand and make visible the current paradigm;
- the internal perspective and emergency manager's worldview, mental model and culture to understand how they make sense and function in the world;
- the current level of futures literacy and emergency management's anticipatory process;
- issues and levels of uncertainty that the profession carries into the future;
- opportunities for re-orientation and potential shape of the emerging paradigm; and
- how futures/foresight and design can support the new emerging paradigm of resilience.

Methods

Research Ethics Board approval [REB 2020-38] was received in March 2020 however, due to the Covid-19 pandemic, research activities were delayed to accommodate the additional time needed to ensure adequate participation of those working in emergency management. Many participants in this research project were directly involved in Covid-19 pandemic response and/or recovery operations.

This research was conducted between May and June 2020 and included participant surveys and interviews about future resilience. The results presented in this paper reflect the data collected from the survey portion of this research project, which captured information on the current emergency management paradigm. This report represents the first in a series of work to share research findings.

This research project had 33 survey participants that work within emergency/ disaster management and/ or military operations. Participant demographic includes:

- 64% live/work in Canada and 36% live/work internationally (countries include: United States, United Kingdom, Netherlands, North Macedonia, Qatar and Australia)
- 48% female and 52% male
- 94% identified themselves as working at a professional level status
- 70% with 11+ years of experience
- 70% age 40+
- Range of sectors: public, private, non-profit, military, academic and others
- Emergency management speciality focus identified as: management, operations, logistics, preparedness, recovery/resilience, communications and humanitarian activities.

This research project captured both quantitative and qualitative data for analysis.

Qualitative Paradigmatic Analysis

An emergent approach was used to analyze qualitative data. The method and type of qualitative coding was determined based on what the research project was seeking to learn from the data. Four different types of qualitative methods were used for this paradigm analysis to understand patterns.

For the external view of the paradigm exploring the litany and systems, the following types of coding were used:

- **in-vivo/grounded theory coding** (elemental method) this coding was used to capture the participant's own language in the data record as codes. This was done to capture relevant cultural categories for emergency management, and to prioritize and honor the participant's voice within this research project; and

- **versus coding** (affective method) this coding was used to capture phrases of actual and conceptual conflicts within, among and between participants. It served as a diagnostic tool to identify tensions and conflicting power issues, and then used to create system maps to understand power that holds patterns in place, and opportunities for positive social change.

These two types of coding were performed on survey questions seeking participants' general perspectives on disaster-response-recovery, climate change and extreme weather events and climate change mitigation and adaptation. Coded data was then mapped to the following broad categories of governance, integrated planning and response planning. In-vivo/ground theory coding was also used on postnormal times survey questions regarding levels of uncertainty (i.e. black elephants, black swans and black jellyfish).

For the internal view of the paradigm exploring the worldview and myth/metaphors, the following types of coding were used:

- **in-vivo/grounded theory coding** (elemental method);

- **narrative coding** (literary/language methods) to discover the structural properties of participants stories, the repetitive motif within the data;

- **domain & taxonomic coding** (procedural method) an ethnographic method for discovering cultural knowledge, organizing behaviour and interpreting experience. Participant generated data was used to construct cultural categories of meaning (structures and processes); and

- **values coding** (affective method) this includes participants values, attitudes and beliefs to understand identity.

Narrative coding and domain & taxonomic coding was performed on survey questions seeking participants' perspectives on the importance and meaning of anticipation, and to understand the processes participants use to anticipate. In-vivo and values coding was performed on participants' general perspective data, with a lens towards capturing the internal perspective.

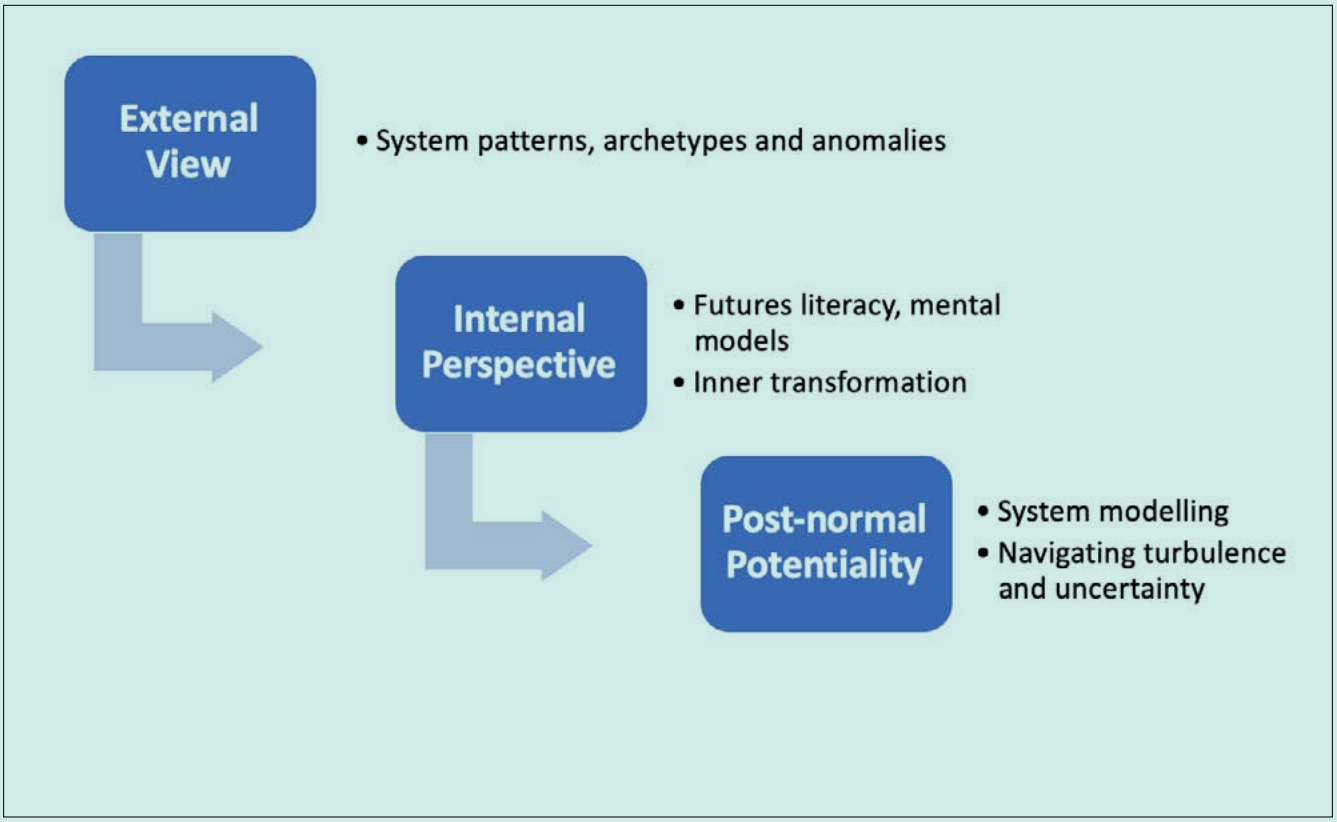
Research Limitations

Limitations surrounding this research project include the sample size being limited to 33 participants, with participation based on research interest and availability during a pandemic. In addition, primary data collection to inform the findings for this report was captured by survey method, there was no additional opportunity to dialogue on survey data responses. It is also important to note that there is a lack of previous research on systemic anomalies, mental models and paradigm shifts in emergency management.

Results

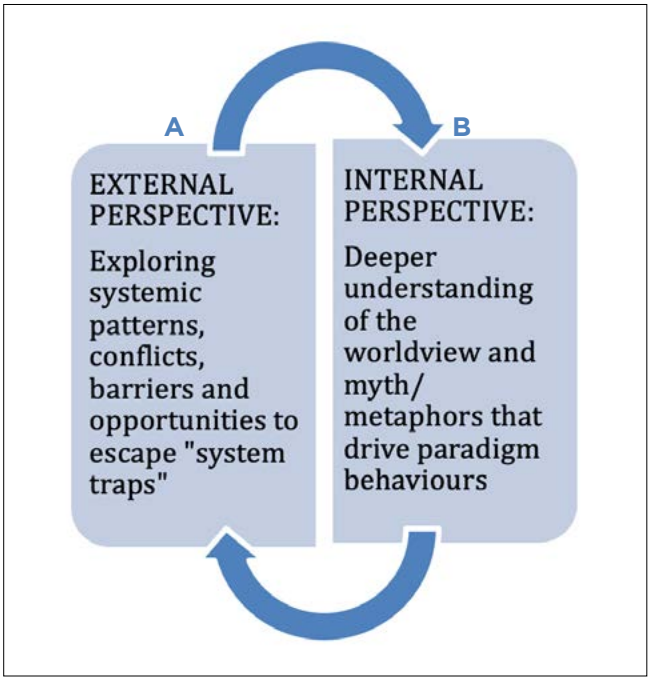
Data collected from this research study has been coded, mapped, analyzed and synthesized in order to understand the experience of emergency managers, their perspective towards the future and current challenges of the existing paradigm.

This section is organized into three main parts:



Paradigm Analysis and Understanding System Anomalies

Section A and B will cover the paradigm analysis in two distinct parts



The word paradigm is commonly used to mean a model, theory, perception or frame of reference. It is how we perceive, understand and interpret the world around us. At the root of our paradigms are our assumptions, where our attitudes and behaviors grow. The paradigm shift of managing disasters to managing current and future risk, and resilience-building as outlined in the Sendai Framework for Disaster Risk Reduction is an evolutionary one, it requires us to move from a reactive way of seeing the world, to a proactive way in order to create powerful change.

Paradigms embody the mindset out of which the system parameters arise – its goals, structure, rules and delays [Meadows, 2008]. To change a paradigm, one needs to build a model of the system, this provides an opportunity to step outside of the system and view it whole. Thomas Kuhn, who wrote about the great paradigm shifts in science, recommends the importance of being able to point at the anomalies and failures in the old paradigm, and to keep speaking and acting with assurance from the new one [Meadows, 2008]. All this suggests that in order for change to occur, one must understand the current paradigm they operate within, and acknowledge its dissatisfaction, challenges and restrictions in order to allow an opening for evolution to take place.

This study has captured the perspectives of participants, each reflecting through their unique lens of experience working in emergency and disaster management. To understand the current paradigm of emergency/disaster management, the causal layered analysis (CLA) framework was used as a paradigm model to explore different levels and perspectives. CLA is a well-integrated approach to understand paradigms and their evolution [Inayatullah, 2019].

Using CLA provides an opportunity to view the emergency management paradigm as a whole, and when combined with systems thinking it can assist to understand the deeper patterns, anomalies and failures. This deeper understanding is necessary in order to diagnose and identify opportunities towards building an evolutionary resilience paradigm as outlined in the Sendai Framework for Disaster Risk Reduction.

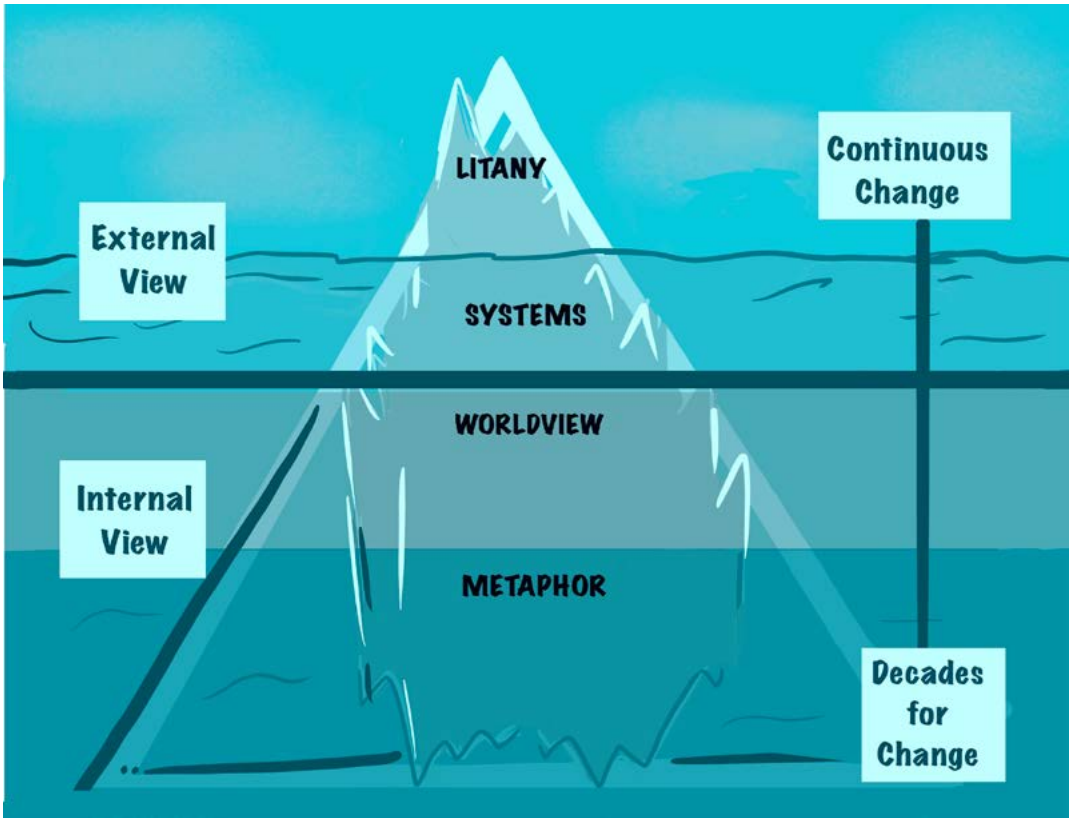


Figure 1 – Causal Layered Analysis (CLA) as Paradigm Model (Redrawn from Inayatullah 2019)

To understand the current operating paradigm a diagnostic approach using qualitative analysis was taken. Data was coded using in-vivo and versus coding approaches. Grounded theory or in-vivo coding served to use the participant's own language in the data record as codes to recognize cultural categories and prioritize and honor the participant's voice. Versus coding served to capture the actual and conceptual conflicts among participants to identify tensions and power issues. Identifying conflicting power issues among stakeholders is an important diagnostic for initiating and facilitating positive social change [Saldana, 2013].

Both sets of data were mapped to the CLA framework across the four levels of the paradigm: the litany, systemic causes, discourse/worldview, and the myth/metaphor. This process assisted in understanding the emergency management paradigm from multiple perspectives, including paradigm failures and opportunities for evolution. The top two levels of the CLA reflect an external perspective of the paradigm, and the bottom two levels reflect an internal one as outlined in Figure 1 above.

The external perspective identifies the litany or the main repetitive problem, and explores social/systemic causes through systemic analysis. Within the external perspective four system archetypes were identified, one at the litany level and three at the social/systemic level. It is important to note that archetypal problems are a consequence of system structure and do not generally respond to standard responses, hence why these archetypes are also known as "system traps". By recognizing these archetypes and altering the structure through leverage points, these system traps can be escaped. For this reason, these archetypes are not just considered traps, but are also opportunities [Meadows, 2008].

Part A:
External View - Four Archetypes in Emergency Management

This section will explore the following four archetypes, starting at the litany level and moving deeper into the system:

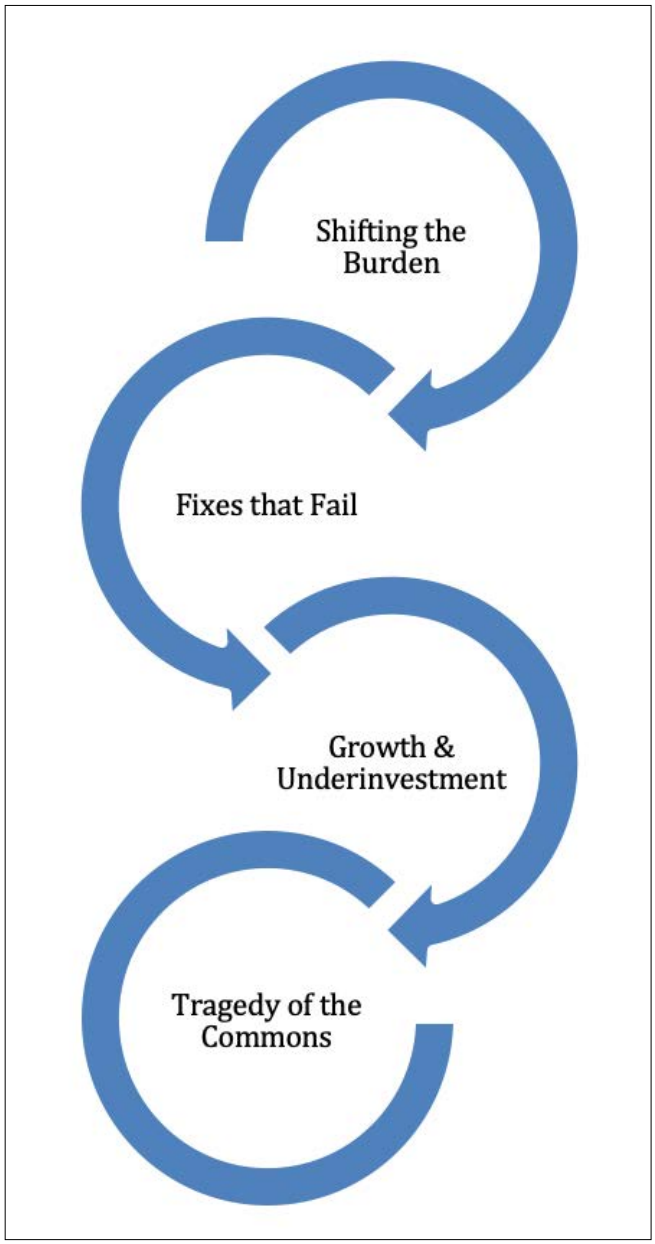


Figure 2 – The Four Archetypes of Emergency Management

Archetype 1: Shifting-the-Burden

The litany is the uncontested reality of our current system. It reflects the repetitive problems and patterns of any system. These are the characterizations that are most visible and obvious, with assumptions rarely questioned.

A strong archetypal pattern was identified in the research data that provides insights into behaviour patterns that relate to anomalies at the governance level. This archetype is known as Shifting-the-Burden and sits in the litany section of the CLA paradigm model.

The Shifting-the-Burden archetype reveals a pattern of behaviour that favours short-term relief of "acute symptoms" or problems, instead of investment in long-term restructuring to address the underlying chronic challenges that persist. An intervenor is required for this archetype to provide immediate solutions to bring the system back into balance. If the long-term capability atrophies, then more of the short-term intervention is needed to achieve the desired effect, which can end up weakening the capability of the original system even more [Meadows, 2008].

When investment predominantly occurs during crisis response, it reveals a pattern of a reactive funding commitment within the emergency management system. Reactive funding commitments are the focus of the first system conflict in this research, which reveals the following systemic pattern of behaviour:

- funding for quick crisis response and recovery vs. proactive long-term funding commitment for disaster risk reduction/management and future resilience.

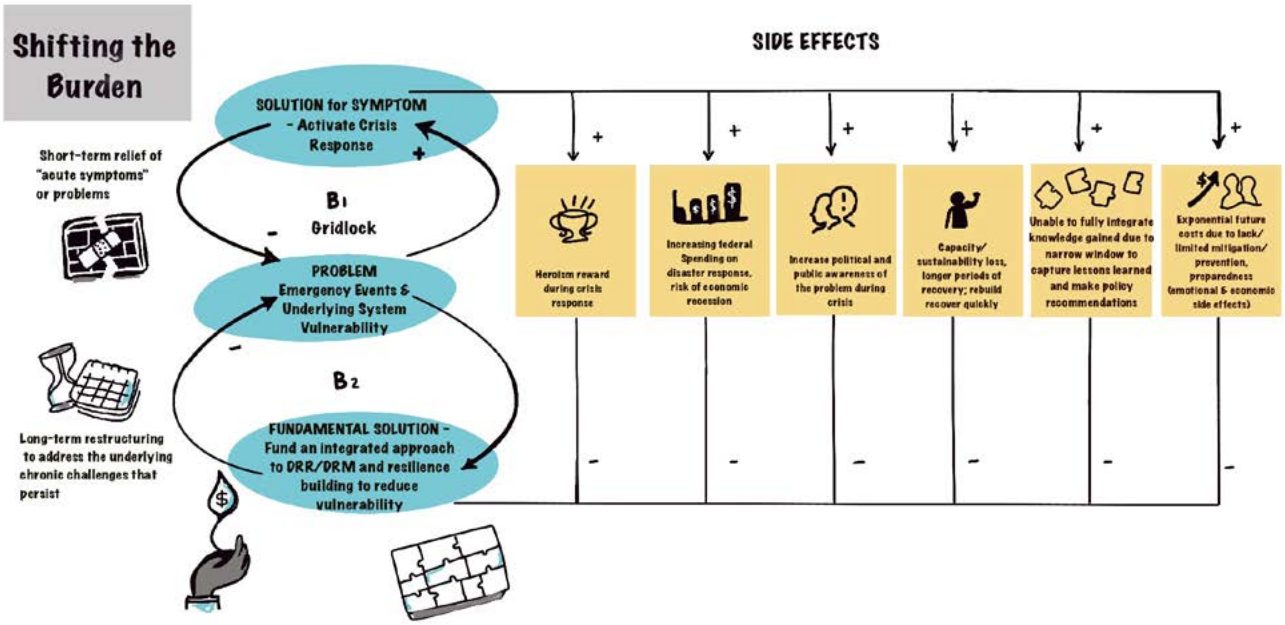


Figure 3 – Archetype: Shifting the Burden: Gridlocked in Crisis Management

As outlined in the Shifting-the-Burden archetype (Figure 3) below, the original problem is the underlying, and growing system vulnerability not fundamentally being addressed in the system prior to hazard exposure. Without sufficient coping capacity to address vulnerabilities at the local level, exposure to hazards can lead to emergency events requiring significant deployment of resources, or can potentially escalate emergency situations into disasters causing serious disruption to social routines and/or property damage. Vulnerability is not a static concept, the risk profile evolves based on external drivers in the broader environment, and as part of the complex system with interdependencies.

In this archetype when an emergency event occurs, the burden is shifted to emergency managers, the interveners in the system to address the disruption, stabilize the system, support a quick recovery, and restore the system back into balance, as outlined in the balancing loop (B1) in Figure 3. The underlying system vulnerabilities are not fundamentally addressed in the balancing loop (B2). Macro environmental drivers of change are creating conditions that result in an increase in frequency and severity of extreme weather events, this shift can strengthen the dependency on short-term crisis management solutions in the B1 loop. The potential consequences of this behaviour is a strain on emergency management resource capacity, as well as potential strain on the capacity of other crisis response interveners such as the military.

In the Shifting-the-Burden archetype, the system trap occurs when the short-term burden is shifted to emergency managers and results in investment predominantly in the crisis response B1 loop. This can result in a long-term loss and lack of investment in a fundamental system solution to reduce risk and build resilience. This pattern undermines the original overarching goal of the emergency management cycle and system by drawing available resources to support predominantly the response pillar. As resources are directed towards response (i.e. civil defence), this directly impacts the risk management pillars of prevention, mitigation and preparedness (i.e. civil protection), intended to maintain the system in the short and longer-term. This behaviour potentially reinforces increases in local vulnerability moving into the future, and creates a paradigm gridlocked in crisis response. This ultimately contributes to the failure to evolve and keep pace with changes in the broader external environment.

Figure 4 – Emergency Management Cycle

Systemic Insights & Diagnosis

This archetype's system pattern appears similar to the pattern of an addiction. In this context, addiction is finding a quick solution to the symptom of the problem, which prevents or distracts one from the harder and longer-term task of solving the real problem [Meadows, 2008]. The rising dependency on crisis management solutions has allowed the response sub-system goal to dominate the overarching goal of the entire emergency management cycle and broader system. This pattern is further supported with legislative rules focused on response planning and activation of resources when an emergency threshold is reached providing overcontrol from the top down. Emergency events typically result in availability of government funding and public donations to support crisis response operations. This can function as an economic incentive, further strengthening the interest in building crisis response capabilities, with limited interest in disaster risk reduction and capacity building to balance the system in the long-term. This can potentially act as perverse economic system feedback, which can lead to potential system collapse if not balanced.

Within the emergency management system, hierarchies exist to provide system stability, balance and resilience. This is reflected in the emergency management cycle comprising five pillars divided along two main subsystems: boundaries of activity, crisis management (response and recovery pillars) and risk management (prevention, mitigation and preparedness pillars) as outlined in Figure 4. The relationship between these two subsystems – crisis management and risk management appears to have weakened over time with the dominance of the crisis response subsystem goal. This pattern suggests a malfunctioning of the hierarchy within the emergency management cycle and sub-optimization of the system, as the risk management subsystem struggles to meet its goals in order to provide the balance needed within the emergency management system. With central control through legislative requirements (rules) predominantly focused on emergency response, this provides little autonomy to keep the risk management subsystem functioning, flourishing and self-organizing to align with the paradigm shift towards managing current and future risks and building resilience. These rules constrain the emergency management hierarchy and makes it difficult to address system vulnerability at the lower levels of the system. These constraints restrict the evolution of the risk management subsystem from a grassroots or bottom-up approach, based on risk reduction and local resilience needs. The unaddressed system vulnerabilities can lead to system deterioration, potentially requiring more and more crisis response, short-term interventions.

Erosion of the risk management subsystem can set into motion a destructive reinforcing feedback loop, compromising the self-maintaining capacity of the original emergency management system, leaving it less able to maintain its own desired state.

Increasing dependency on the crisis response interventions, can also lead to an increasing focus on maintaining consistency of emergency response capabilities over time. Systems that are expected to be constant over time can potentially become un-resilient. As quoted by ecologist C.S. Holling *"placing a system in a straitjacket of constancy can cause fragility to evolve".*

Side Effects

System side-effects identified with the Shifting-the-Burden archetype includes:

- **Heroism Reward:** of crisis response intervenors, which can unintentionally incentivize addictive short-term system behaviours;
- **Recreating System Vulnerabilities:** with pressure for short-term quick wins to reduce immediate risks, and strategies to recover and rebuild quickly without addressing the underlying vulnerability problems;
- **Capacity Loss:** emergency management resource capacity loss to sustain activities with longer response/recovery periods;
- **Poor Knowledge Integration:** of lessons learned from crisis response due to narrow window to capture knowledge and inform future policy recommendations;
- **Economic Impacts:** risks and cuts to other government/ public programs and services with increasing federal spending on disaster response activities; and
- **Exponential Future Costs:** from emotional to economic consequences, potentially limiting future availability of funding available for risk management and resilience building activities.

Stock and Flow – Crisis Response Capabilities

This increasing dependency on crisis response leads to the question, what is the strength of the crisis response loop? How well is this loop resourced and designed to balance the disruption and impact from emergency events in an evolving and uncertain environment? These are important considerations given the disruption and significant changes we are experiencing from the Covid-19 response. Figure 5 below is a stock and flow diagram that maps the current pressure on crisis response capacity and capabilities.

The potential risk of decline of the crisis response stock is relative to the rate of change triggering demand for crisis response actions. Increasing and high demand contributes to a behaviour pattern that potentially leads to discrepancies in maintaining this critical resource stock. Situations that continually exceed the crisis response and broader emergency management resource capacity have the potential to reinforce stock decline, with the following implications:

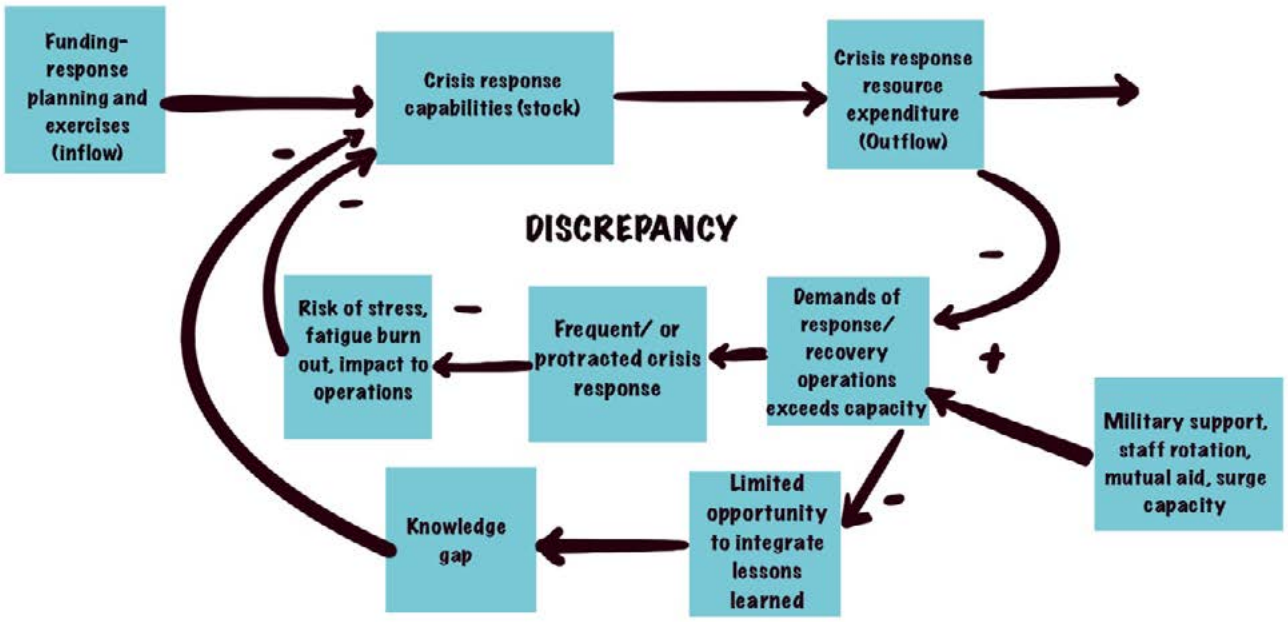


Figure 5 – Stock and Flow: Crisis Response Capacity

- **Requests for Assistance:** increasing requests for military assistance to augment surge capacity;
- **Health:** potential risks to mental and emotional health due to stress, fatigue and burnout; and
- **Learning Dilemma:** stretched response capacity can result in the lack of ability to reflect on the consequences of actions, and integrate lessons learned and knowledge.

Paradigm Reorientation - Opportunities to Intervene in the System

This archetypal pattern signals that the system is in a state of gridlock, with reactive funding for "acute" crisis response activities. This is activated when the threshold for emergency response is reached, and there is a need to restore short-term balance, until the emergency reappears again. This pattern of behaviour distracts in the short-term and may reduce the pressure to implement a fundamental solution to address the original underlying problem. It may also mask the underlying "chronic" vulnerabilities, issues and root causes of systemic challenges.

In order for the system to evolve out of a state of gridlock, attention, leadership, commitment and investment is required to support long-term restructuring to address system vulnerabilities and build resilience. This direction aligns with the UN Office for Disaster Risk Reduction, which has highlighted the need for radical transformation within the system, and more investment at the prevention end of the cycle [Mizutori, 2019]. Proactive investment provides an opportunity for the hierarchy to function to assist the lower sub-systems, creating an opening for the hierarchy to evolve from the bottom up.

Connected to the Shifting-the-Burden archetype are the following system leverage points as outlined in the chart below. Each leverage point provides an unique opportunity to influence change within the system, they include: goals, self-organization, rules, information flows and balancing feedback loops.

Leverage Point	Current Pattern	Opportunities to Strengthen System
System Anomalies	• Gridlocked in Crisis Management • Fragility to evolve	• Work at system paradigm level - support long-term restructuring to address system vulnerabilities and build resilience
System Goals	• Emergency response subsystem goals overpowering the entire system • Erosion of the risk management subsystem	• Re-examine the system's goals to align with the paradigm of managing risk and building resilience • Harmonization of goals across the system
Self-organization	• Hierarchy malfunction • Sub-optimization of the system • Little autonomy to keep sub-system flourishing, functioning and self-organizing from the bottom-up • Tension between consistency and flexibility to evolve structure	• Shifting the function of the hierarchy • Cultural and structural shift to a more collaborative approach to empower and allow the evolution from the bottom-up and grassroots level • Hierarchy to serve the needs and address the vulnerabilities of its subsystems at the lower levels
Rules	• Not designed to recognize accumulation of risk and vulnerability • Lack of capacity to reduce the risk, and potential escalation of an emergency situation	• Evolve the existing structures and scope for vulnerability and early accumulation of risk, with dedicated resources activated for mitigating and preventing escalation of risk, and enhancing coping capacity
Information Flows	• Missing information flow in regards to dynamic information on local level vulnerability and coping capacity, as well as a lack of a measurement approach	• Build a new feedback loop with focus on local level information on vulnerability and coping capacity
Reinforcing & Balancing Feedback Loops	• Destructive reinforcing feedback loop in favour of crisis response • System feedback, the strength is low relative to impacts, re-creating system vulnerabilities	• Improve the system's self-correcting abilities requires strengthening or adding balancing feedback loops in both the short and long-term • Feedback loops that learn and evolve

Table 1 – Shifting the Burden: Summary of Leverage Points for System Change

Investments in a fundamental solution focusing on the system's longer-term goals of risk reduction, risk management (prevention, mitigation and preparedness), and new resilience building capabilities are necessary strategies to support the evolution of today's structure in response to the changing environment. These long-term goals can work towards reducing chronic system vulnerabilities, with a growth mindset to build the capacity at the community level, as well as other levels in the system. This provides the capability for the system to maintain a level of coping capacity and/or resilience in a changing and variable environment over the longer-term.

Patterns of Power

The following power issues in the Table 2 below were identified for this archetype. Identifying power issues is an important diagnostic for initiating and facilitating positive social change, and can be used to examine the power that holds patterns in place.

Who has power over the rules?	Political level, government bureaucracy
Power that holds patterns in place?	Legislation, regulation, directives, policies, guidelines
Patterns of hierarchy and power?	Top-down structure, centralized structures, limited feedback loops
Who is accepting and struggling against them?	Emergency managers, the system interveners and vulnerable communities
Conflicts to transcend for change and transformation	Reactive vs. proactive funding, ability to break out of system gridlock and evolve structure, disconnect between political, policy, funding and emergency response cycles
Contradictions to future resilience? **Actions holding us in the past?**	Addiction to short-term crisis management solutions and command and control approach, response pillar dominating emergency management cycle, lack of investment in reducing risk and building future resilience over the longer-term

Table 2 – Shifting the Burden: Patterns of Power

Archetype 2: Fixes-that-Fail

In April 2020 during the Covid-19 pandemic, the UN Office for Disaster Risk Reduction released a series of papers on systemic complexity of risk, and the following quote "The Sendai Framework for Disaster Risk Reduction impels a move away from an obsession with prediction and control, calling to embrace multiplicity, ambiguity and uncertainty" [Gordon; Williams, 2020]. The Covid-19 crisis has highlighted the need to view the topography of risks through time, and to be better prepared for the challenges of global events. This new direction sets the stage for a new chapter for the "rules" of the emergency management system.

The Fixes that Fail archetype is known for its "policy resistance" pattern. This pattern is derived when a "problem or symptom" in the system needs to be balanced by a "fix or solution" to stabilize the system. The primary symptom of this archetype's balancing feedback loop is one of little change, despite outside forces pushing down on the system. This creates a situation where the system gets stuck producing the same behaviour every year, regardless of the changes in the broader external environment. This pattern appears to have a beneficial effect in the short-term however, symptoms of the problem can become worse over time.

This type of behaviour is accompanied by a bounded rationality of the actors in the system attached to their own goals. If there is a discrepancy, correction is required. The greater the discrepancy between the goal and the actual reality of the situation, the more action is required to balance. This is reflected as the difference between emergency response plans based on planning assumptions, and the actual emergent strategy required during emergency events to balance the system. Within this archetype are contained very powerful leverage points, the rules of the system!

Understanding the rules and who has power over them in a system is critical, as mentioned, the rules define the system's scope, its boundaries, and its degrees of freedom (Meadow, 2008). Rules are high leverage points in a system and restructuring of the rules can shift a system's behaviour.

In emergency management there are rules embedded in legislation, regulations, directives, policies, requirements and guidelines. Rules of the system are the focus of the second and third conflict identified in our research, specifically:

- legislative requirements to prepare emergency management response plans according to identified risks vs. reducing and managing disaster risk with opportunities for mitigation, preparedness, adaptation and resilience building;
- hazard risk lens with a deterministic and reductionist approach to risk assessments (quantitative) vs. holistic lens and emergent approach to understand system complexity, change and opportunities for growth, innovation and transformation (qualitative)

This archetype's fix/solution uses a hazard lens with a linear and deterministic approach to quantify the most probable risk; it is a narrow and surface level view to understand systemic risk and vulnerability. This lens skims the surface and does not reflect the broad dynamic nature of reality, complex interdependencies and change within a system. Traditional methods have an inability to grapple

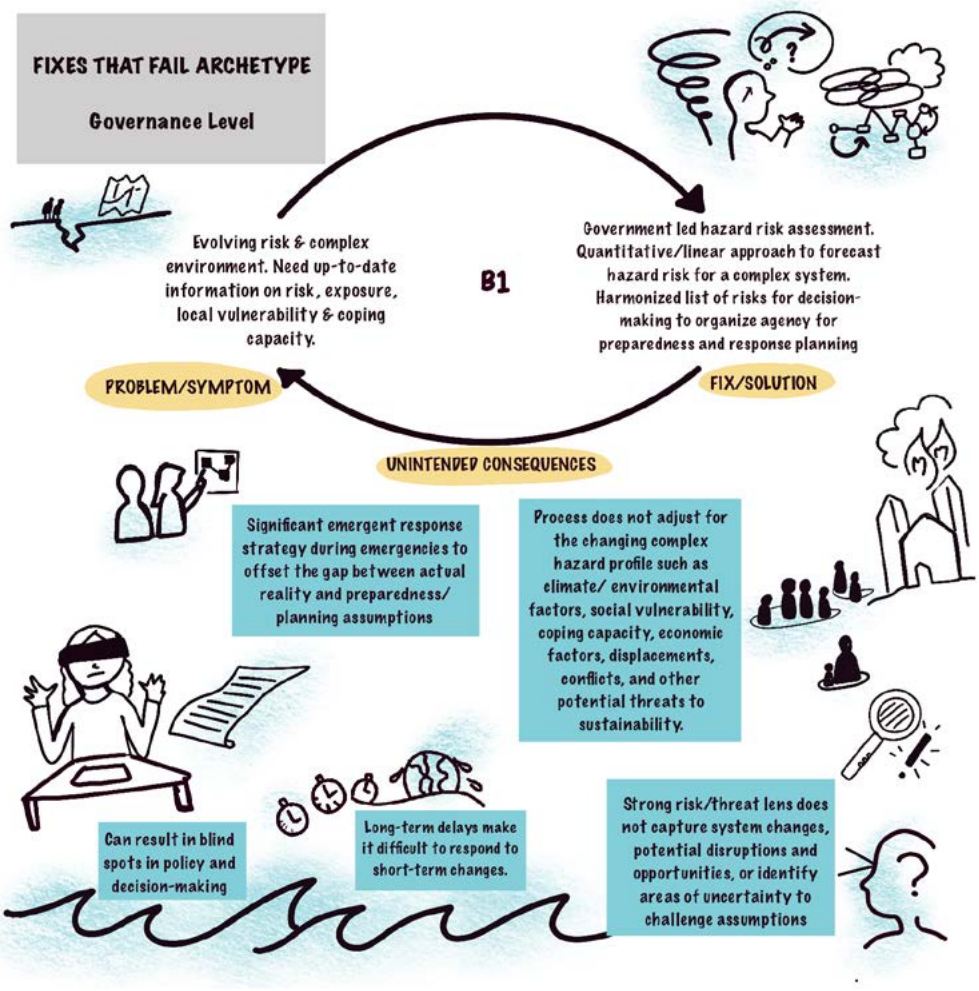


Figure 6 –Archetype: Fixes-that-Fail - Risk Assessment Process

with the long-term's multiplicity of plausible futures [Walker, 2010] and short-termism could create blind spots and limit integrated efforts to mitigate risks [Franco, 2020]. This is important, since the risk assessment process is the "system rules" that informs decision-making for emergency management activities.

Rules of the System

Rules outlined in legislation, regulations, directives, policies and guidelines in emergency management, is the power structure in the system that holds patterns in place. Power over the rules is held within government structures, which include both the bureaucratic/public service, political and legislative side of government.

System conflicts in the rules of the system appear in legislative requirements for emergency planning, and in the hazard identification and risk assessment lens. It is important to note that these rules set the system's scope boundaries, but can also restrict the system and constrain activities deemed to be outside of this system's scope.

In Canada, the legislative requirements in the 2009 Emergency Management Act s.4.0, s.6.0 focus on having emergency management plans in place based on risk identified in assessments. In practice, these are plans that are activated when the emergency threshold is reached to support emergency response activities. Additional requirements to support the response plan also include the need to maintain, test and implement response plans, and conduct exercises and training in relation to response plans. These requirements are important to maintain crisis management readiness and capabilities but represent only part of the emergency management cycle. Emergency management plans are highly dependent on risk assessments. Systemic inaccuracies and blind spots in the risk assessment can underestimate the need for investments in emergency management planning activities.

In practice, this legislative rule appears to establish a boundary around crisis management and does not include the disaster risk management side of the emergency management cycle, or new resilience building activities as outlined under UN's Sendai Framework for Disaster Risk Reduction. This inadvertently constrains aspects of risk management activities since it may be interpreted to be outside the scope of the system rules and legislative responsibility, which impacts opportunities for mitigation, preparedness, adaptation and resilience building in an evolving risk landscape.

In Canada at the federal level, the risk assessment perspective is imbedded in the All Hazards Risk Assessment (AHRA) process developed by Public Safety Canada. The AHRA process is important within the emergency management system paradigm because it functions as the rules of the risk governance system. AHRA is an annual assessment that focuses on the most probable and consequential risks. This assessment uses a specific and focused lens to document and outline hazards, and their associated risks within a geographic boundary. It uses known past and current data to assess which hazards pose the greatest risk in terms of how likely they are to occur, and potential impact on public safety. The approach uses probable and worst case scenarios in order to create a harmonized list of risks for decision-

making on investments and opportunities to organize agency and resources to reduce or mitigate current and short-term future risk (1-5 years). This approach is not intended to be used as a predictive tool, additional forecasting approaches are used for exploration for the future to support the knowledge process.

Significant efforts go into understanding hazards however, understanding of the other facets such as social and ecological vulnerability, the human cost in lost lives, health impacts, livelihoods, and the impact of hazards on the very poorest people is not yet a regular component of the risk equation [Mizutori, 2019]. This is a significant gap in understanding systemic risk.

While there is an appreciation of the inherent uncertainties in all key aspects of the risk assessment process, there is a lack of use in anticipatory methods to explore emergence and uncertainty as part of the risk assessment, preparedness or planning process. This risk assessment approach deals with uncertainty by using methods of resistance, i.e. worse case scenarios, with a resilience goal to recover quickly [Walker, 2010] or 'bounce back' after an emergency event with a response capacity to address the most likely and probable risks. What happens if disruption emerges outside of the most probable lens, and perceived risks are significantly different from actual reality?

Based on research survey data, the rules of the risk governance system appear to have the following five features:

- **Response Focus:** legislative requirement focused on emergency management plans that support preparedness for response to civil emergencies;
- **Expert Driven:** an expert driven intelligence process to determined relevant risks and impacts;
- **Probabilistic Lens:** with exercises, training and plans focused on most likely risks and worse-case scenarios;
- **Forecasting Models:** an approach to "use-the-future" based on anticipation for the future (AfF), with a knowledge creation process that uses forecasting models based on predetermined assumptions about the future; and
- **Uncertainty:** a recognition and appreciation of the inherent uncertainties within the risk assessment process, with no integration of anticipatory methods for emergence (AfE) to assist working with uncertainty.

Systemic Insights & Diagnosis - Unintended Consequences

The Covid-19 pandemic clearly demonstrates the importance of having a systemic perspective to support decision-making. Models that can only describe single-system vulnerabilities for complex risk scenarios do not assist decision makers to understand and prepare for systemic risks. Unfortunately, policy makers are currently facing this across the world with the COVID-19 pandemic [Gordon; Williams, 2020]. Most recently, the UNDRR has called for major renovations of approaches to risk assessments and analysis, and ensure a wider context for the Sendai Framework and the 2030 Agenda for Sustainable Development [Gordon; Williams, 2020].

Discrepancies in risk assessment approaches are reflected in preparedness and planning assumptions, and are ultimately revealed during emergency events. The larger the gap between planning assumptions and the reality of the emergency event, the more likely the need for an emergent strategy to potentially mobilize a large amount of resources to balance the system and support a quick recovery. This risk discrepancy represents system blind spots, which are often characterized as wildcards or black swan events.

These consequences and challenges suggest that the risk assessment methodology to balance the loop in the Fixes that Fail archetype is limited in strength. This means the approach used to understand risk is not adequately designed to meet the needs of today's complex systemic challenges in an evolving and uncertain risk landscape. The approach appears to create an inadequate perception of risk, which inhibits the system's ability to anticipate and keep pace with emerging systemic changes at the macro and community level.

Risk is a strong motivator for action and change. The identification and prioritization of risk is an important part of anticipation. Some level of risk must be experienced or anticipated in order to consider reflecting on the positive or negative consequences of behavior. Therefore, risk perception, as a precursor to anticipation, is needed to motivate adaptive anticipatory behavior. A lack of risk perception can lead to inadequate anticipatory behaviour which in turn has the potential to elevate vulnerability when exposed to risks [van Niekerk et al., 2017].

The Fixes-that-Fail archetype tends to resist change, despite the changing reality of the dynamic environment. In reality, the macro environment is changing, hazard profiles are changing, and local concerns about risk, impacts and consequences are becoming broader and more complex. These are the forces pushing down on today's emergency management system as local chronic systemic vulnerability increases at the community level. The evolving risk and increasingly complex landscape requires a new system of relations to make sense of dynamic interactions and systemic risk. This requires access to shared knowledge and collective intelligence to understand interdependencies of risk, exposure and vulnerability (local, social and infrastructure), with access to real-time risk information to support adequate preparedness, capacity building and adaptive anticipatory behaviors.

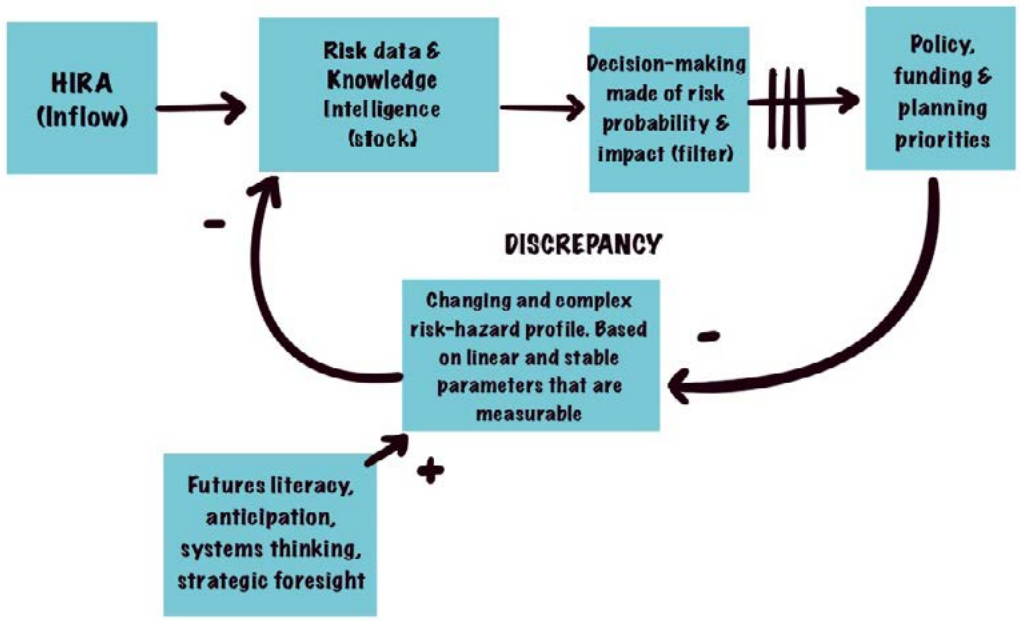


Figure 7 – Stock & Flow: Collective Intelligence & Risk Data

Stock & Flow - Collective Intelligence & Risk Data

The stock and flow diagram below in Figure 7, identifies risk data as an emergency management stock, that is subjected to filters such as likelihood and impact to quantify and prioritize risk. This supports the outflow of data to support policy, strategy, funding and planning priorities. Discrepancies in systemic and anticipatory risk intelligence affects the ability for emergency management to maintain accurate risk data (stock) that reflects the systemic environment and keeps pace with the rate of change. This can lead to decision-making based on limited or incomplete data. An opportunity exists to integrate other knowledge systems into the process to capture insights and expand beyond the current hazard focus and predictive lens to include systemic risk and anticipatory knowledge based on emergence and horizon scanning information.

Restrictions in systemic risk information flow (inflow and outflow) and the inability to capture and integrate broader system feedback reveals a systemic malfunction in our risk approach. The current approach is limited in knowledge to experts, and is not inclusive to capture knowledge across different system stakeholders to understand vulnerability and coping capacity. There is a bias for approaches fixed on specific hazard risk drivers instead of underlying drivers of risk, which are as much a root cause of loss, damage and people affected.

Strong collective intelligence from a diversity of perspectives, including those most at risk at the local level, can assist to obtain a clearer picture of potential local impact from exposure to a hazard. Maintaining this stock of risk data is critical for emergency management. The UNDRR has confirmed the current risk situation with the statement *"understanding the dynamic and systemic nature of risks, and the opportunities afforded by new approaches and new concepts of risk, will be the central challenge of the first half of the twenty-first century"* [Gordon; Williams, 2020].

Paradigm Reorientation - Opportunities to Intervene in the System

The Fixes-that-Fail archetype as outlined in the previous sections is prone to the system trap of policy resistance, and despite efforts the system appears to be stuck producing the same behaviours. The resistance also results from the bounded rationalities or mental models of the actors in the system. It's important to examine the feedback loops within the system, to understand the bounded rationality behind them, and explore options to harmonize the goals of other stakeholders in the system while moving the system forward. The most effective way of dealing with policy resistance is to find a way of aligning the various goals of the subsystems, usually by providing an overarching goal that allows all actors to break out of their bounded rationality [Meadows, 2008]. One potential overarching goal is to move towards an understanding of the dynamic and systemic nature of risk, with an anticipatory lens to identify system change, disruption and opportunities for new adaptive anticipatory behaviours.

Connected to the Fixes-that-Fail archetype are the following system leverage points as outlined in the table below. Each leverage point provides a unique opportunity to influence change within the system. They include: goals, rules, information flows, balancing feedback loops and delays.

The Fixes-that-Fail archetype teaches us the importance of examining our mental models and testing them against reality. It is important to bring to the surface our assumptions that shape our perspective. Having a narrow and short-term lens focused on prediction and probability to understand dynamic complex systems is a limited way of thinking about the future, and keep pace with the rate of change. This also creates the situation of being in a position of always catching up or reacting instead of getting ahead, leading with vision and creating the agency for change to shape the future.

This highlights the importance of developing future literacy as a capability to understand differences in anticipatory systems and methods, each used for different purposes to create different forms of knowledge. Each anticipatory system is grounded in different anticipatory assumptions about the future, offering different ways of thinking, seeing and opportunities to act. Ranging from investing and organizing agency to reconceptualizing human agency for future investment and fundamental change [Miller, 2018]. The ability to consciously shift perspective between types of anticipatory systems is a leadership skill that requires cognitive and psychological flexibility.

Leverage Point	Current Pattern	Opportunities to Strengthen System
System Anomalies	• policy resistance trap • limited risk perception • inadequate anticipatory behaviours • elevating chronic vulnerability	• break bounded rationality/mental model • consider a two-tier approach linking probabilistic scenarios with short-term preparedness and planning needs, with plausible and possible scenarios to challenge assumptions and identify opportunities to shape future resilience.
System Goals	• legislative responsibility to respond to emergencies • assess risk to prioritize emergency management activities	• align various sub-system goals with an overarching goal to include the new paradigm -disaster risk management and building resilience • harmonize emergency management legislative and risk framework with disaster risk management • extend risk management framework to align with new system paradigm goal
Rules	• legislative boundary around crisis management (constraints risk management) • mental model – prediction and probability, deterministic approach • risk assessment aligned to system goals, forecasting to quantify and prioritize risk, not designed for complex systemic risk and uncertain landscapes • not aligned with managing current/future risk and resilience building • expert driven, low strength in system feedback to risk assessment • risk discrepancies resulting is system blind spots	• need a new concept of risk, systemic and anticipatory lens aligned to new paradigm • develop futures literacy as a capability to understand differences in anticipatory systems, emergence and knowledge creation • two-tier approach, layering anticipatory systems for broader perspective • navigate uncertainty and understand impacts of various system drivers
Information Flows	• traditional top-down, command and control structure with one-way communication flow • missing information flows (risk assessment malfunction) • missing feedback on vulnerability, risk reduction and mitigation support	• adding missing information for system accountability • risk information publicly available to support system transparency and accountability • evolution in thinking about systemic risk governance • two-way communication feedback to empower disaster risk management
Delays	• difficult to keep pace with risk information relative to changing environment to response to short-term changes in the system (low agility) • difficult to maintain emergency management capability stock (crisis response and disaster risk management) • undershoot required resources to maintain capacity	• agile and responsive to dynamic system change • real-time local vulnerability and needs prior to emergency events
Stock & Flow	• expert driven risk information, limited diversity and inclusivity of perspectives to understand vulnerability and coping capacity • discrepancies in systemic and anticipatory risk intelligence • difficulty maintaining accurate stock of risk data	• strong collective intelligence from a diversity of perspectives, including those most at risk at the local level and potential impact from exposure to a hazard

Table 3 - Fixes that Fail: Summary of Leverage Points for System Change

Patterns of Power

The following power issues in the Table 4 below are summarized for this archetype and reveals the power that holds patterns in place.

Who has power over the rules?	Political level, government bureaucracy
Power that holds patterns in place?	Legislation, regulation, directives, policies, guidelines and funding mechanisms
Patterns of hierarchy and power?	Top-down structure, centralized, expert feedback, limited systemic feedback loops
Who is accepting and struggling against them?	Government accepts the current approach. Emergency managers, the system interveners are struggling against risk discrepancies resulting in a lack/limited resources available to respond to emergencies or mitigate risk.
Conflicts to transcend for change and transformation	Mental model/perception of risk. Hazard risk lens (deterministic/reductionist approach) with missing systemic information flow. Need to expand legislated requirements to include disaster risk reduction and resilience building.
Contradictions to future resilience? **Actions holding us in the past?**	Surface level understanding of risk vs. holistic, and a low level expectation of resilience (e.g. recovery vs. adaptive strategy). Does not appear to prioritize disaster risk reduction, mitigation and building resilience to address system vulnerabilities over the long-term.

Table 4 – Fixes that Fail: Patterns of Power

Evolution of the Planning Hierarchy

As we look deeper into the system structure of the emergency management paradigm, the planning structures are an important element for further examination. Upon observation, there is a system hierarchy that is organized into various planning sub-systems. The questions arise, how coordinated are the sub-systems to ensure sufficient feedback in order to achieve the overarching goal of the planning structure? How sensitive is this structure to shifts in the broader macro environment? Based on the participant survey, **85% of those working in emergency management identified the climate crisis and increasing extreme weather events as having a significant to major long-term impact on their role.** This highlights the importance of being well coordinated with the ability to adapt within a changing environment.

This research identified **five conflicts** within the existing planning structures, as outlined below:

- use and comfort with traditional disaster heuristics **vs.** learning, adapting and transforming processes or methods;
- focus on current tactical and operational level activities **vs.** systemic, strategic and policy level focus moving into the future;
- emergency response pillar as the dominant emergency management priority **vs.** full emergency management (mitigation, prevention, preparedness and recovery pillars);
- dedicated response funding and/or competition for donations **vs.** interagency collaborative funding sources; and
- reliance on expert driven knowledge **vs.** expanding knowledge forums for broader public engagement and participation to support a whole of society response.

These conflicts signal challenges with the current planning structures, and possible difficulty self-organizing to evolve into a structure with new degrees of integration and hierarchy. An evolution in structure is needed to support the ability to work collaboratively and achieve the new overarching system goal of disaster risk management and building resilience.

Key challenges identified within the current planning structure include the following:

- **Vision & Adaptation:** lack of a unified vision for the profession, with adaptation taking place without reflection and/or limited awareness of the issues.

- **Response & Incident Command System (ICS) Doctrine Focus:** role and funding tied to emergency response planning, exercises and ICS doctrine is driving institutional interests. There is limited opportunity to turn the dial and advance work on disaster risk management, despite internal advocacy and attempts to seek endorsement.

- **Thinking & Behaviour Mismatch:** the thinking among many emergency management professionals in this study was centered on the long-term. There is significant consensus within the emergency management community that long-term mitigation/prevention, preparedness and recovery planning must be undertaken now. This thinking runs counter to the short-term cycle of behaviour observed.

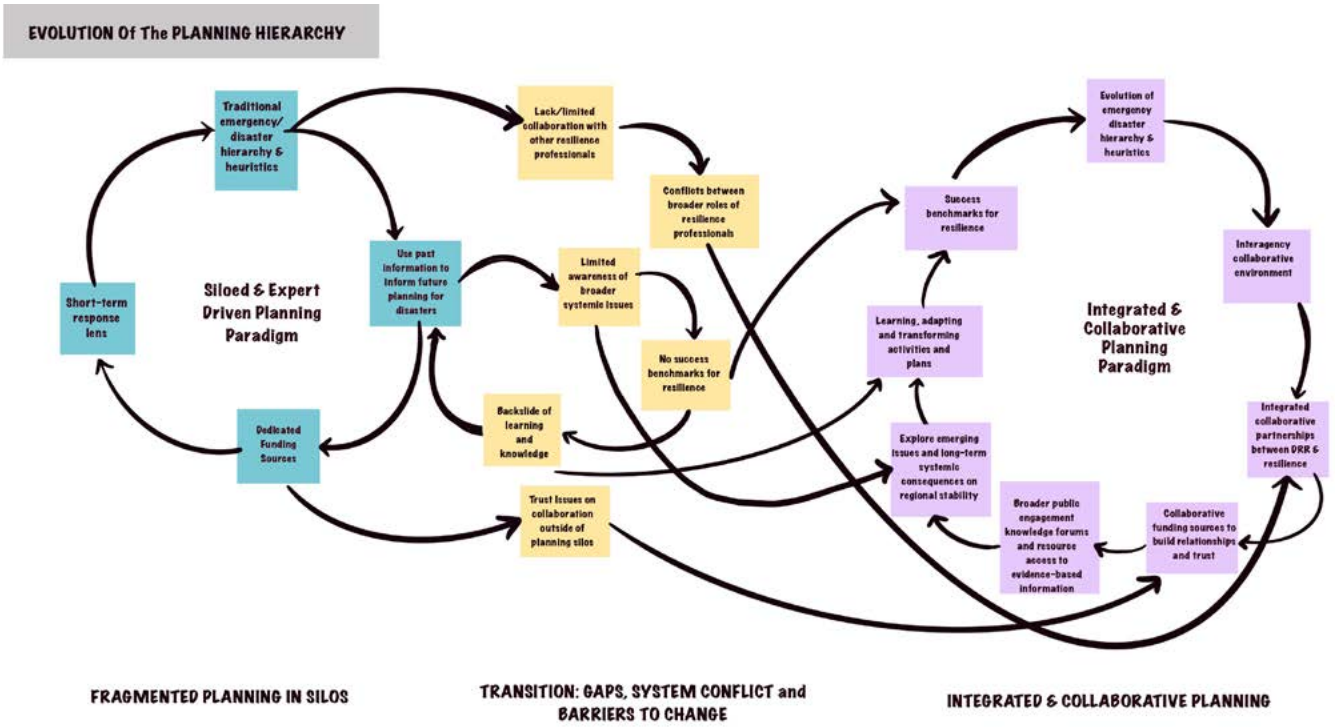


Figure 8 – Fragmented to Integrated and Collaborative Planning

- **Grassroots & Partner Capacity:** major reform is needed to engage with grassroots/local level to support mitigation and preparedness with top down resources. Short-term disaster relief efforts do not assist local communities to bounce back after an emergency or disaster. Building partner capacity at different levels in the system requires tremendous collaboration, commitment and investment over many years and election cycles.

- **Professional, Industry & Geographic Variations:** there are many communities within the emergency management ecosystem. Some see planning, mitigation and preparedness just as important as response and recovery, while some are only concerned once a crisis has occurred with little time, effort and resources available. In general, public sector emergency/disaster management governance promotes the short-term response/recovery with elected officials at the top of the governance model looking for quick wins within their mandates. Private sector organizations may not see risk, business continuity management or crisis management as being business critical priorities.

As outlined in Figure 8, there are a few key **barriers to change** to support the movement towards building resilience. They include:

- Issues of trust and willingness to collaborate outside of established planning silos;
- Limited resources and competing pressures;
- Institutional interests dominate, as some could lose their role and funding if there were fewer emergencies and less need for response actions;
- Limited internalization of lessons learned and experiential knowledge; and
- No success benchmarks for resilience or measures of progress towards achieving goals.

In addition to the previously described archetypes, analysis of the planning structure revealed two system archetypes that are worth briefly exploring as part of the patterns at the paradigm level:

- Growth & Underinvestment
- Tragedy of the Commons

Archetype 3: Growth & Underinvestment

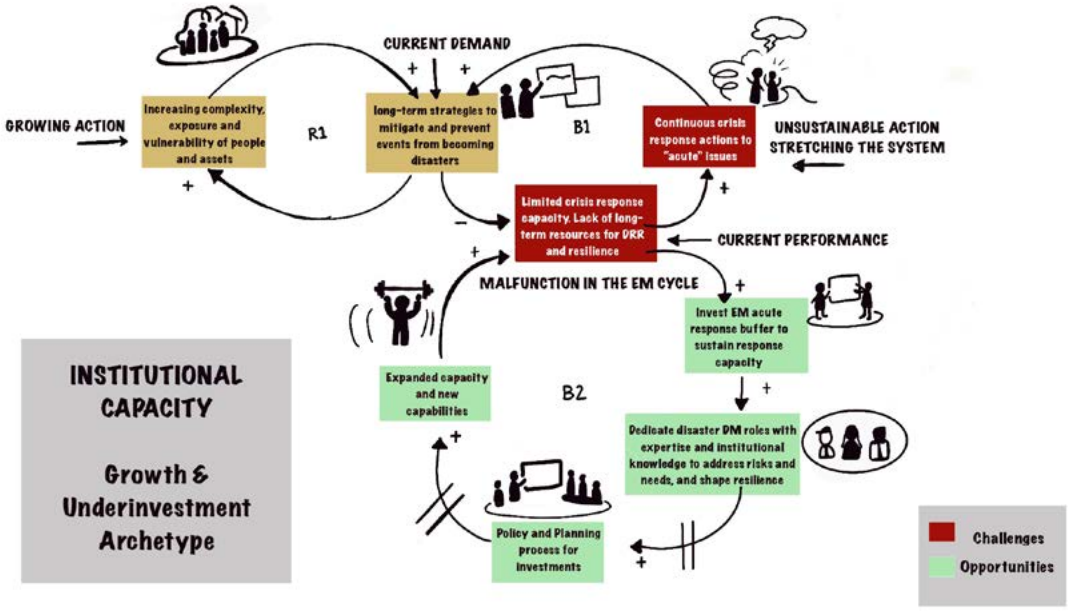


Figure 9 –Archetype Growth & Underinvestment: Institutional Capacity

The Growth and Underinvestment archetype reflects system interventions at the structure/function level of the paradigm, specifically capital planning which includes capacity investments and performance measures. The dynamic theory of this archetype reveals a reinforcing growing action within the system, creating demand for a particular action and need for capacity investments to avoid a decline in performance standards.

This archetype's growing action is outlined in the systemigram (Figure 9) above in the reinforcing loop (R1). This growing action is the increasing complexity, exposure and vulnerability of people and assets, which leads to the increasing need for longer-term strategies to mitigate, reduce vulnerability and build coping capacity to prevent emergency events from becoming disasters. This R1 loop is met with a balancing loop (B1) that seeks to balance the system in the short-term using crisis response actions to address the "acute" emergency issues. The limited crisis response capacity can make it challenging to balance the system in the short-term. In addition, the lack of long-term resources for disaster risk reduction and resilience building further creates a discrepancy in the system's performance.

This archetype highlights **two conflicts** in the system:

- growing demand for planning needs/resources **vs.** the limited capacity/resources; and
- an increasing frequency and severity of emergency events **vs.** ability and time to recover and build resilience in between emergency events.

This archetype represents a malfunction in the emergency management cycle, as the ongoing demands for crisis response actions in the B1 loop to address increasing frequency of emergency events can stretch the system, affect performance and quickly become unsustainable. The B2 loop represents the

need for investments to expand capacity and new capabilities to balance the discrepancy in the system. It also highlights the potential delays in decision-making and policy approval process. In this case, the investments needed may include:

- an emergency management acute response buffer to sustain response capacity;
- dedicated disaster risk management roles with the required expertise and institutional knowledge to address current and emerging risks and needs, and to shape resilient and sustainable approaches.

Systemic Insights and Diagnosis

A prescriptive action would be to anchor investment decisions based on current demand/needs and external signals of change. Monitoring patterns of behaviour between capacity investment and performance measures may be valuable. Additional opportunities for discussion may include the ability to:

- meet demands over longer periods of time;
- maintain capabilities and competencies at an appropriate level for advantage in a changing environment;
- clarify the level of performance expectations; and
- assess erosion of performance standards.

Stock & Flow – Discrepancies in Infrastructure Investments & Institutional Capacity

Physical system stocks and flows have major effects on how a system operates however it is rarely considered a leverage point because changing it is rarely quick or simple. The leverage point is in the proper initial design. Once a structure is built, the leverage point is to understand the limitations and bottlenecks, and use with maximum efficiency and refrain from activities that strain its capacity [Meadows, 2008].

A discrepancy is the difference between the desired and actual stock capacity. Feedback is an important system monitor, the lack of feedback of these stocks within the system makes it difficult to adjust for the discrepancy, and bring the system up to the desired state. Figure 10 and 11 below identify physical systems to be assessed to ensure capacity and adequacy of the system, such as critical infrastructure and natural capital investments for disaster risk reduction. Each has a number of system demands and challenges creating potential discrepancies. This leads to the importance of addressing the discrepancies to maintain or build stock capacity to ensure physical system resilience is strong.

Assessing the capacity and adequacy of critical infrastructure systems and upgrading as necessary according to identified risks is an essential element of the UNDRR's Disaster Resilience Scorecard for Cities [UNDRR, 2017]. This is a large focus of disaster risk reductions activities despite it being considered a low leverage point in the system. It is a slow and expensive process for change, and is primarily led by

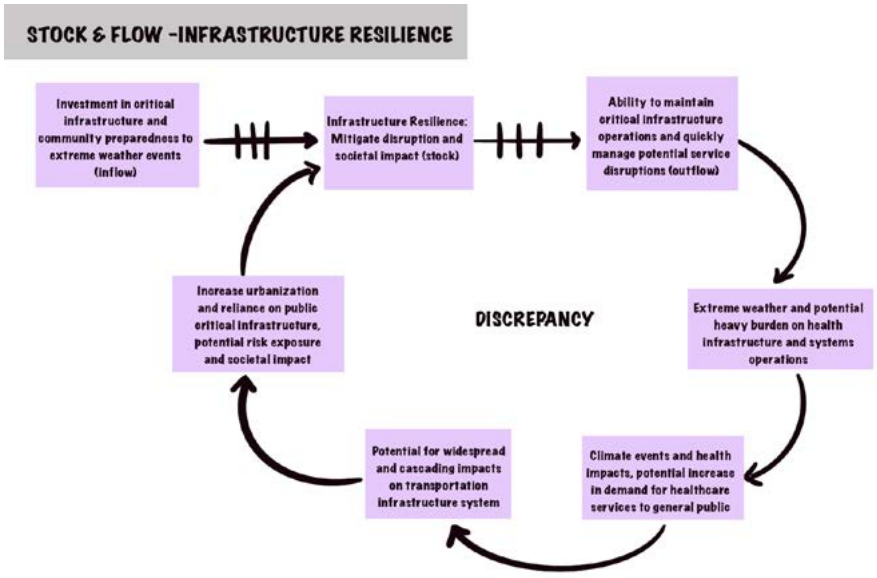


Figure 10 – Critical Infrastructure Stock & Flow

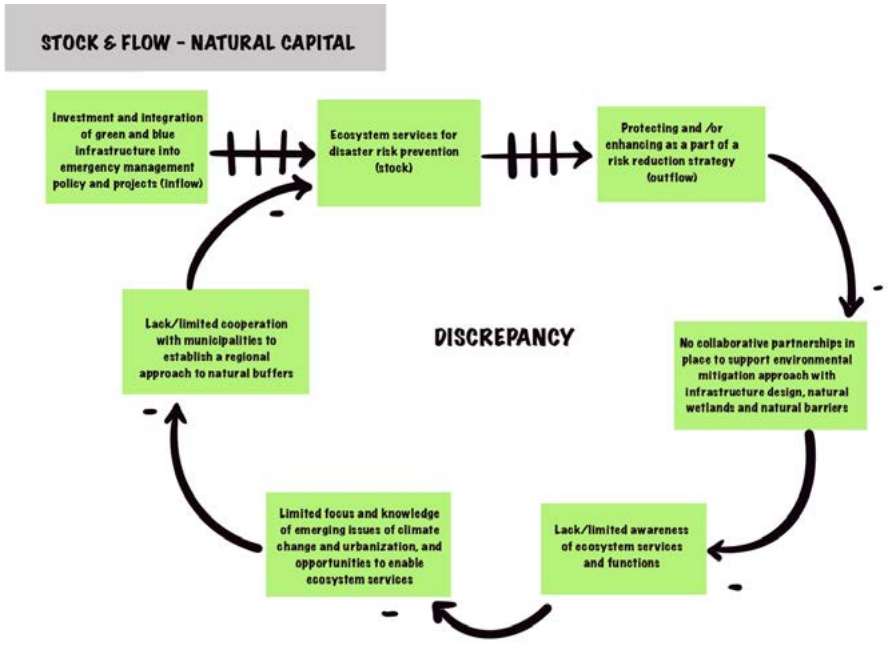


Figure 11 – Stock & Flow: Natural Capital

engineering and architecture teams. In addition to upgrading critical infrastructure systems to reduce risks, assessment of "surge" capacity is also important to factor. Generally these structures need to be able to continue to operate with maximum efficiency, and situations that can potentially strain its capacity need to be prevented. Examples of critical infrastructure include hospitals, transportation systems and electricity and power generators. Both critical infrastructure and building natural capital stocks experience delays in system upgrades, which can prolong risk exposure. In regard to natural capital, more awareness of opportunities for collaborative partnerships to support ecosystem services and functions is required.

Figure 12 below is a non-physical knowledge stock that highlights the importance of institutional risk management capabilities and the ability to build resilience over the short and longer term. This is considered an essential element of the UNDRR's Disaster Resilience Scorecard for Cities

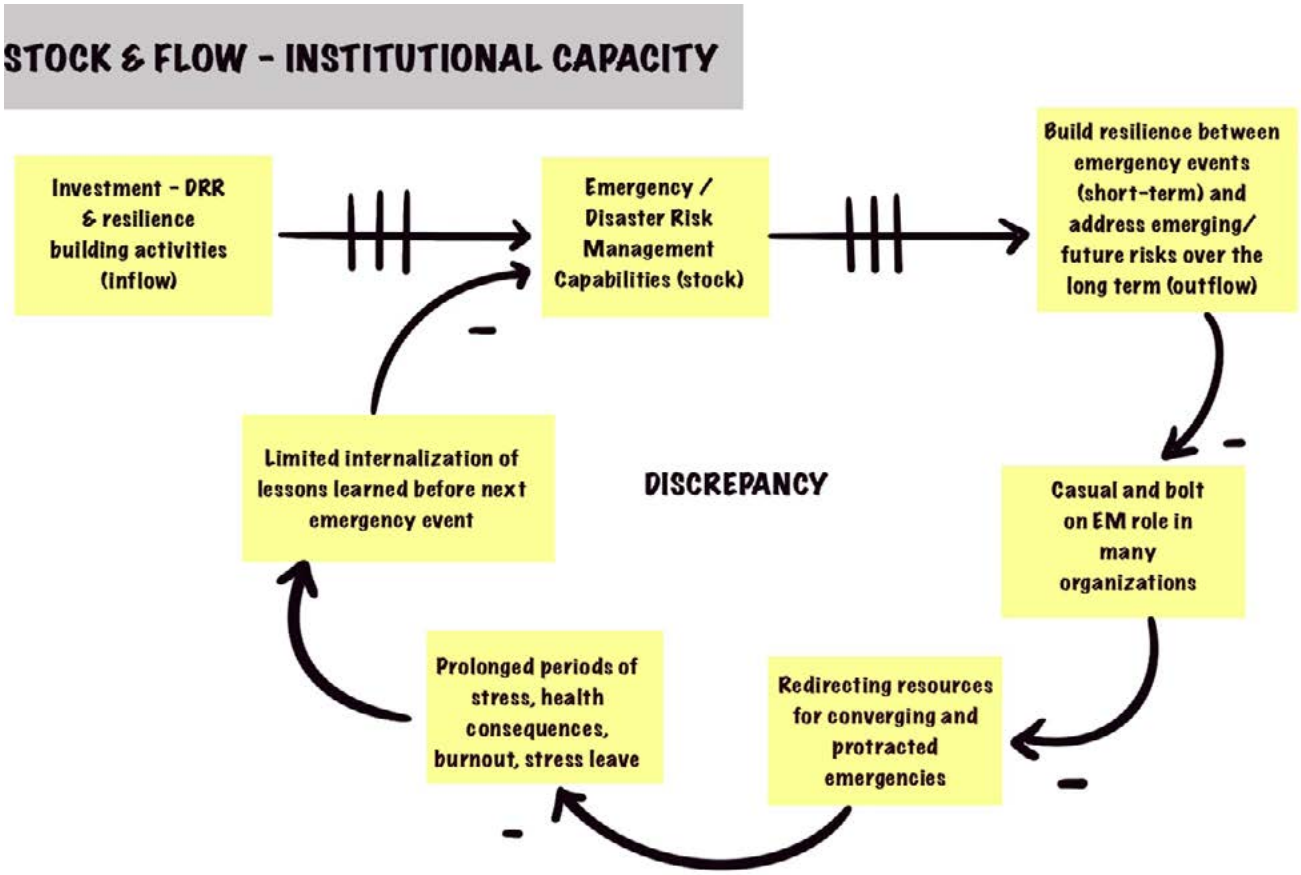


Figure 12 – Stock & Flow: Institutional Capacity, Disaster Risk Management and Resilience

[UNDRR, 2017]. Interestingly, this knowledge stock can potentially provide opportunities for self-organization to evolve the system structure. Self-organization is considered a high leverage point to influence and change a system. Unfortunately, little attention is focused on building this institutional capacity and the important knowledge and skill sets needed moving into the future. This is a missed opportunity to strengthen resilience in this part of the system.

Paradigm Reorientation - Opportunities to Intervene in the System

In the Growth and Underinvestment Archetype, the following system leverage points in Table 5 below provide an opportunity to intervene and influence the system towards the desired direction:

Leverage Point	Current Pattern	Opportunities to Strengthen System
Goals	• Malfunction in the emergency management hierarchy • Limited crisis response capacity • Lack of long-term resources for disaster risk reduction and resilience	• Identify a clear purpose with benchmarks and accountability
Self-organization	• Chronic lack of funding • Limited resources, capacity and competing pressures	• Opportunity to add, change or evolve system structure by supporting investments in an emergency response buffer and disaster risk management roles with required expertise
Rules	• Short-term response preparedness and planning budget only • Crisis focused, unable to think ahead	• Creation of new rules to incentivize and fund a resilience program focusing on longer-term disaster risk reduction and resilient building activities
Information Flow	• Limited to no information on investments required to maintain capabilities and competencies to ensure performance standards, and reduce disaster risk	• Access to information to prioritize disaster risk management activities to build resilience and ensure performance standards are maintained

Table 5 – Growth & Underinvestment: Summary of Leverage Points for System Change

In summary, disaster risk management and resilience building is a new narrative for emergency/disaster management. This new narrative requires a vision, strategy, structure and investment in resources to realize its potential.

Patterns of Power

The following power issues in the Table 6 below were identified for this archetype and reveals the power that holds patterns in place.

Who has power over the rules?	Government and political priorities
Power that holds patterns in place?	Legislation, regulation, directives, policies, guidelines, lack of funding
Patterns of hierarchy and power?	Top-down structure, centralized structures, limited feedback loops on status of various capacity stocks within the system to maintain performance standards and system functioning – malfunction of EM hierarchy (risk management)
Who is accepting and struggling against them?	Accepting – governments accepting the current level of risk Struggling - institutions and society are increasingly having difficulties responding/recovering from difficult emergency events. Critical infrastructure risks are increasing, limited risk reduction investments and high public expectations to maintain services; limited focus on natural infrastructure to slow down ecosystem degradation and investment in natural risk reduction barriers
Conflicts to transcend for change and transformation	Awareness of the need and willingness to invest in risk reduction and resilience building. Living the adage "an ounce of prevention is worth a pound of cure"
Contradictions to future resilience? Actions holding us in the past?	Continuous crisis response actions to "acute" emergencies is very expensive and unsustainable over the longer term both from a resource and financial perspective

Table 6 – Growth & Underinvestment: Patterns of Power

Archetype 4: Tragedy of the Commons

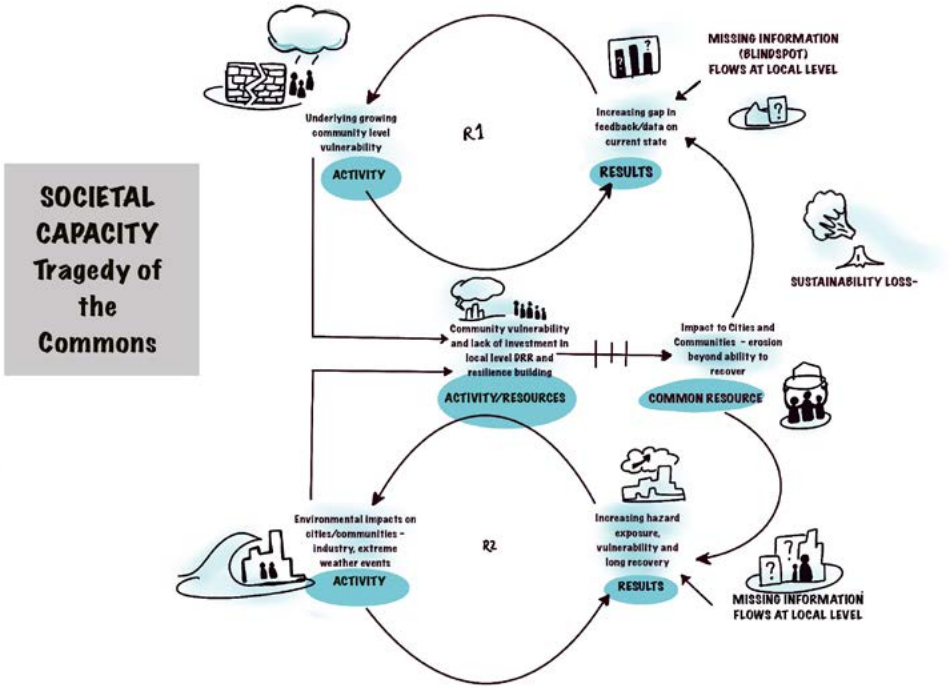


Figure 13 – Archetype: Tragedy of the Commons: Erosion beyond Regeneration

The Tragedy of the Commons archetype is a pattern that reveals escalation or growth in a commonly shared environment. Unlimited patterns of growth have the potential to erode an environment. If we consider the commons to be cities and communities, what patterns of growth could potentially erode the commons?

Two examples included in Figure 13 are:

- **Social reinforcing loop (R1):** growing urbanization, aging population, social/economic disruptions resulting in changing community vulnerability and widening gap in system feedback/data; and
- **Environment reinforcing loop (R2):** overexploitation of resources by industry, use of common sinks to dump pollution resulting in a growing hazard exposure, vulnerability, extreme weather events and longer recovery time to bounce back and recover.

This tragedy arises from missing or too long delayed feedback on the growth patterns and the lack of adequate resources available. This can potentially lead to erosion beyond a threshold, and the lack of ability to regenerate. The lack of strong system feedback mechanisms creates a blind spot due to missing information flows.

Both the social (R1) and environmental (R2) loop reveals the changes in the external environment resulting in increasing vulnerability at the community level. In the case of R2, economic activities and opportunities can overrule environmental risks. Both growth loops signal the need for disaster risk reduction and crisis response capabilities. Unfortunately, funding is predominantly available for reactive response activities, and not to reduce risk or build local capacity and resilience. As the vulnerability increases, it may reach a point beyond the ability to recover. This can potentially lead to system collapse, both physically and economically, with loss of sustainability of cities and communities.

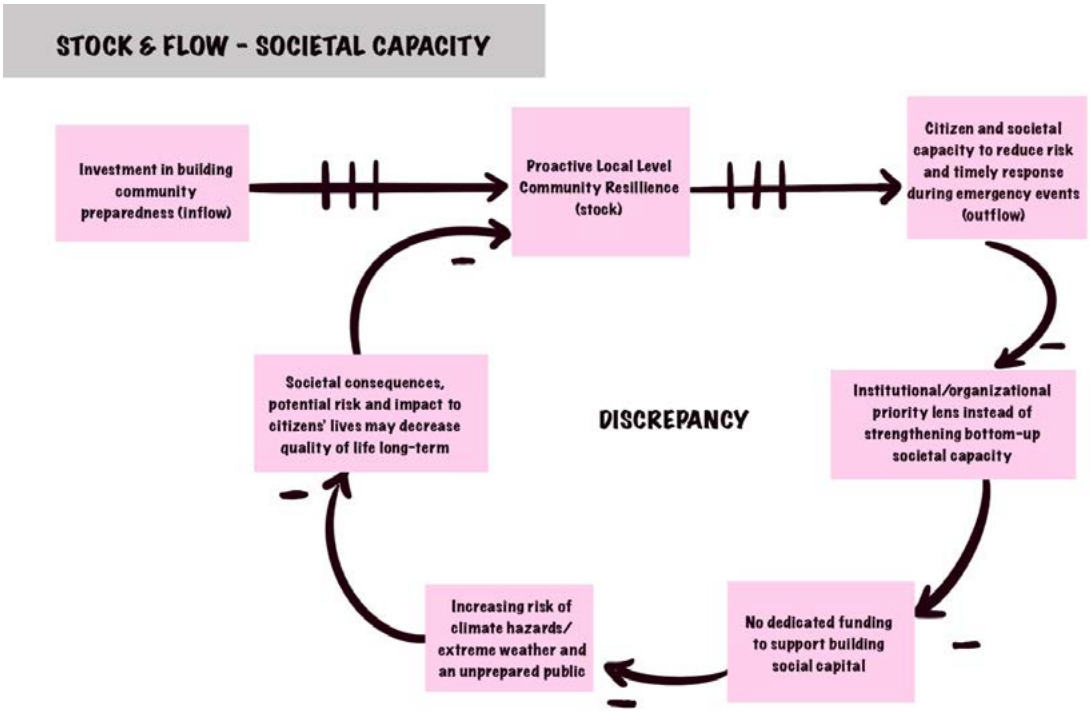


Figure 14 – Stock & Flow: Societal Capacity

Systemic Insights and Diagnosis

- Missing information flow at the local level impacts the ability to understand local risk and proactively make decisions concerning resource allocation to the commons;
- A governance structure with strong system feedback is important to understand risk and support resource allocation for local investment in risk reduction and resilience building;
- Resource allocation and local investment in disaster risk reduction and resilience building in needed at the commons to reduce system vulnerability; and
- Other opportunities to protect the commons includes education, and regulation of the commons against certain behaviours that must be enforced via quotas, permits, taxes, incentives etc. This requires the ability to interpret conditions of the commons, and have an effective means of deterrence while ensuring the good of the whole community.

Stock & Flow – Discrepancies in Societal Capacity

In terms of Figure 14 above, these are knowledge stocks (non-physical) that highlight the importance of building societal capacity at the local level to reduce risks and support timely response efforts by engaging citizens at the community level. A governance structure inclusive of citizen participation with strong feedback can potentially strengthen societal capacity. Societal capacity is considered an essential element of the UNDRR's Disaster Resilience Scorecard for Cities. This is often a missed opportunity, as building societal capacity tends to not receive adequate support or funding. In addition, institutions and organizations tend to get first priority, instead of local engagement to address social risks and needs.

Leverage Point	Current Pattern	Opportunities to Strengthen System
Goals	Cities/communities as the commons does not appear to be the top priority	Anticipatory governance process to allow for large scale citizen participatory processes to envision, set the direction and strategy to proactively protect the commons, reduce risk, address vulnerability and build resilience of cities and communities. Linked to sustainable development goal 11(Make *cities* and human settlements inclusive, safe, resilient and *sustainable*).
Self-Organization	Lack/limited investment to support local education initiatives to empower local cities and communities in disaster risk reduction and resilience building activities. Resource constraints to support cities/communities.	Investing/resource allocation in disaster risk reduction with new funding and incentives to support and empower citizen action at the local level. Explore evolution of the emergency management hierarchy to amplify coordination and communication at the local level. Collaboration with urban resilience professionals.
Rules	Funding constraints, only available to support response activities. Perverse reinforcing feedback loop in favour of short-term crisis response solutions. Industry behaviours not addressed by the government.	Long-term investment in disaster risk reduction/management by engaging and harnessing the intelligence and wisdom of citizens. Regulation of the commons against certain behaviours to reduce risk and protect the commons.
Information Flows	Lack/limited information available on local level (cities and communities) on exposure and vulnerability. Excludes feedback from citizens/communities.	Restore or establish information flow at the local level/commons. Identify proactive opportunities for investment and resource allocation to reduce risk/build resilience. Use an anticipatory governance process to harness the intelligence and wisdom of citizens to chart intelligent directions.

Table 7 - Tragedy of the Commons: Summary of Leverage Points for System Change

Paradigm Reorientation - Opportunities to Intervene in the System

In the Tragedy of the Commons Archetype, the following system leverage points in Table 7 below provide an opportunity to intervene and influence the evolution system towards the desired direction of resilience. There is a need for broader and different perspectives in emergency management, with organization of civil protection at the local level that is inclusive of women, minorities and those with disabilities [Alexander, 2020].

Diversity and community representation in disaster recovery planning to facilitate equal participation, information access, and policy implementation across communities is important for good governance [Fraser et al., 2020].

Anticipatory governance can assist to achieve this system goal, by providing a participatory process for exploring, envisioning, direction setting and developing a strategy for a community/ region [Ramos, 2016]. It can be applied to prepare for horizons of change by tapping into citizen knowledge to address risks/threats and highlight new opportunities to be adaptive, while moving towards a preferred future for the good of the community. Anticipatory governance allows a city to harness the intelligence and wisdom of its citizens in charting intelligent directions for community and cities [Ramos, 2016]. This type of inclusion unlocks diversity, and encourages citizens and communities to be actors and agents of change.

Anticipatory governance using participatory processes can influence change across several system leverage points in the table below, and could be part of a commons governance framework to protect and build local resilience.

Patterns of Power

Who has power over the rules?	Government and industry
Power that holds patterns in place?	Legislative, regulations, funding allocations
Patterns of hierarchy and power?	Top-down hierarchy, government-led, industry lobby groups
Who is accepting and struggling against them?	Accepting – government and industry Struggle -Citizens and communities
Conflicts to transcend for change and transformation	Lack of information at local level vs. monitoring/awareness to justify resource allocation
Contradictions to future resilience? Actions holding us in the past?	Short-term economic priority over environment and social risks, can lead to erosion beyond regeneration, with long-term resilience and sustainability implications.

Table 8 – Tragedy of the Commons: Patterns of Power

"We can't impose our will on a system. We can listen to what the system tells us, and discover how its properties and our values can work together to bring forth something much better than could ever be produced by our will alone"

Donella H. Meadows

Summary of Archetypes

To summarize, this section of the paradigm's external view presented four archetypal patterns that are also system traps, keeping the emergency management profession in a status quo position. The four archetypes are:

- **Shifting the Burden:** highlights the system anomaly of an "addiction" to quick short-term quick solutions causing the system to be gridlocked in crisis response, and creating a situation where the emergency management structure is experiencing fragility to evolve due to a hierarchy malfunction, and erosion of the risk management sub-system. If not balanced, this can potentially lead to system collapse.

- **Fixes that Fail:** highlights the system anomaly of "policy resistance" and a bounded mental model that creates a limited perception of risk and constrains risk management activities leading to inadequate anticipatory behaviours. This pattern elevates chronic system vulnerability over the longer-term, and widens the gap between perceived and actual systemic risk. This leads to a reduced ability to address underlying vulnerabilities and limits preparedness to respond to emergency events.

- **Growth & Underinvestment:** highlights the system anomaly of "capital planning" and the need for investments to respond to the reinforcing growing signals of change, and to avoid a decline in response performance standards. A stretched system can lead to an erosion of performance standards. Important system stocks highlighted include: critical infrastructure, natural capital, and infrastructure capacity.

- **Tragedy of the Commons:** highlights the system anomaly of escalation or growth in a commonly shared environment – cities and communities. This unlimited pattern of growth has the potential to erode an environment. This tragedy arises from missing or delayed feedback on the growth patterns and inadequate resources available. This can lead to erosion beyond the ability to recover, potentially leading to system collapse and loss of sustainability. An important system stock includes building social capacity.

Each of these archetypes reveals a power dynamic, and it becomes important to ask the following questions: 1) Who has power over the rules? 2) What power holds patterns in place? 3) What is the pattern of hierarchy and power?

Common features across each archetypal pattern is presented in the Figure 16 below, and reveals a strong historical pattern of power dynamics in the system which holds the system in its current position. This system rigidity prevents system evolution. This highlights the need for a shift in power dynamics and culture to accommodate the emerging paradigm based on collaboration and local level empowerment, and not competition for limited resources.

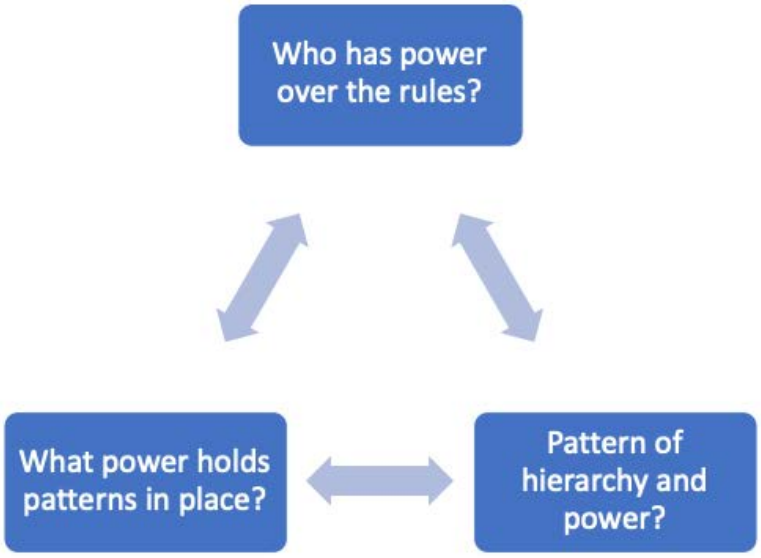


Figure 15 – Questions to Understand System Power Dynamics

This pattern also leads to behaviors that contradict and/or restrict system resilience goals, such as:

- The addiction to crisis management and the culture of command and control;
- Response sub-system goal dominating the emergency management hierarchy, with a resilience goal limited to bouncing-back and recovery;
- The expensive "quick fix" approach of crisis response actions to "acute" emergencies, which is unsustainable over the longer term both from a resource and financial perspective; and
- Short term economic and industrial priority over the environmental and social risks, potentially leading to erosion beyond regenerative capacity, with long-term resilience and sustainability implications.

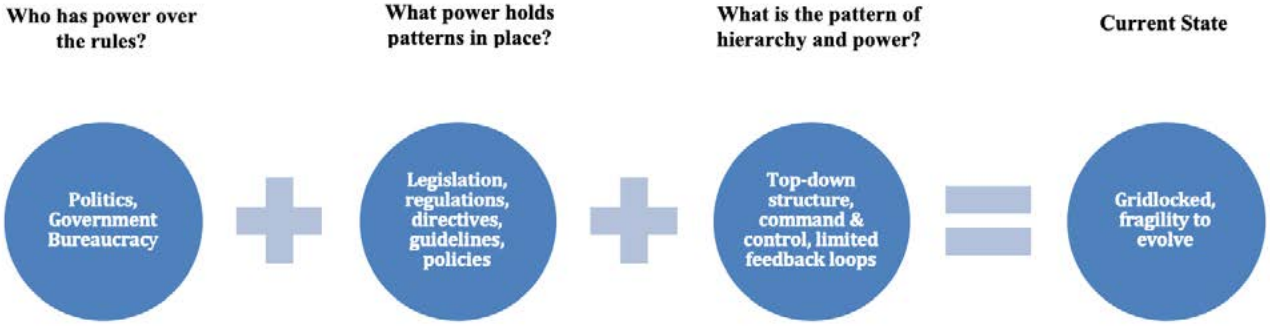


Figure 16 - Common Power Features Across Archetypal Patterns

Part B:
Internal Perspective – The Lens of Emergency Management

Our perspective, the lens in which we view the world is based on a frame. When we narrow our lens and zoom-in to focus on a particular sub-system, we can uncover and develop very specific knowledge. If we remain in a fixed state of viewing only through a hyper-focused lens, we miss out on understanding the broader perspective, ecosystem changes and shifts that may have an impact on our sub-system. Broadening our lens provides an opportunity to shift perspective to examine and explore the unfamiliar; what's emerging, as well as the complex reality of today's world.

The emergency management system tends to operate at a preparation and planning level, based on forecasts of risk and closed system definitions. This practice is aligned with a perspective and lens that uses past data to determine risk and inform future decision-making. This approach uses a linear and deterministic lens that simplifies complexity through an approach that considers the system to be the sum of the parts, and assumes the considered conditions of change to be predictable. This has led to a practice of mainly focusing on what is "known", with response actions that are generally short-term and frequently reactive.

The emergency management profession holds the following perspectives:

- **Future Risk -** can be predicted and quantified based on stable quantitative parameters that are measurable;
- **Forecasting and Modelling -** provides knowledge to inform planning activities to address "wicked problems" of systemic risk, exposure and local vulnerability; and
- **Uncertainty** – unclear about the value in exploring the unknown and working with uncertainty.

The next section on the paradigm's internal worldview of emergency management will explore the following aspects:

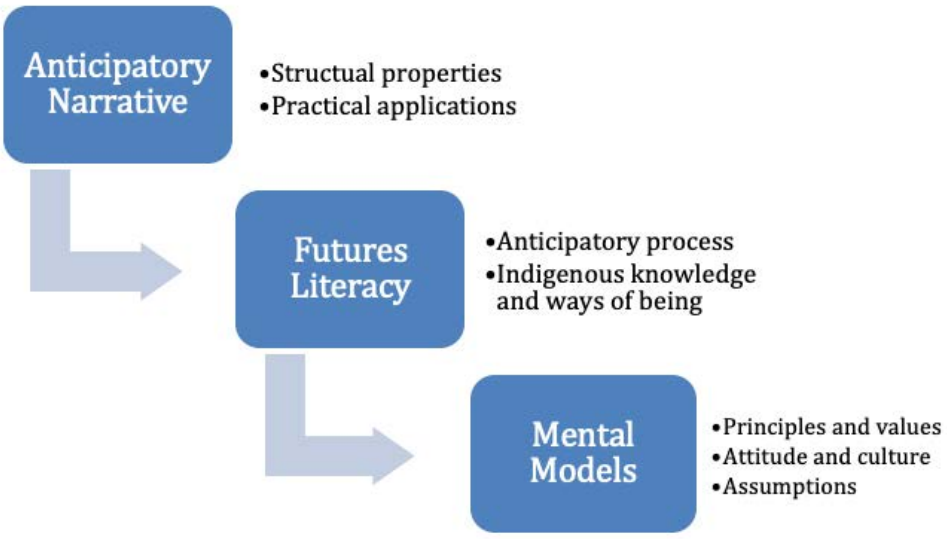


Figure 17 – Paradigm Internal Worldview

Anticipatory Narrative

Figure 18 - Anticipatory Narrative: Structural Properties and Practical Applications

According to survey participants, the ability to anticipate future changes and/or shifts in the broader external environment was identified by **100% of participants** to be important to very important in emergency/disaster management.

Qualitative analysis revealed an anticipatory narrative in emergency management, consisting of four structural properties that reveal practical applications:

- **Data, Prediction and Risk (Scientific Mindset):** Anticipation is viewed as a predictive tool to identify tomorrow's challenges. It complements data models and risk assessment that use past data, by anticipating risks in order to mitigate or pre-empt the situation from occurring.

- **Sense-Making (Systemic Risk Lens):** Anticipation is used to assist in building awareness and understanding of the external environment, complexity, changes and potential stress. It supports the ability to build a common operating picture.

- **Decision-Making for Investment & Impact (Resource Optimization):** Anticipation supports intentional and forward decision-making, assists to gain political consensus and funding for change, investments in mitigation, prevention, preparedness, contingency plans, and to optimize resources for impact.

- **Fit for Purpose (Organization Capacity):** Anticipation provides the ability to shape organizational capacity to ensure fit for purpose in the current operational environment, with iterative improvement and incremental adaptation. It also supports the ability to maintain resilience and transform as the environment shifts.

The language of this narrative also identifies the relationship between the risk/threat observations, thoughts about the level of immediate risk to public safety, and taking action to mitigate, prevent or respond to events. The very nature of this work is one of protection, and hence tends to be reactive based on a perceived risk/threat level.

In practice, the broader forces in the external system are viewed and distilled through a risk/threat lens, instead of seen as drivers of system change and disruption, highlighting potential new opportunities. The mindset and relationship towards the future is one of prediction, which is rooted in the foundation of science that seeks to identify risk and propose interventions to control and/or minimize impact of the changing risk profile. Change is seen as a potential threat to the status quo, once a certain risk/threat level is reached, it can motivate action to maintain system balance and stability.

In emergency management, anticipatory skills appear to be used at the operational level to enhance situational awareness, and to support practical decision-making and investments to optimize planning, resources and impact. There is an opportunity to use anticipatory systems to shape organizational capacity to ensure continued strategic fit moving into the future as it emerges. Anticipatory capabilities at a strategic level (beyond 3-5 year horizon) can assist to understand emergence, disruption and potential future opportunities to reimagine and self-organize for operational advantage in the future. The application rarely occurs in practice.

"If you don't have a strategy, you're part of someone else's strategy"

Alvin Toffler

Futures Literacy

Preparedness and planning represent domains of futures literacy that anticipates for the future, focusing on the past and current information to invest and organize agency for today. These domains are a strong focus in emergency management.

Emergence is the domain of futures literacy that focuses on anticipatory methods to explore emergence and novelty in order to reconceptualize human agency for the future. Interestingly, 67% of survey participants described working with emergence and novelty as part of their work (i.e. methods to sense and making sense of change in the present) however, their described use of anticipatory methods for emergence is limited to understanding trends to identify potential risks or threats. Here exists an opportunity to expand their use of anticipation for emergence, using a horizon scanning frame to understand not only trends, but broad system shifts, emerging issues, weak signals of change and potential future opportunities to navigate disruption or turbulence. This broader systems perspective provides an opportunity to identify patterns sooner, and strategically reorganize existing agency or reconceptualize the agency of emergency management moving into a different future environment.

The emergency management worldview does not routinely consider other factors of systemic complexity, change, emerging issues that can lead to disruption, or potential threats to resilience and sustainability (e.g. climate change/environmental, social, economic factors, displacements, conflicts). The profession tends to work at an operational and tactical level. The strategic level view to consider opportunities for growth, adaptation and system evolution to build future resilience in the face of uncertainty is typically not explored.

Growing system complexity and the interconnected nature of risks and challenges, also known as "wicked problems", have limited the effectiveness of the traditional approaches used to inform preparedness and operational planning. As system complexity contributes to levels of uncertainty, different anticipatory systems are needed to work with uncertainty. As outlined by the Organization for Economic Cooperation and Development (OECD), in times of increasingly rapid change, growing complexity, and critical uncertainty, responsible governance requires preparing for the unexpected. The OECD further states, that whenever there is a high degree of uncertainty surrounding changes to the relevant future context, strategic foresight is required.

Choosing to ignore uncertainty could lead to large adverse consequences for people, countries, and the earth' s ecosystems, and can also result in poor policies, missed chances and opportunities, and can lead to inefficient use of resources [Walker, 2010]. By ignoring uncertainty we are potentially limiting our ability to take corrective action in the future and end up in situations that could have been avoided [Walker, 2010].

Based on UNESCO's Futures Literacy Framework, emergency managers were asked to select dimensions that best described their approach towards the future. Survey results indicated that emergency management professionals are predominantly

TYPE OF FUTURE	KNOWLEDGE CREATION PROCESS	
	General – Scalable	Specific – Unique
Anticipation for the Future	AA: Forecasting – 45% AA: Creative Reform – 73%	AA: Destiny – 0% AA: Improvement – 42%
Anticipation for Emergence	AA: Strategic Thinking – 88%	AA: Wisdom – 33%

Table 9 – Emergency Management Futures Literacy: Anticipatory Assumptions (Redrawn from Miller, 2018)

focused on knowledge creation processes that are general and scalable. The top three anticipatory assumptions (AA) selected by participants identify the kind of future emergency managers want to know. They are: forecasting, creative reform and strategic thinking. Interestingly, **88% of participants identified anticipation for emergence and strategic thinking as their approach towards the future.** This understanding provides an opportunity to design and implement processes that would enable the ability to acquire such knowledge, and use anticipation for different ends, different ways and for different contexts [Miller 2018].

Anticipatory Process - Cultural Categories of Meaning & Knowledge

Based on survey responses, 76% of participants identified having a process to work with anticipatory systems in emergency/disaster management.

To further understand their anticipatory process, an ethnographic method was used to analyze response data to identify cultural categories of meaning and knowledge, organized process and practical real world experience with anticipatory methods. Information is organized in the chart below according to domain, taxonomy and experience, and consists of four different cultural knowledge structures: operational environment (internal), risk intelligence (external), broader environment/trends and knowledge networks.

DOMAIN Knowledge Structure		TAXONOMY Organized Process	EXPERIENCE Practical Application
INTERNAL	**Internal Operational Environment**	**Vulnerability Risk Assessment** • scenario-based planning • exercises or war-gaming activities	• scenario based planning to identify challenges and roadblocks to plan for and/or eliminate • scenario-based exercises and evaluations to test current capabilities and identify vulnerabilities (table-top or full scale) • war-gaming or rehearsal of concept is a critical step in developing contingency plans
EXTERNAL	**Risk Intelligence**	**Threat Risk Assessment** • define and track – assumptions, hazard, vulnerability, exposure • assess risk to strategy, mission, organization/force or public	• risk scenarios to consider vulnerabilities and limitations
	Broader Environment & Trends	**Holistic Risk Assessment** • analysis and synthesis to codes/standards to identify trends • develop a common operating picture • anticipate change	• use of dedicated teams that draws upon multiple sources of information, including open source articles with identified key words • analyzed to codes and standards (e.g. NFPA 1600) for continuity, emergency and crisis management
		Future Risk • modelling risk scenarios • probable planning scenarios • worse case scenarios and back-casting	• modelling risk scenarios to anticipate future needs • probable planning scenarios to identify vulnerabilities • worse case scenarios and back-casting to identify potential risks
NETWORK	**Knowledge Networks**	**Risk Research & Networks** • academic reading, research, wide range of connections and experts	• research specific areas of focus (e.g. demographics, climate change, socio-economic changes) • professional memberships and conferences

Table 10 – Anticipation and Knowledge Structures in Emergency Management

Based on the participants descriptions, anticipation in emergency/disaster management is primarily focused around a taxonomy of risk, from an internal, external and network perspective. This strong focus around risk makes sense given the profession's mandate concerning public safety and civil protection to prepare for, respond to and recover from emergency events.

Their anticipatory knowledge structure and processes sit within the preparedness and planning domains of futures literacy. Anticipation is used to identify potential challenges, vulnerabilities and risks to develop a common operating picture and potential needs. This assists to inform decision-making for investment and impact, and contingency planning to ensure organizational capacity continues to be fit for purpose. Emergency management's use of anticipatory methods fits with the futures literacy definition category of a deterministic and reductionist paradigm for conceiving and organizing human agency for today [Miller, 2018]. This coincides with the survey data, where emergency managers described the type of future they typically work with as being preparatory and planning based. The first uses forecasts to prepare for contingencies, and the second using probability estimates based on past data to realize a future deterministic outcome. Determinism suggests working with a single system model and with probabilistic parameterization (quantitative).

Working with uncertainty is not part of the emergency management operational/planning paradigm. The exploration of trends are typically mature mainstream issues, and it does not appear to include early reframing of academic exploration, emerging issues or weak signals of change that are in the innovation and foresight zone. There is a lack of awareness and understanding of the transition to different levels of uncertainty, and how the spectrum ranges from determinism to total ignorance. The deeper uncertainty levels have complexity features of several system models/structures or an unknown system model [Walker, 2010] and requires a different approach.

"The future is uncertain... but this uncertainty is at the very heart of human creativity"

Ilya Prigogine

Figure 19 – Bridging Knowledge Systems for Resilience

General Scalable Knowledge

As mentioned earlier in this section, emergency management professionals are predominantly focused on knowledge creation processes that are general and scalable such as forecasting, creative reform and strategic thinking.

Creative reform relates to the ability to solve known problems in innovative ways, and seek system solutions with the goal of resilience and adaptive continuity. Several issues are gaining visibility in emergency management, with many working to address it by injecting new ways of thinking and innovative strategies. Opportunities exist to include creative processes in different ways to acquire this knowledge, and support adaptive and innovative solutions.

Strategic thinking is the ability to sense and make-sense of emergence, focus on identifying scalable attributes of the present, detecting system boundaries and identifying paradigm parameters [Miller, 2018]. **Strategic thinking was the highest approach identified, with 88% of survey participants.**

Crises are most often over-managed and under-led. The best leaders navigate rough waters deftly, saving lives, energizing organizations, and inspiring communities. However, many leaders fall into one or more of the following leadership traps: taking a narrow view, getting seduced by managing, over centralizing the response, and forgetting the human factors [McNulty, Marcus, 2020]. Here presents an opportunity to bridge knowledge systems and introduce new capabilities to support emergency management including: futures literacy, strategic foresight, systems thinking and design to assist in developing innovative system solutions to support anticipatory adaptive capacity, as well as opportunities for transformation. The overlap between the two knowledge systems is awareness and relationship to the present state. Awareness of the dynamic whole opens up awareness to what is emerging. This type of deep listening and openness beyond preconceptions and historical ways is known as presence, and is believed to be a core capacity needed to access the field of the future. Presence welcomes the letting go of old identities and the need to control, and making choices to service the evolution of life. This capacity allows a shift from recreating the past to manifesting an emerging future [Senge et al, 2004].

Specific Unique Knowledge

Emergency managers also identified futures literacy for specific and unique knowledge creation processes, this included improvement of services and understanding attributes of wisdom.

Improvement speaks to an internal creativity focus on adaptation at the personal or organisational level through experience induced attitudinal or consciousness changes [Miller, 2018]. This shift in attitude or consciousness to support service improvement or incremental adaptation depends on institutional learning based on the previous crisis. If the memory and the experience provide a context for the modification of management policy and rules, the institution can act adaptively to deal with the crisis [Gunderson, Holling 2002].

According to emergency managers, every incident is a learning opportunity however there is a disconnect between capturing lessons learned and informing future preparedness and planning activities. The emergency management cycle intends to seamlessly connect crisis response to risk management, but often this is not the case. In many cases, organizations fail to structurally anchor or institutionalise the lessons learned in between emergency cycles.

This learning and knowledge discrepancy can create a situation of reactive learning, which is governed by "downloading" habitual ways of thinking, and seeing the world within the familiar and comfortable categories. In reactive learning, actions are actually re-enacted habits, and invariably end up reinforcing pre-established mental models [Senge, Scharmer, Jaworski, Flowers, 2004]. All learning integrates thinking and doing; what differs is the depth of the awareness. If awareness never reaches beyond superficial events and current circumstances, actions will be reactions. Deeper levels of learning are required to understand the larger whole as it's evolving, with actions that increasingly serve the whole. [Senge, Scharmer, Jaworski, Flowers, 2004].

Wisdom – Embracing Emergence & Novelty

Wisdom in futures literacy relates to the ability to sense and make-sense of emergence with a focus on locally specific-unique attributes of the present (difference). Local is defined to mean within a limited physical or virtual community [Miller, 2018]. Wisdom has also been described as Tao and Being, which is beyond thinking and the analytical mind. The Tao can be roughly thought of as the *flow of the Universe*, or as some essence or pattern behind the natural world that keeps the Universe balanced and ordered [Cane, 2002]. Spiritual awareness is becoming part of a new world paradigm of what is real, and what is important, with leaders becoming more conscious, self-aware and reflective. This type of awareness can lead to clarity of intent [Inayatullah, n.d.].

This space of awareness is a type of intuition that is beyond concept, and is derived from actual living experience of one's everyday being. This Beingness within the internal body is beyond thinking, it's a conscious and deep inner knowing, listening, and awareness called presence [Senge, Scharmer, Jaworski, Flowers 2004]. This is a consciousness focused on awareness and connection in the now, not past or future. Insights from this deeper and holistic

perspective tends to reflect a realization of inner nature, and harmony with outer nature.

Wisdom in emergency/disaster management has more recently emerged with the recognition of Indigenous knowledge and ways of being [National Collaborating Centre for Environmental Health (n.d.)]; and local community wisdom [Hutagalung, Indrajet, 2020]. Due to their relationship and connection to nature, harmony with the environment, and collective knowledge of the land, sky and sea, Indigenous peoples are excellent observers and interpreters of change [Berkes, 2000]. Traditional knowledge (TK) is now widely recognized and is of interest to many disciplines. This recognition of TK is evident from the fact that knowledge systems are being legislated (in Canada and internationally) in natural resource management, land-use planning, environmental assessment and understanding, and adapting to climate change, as well as mitigating natural hazards risks [Khalafzai, Nawaz, 2016].

Indigenous Knowledge & Ways of Being

Traditional Knowledge is *a body of cumulative knowledge, practice, and belief, evolving by adaptive process, and handed down through generations by cultural transmission about the relationship of living beings (including humans) with one another and the environment* [Berkes, 1999; Berkes et al., 2000]. This definition signifies the oral traditions of several generations, integrated socioeconomically, culturally and ecologically with a strong spiritual foundation embedded in values, beliefs and practices [Khalafzai, Nawaz, 2016]. Their awareness of global laws and patterns offers clues to our continued survival on this planet. Their keen understanding of weather, seasons, geography, animal behaviours and patterns, plant growth, sea and water fluctuations, soil protection, gardening, ethnobotany, ecology, astronomy, and other natural knowledge is sophisticated and has been validated repeatedly over generations [Kaminski, 2013].

This way of knowing reflects a parallel mode of acquiring knowledge that is supremely abstract, versus the science of "the physical world" that is approached from the opposite end and is supremely concrete [Berkes, 2000]. An example of integrating knowledge systems is the Environmental Monitoring and Science Division of Alberta Environment and Parks, guided by the Indigenous Wisdom Advisory Panel. This division is developing new approaches to documenting and interpreting environmental change based on the knowledge co-creation between indigenous and scientific knowledge systems [Raygorodetsky, 2017; Tengo et al., 2014].

Table 11 below provides an outline of different knowledge systems, corresponding worldview and purpose. Together it provides multiple points of evidence to bridge knowledge and can support a complementary and holistic approach to preserve knowledge integrity.

Concrete/ Quantitative/ Measurable		Anticipation for the Future	Anticipation for Emergence		Abstract/ Qualitative/ Immeasurable
	Knowledge System	Science / Prediction Forecasting, risk modelling, scenario modelling	Emergence, Strategic Thinking Trends, Emerging Issues, Weak Signals, Change/Disruption, Uncertainty	Emergence, Wisdom Awareness, Presence, Indigenous Knowledge	
	Worldview	Physical World (mechanical) *"modeling the system"*	Physical World (organic) *"seeing the emerging whole"*	Natural World (inner/spiritual) *"seeing from within the emerging whole*	
	Purpose	Preparedness/ Planning organize response activities	Robust Adaptive Strategies, Vision, Resilience change for competitive advantage, reconceptualize	Deep Knowing, Redirecting, Adaptability change that promotes harmony/balance	

Table 11 – Knowledge Systems and Multiple Points of Evidence

"Knowledge is knowing... or knowing where to find out"

Alvin Toffler

Indigenous knowledge (in Canada: First Nations, Inuit, and Metis) is strongly linked to the natural world. Traditionally, Indigenous people see their relationship with each other and with the Earth as an interconnected web of life, which manifests as a complex ecosystem of relationships. Balance and holistic harmony are essential tenets of this knowledge and subsequent cultural practices. Embedded too is a keen belief in both adaptability and change, but change that further promotes balance and harmony, not change that creates distress, death, and the depletion of the Earth's populations and resources. Careful observation of the seasons and the cycles of life foster an appreciation for the impermanence of things, including humans, as well as the interdependence of all life forms with each other [Kaminski, 2013].

Indigenous approaches used to navigate the changing environment include:

- **Community/Collective Knowledge:** valuable insights from community-based and collectively-held knowledge to complement scientific data with chronological and landscape-specific precision for verifying climate models and evaluating scientific climate change scenarios [Berkes et al., 2000]

- **Adaptive Management:** viewed as a scientific analogue with integration of uncertainty into management strategies. The emphasis is on practices that confer resilience, and responding to and managing feedbacks from ecosystems to avoid ecological thresholds at scales that threaten the existence of social and economic activities [Berkes et al., 2000]

- **Adaptive Capacity:** contributes to resilience by supporting people's ability to modify their behaviour and environment to manage and take advantage of changing climatic conditions [Ford et al., 2006]

- **Sustain Resilience:** knowledge to provide a crucial foundation for community-based adaptation and mitigation actions that sustain resilience of social-ecological systems at the interconnected local, regional and global scales [Raygorodetsky, 2011]

"Balance is not a passive resting place - it takes work, balancing the giving and the taking, the racking out and the putting in"

Robin Wall Kimmerer

Mental Models

Exploring mental models is a powerful part of understanding the internal perspective within a paradigm because it represents how the system sees the world. It provides insight into our deeply held internal images of how the world works, and can keep us thinking and acting in familiar ways. Mental models determine not only how we make sense of the world, but how we take action; it is an active construct that shapes our actions in the world [Senge, 2006]. The discipline of managing mental models is an important element of building a learning organization. Bringing attention and awareness to our mental models provides an opportunity to examine them to see if they are in keeping with the reality of the changing environment and to accelerate learning. Unexamined deeply entrenched mental models can create inertia, despite the strong systemic insights. Failure to appreciate mental models has undermined many efforts to foster systems thinking [Senge, 2006].

This section will explore the microcosm or mental image of the emergency management paradigm, this includes emergency management's principles, values, culture and assumptions through their unique lens of experience.

Principles & Values

Values coding was used on qualitative data to reflect participant's values, attitudes, and beliefs, representing their perspectives or worldview:

- a value is the importance we attribute to oneself, another person, thing, or idea;
- an attitude is the way we think and feel about oneself, another person, thing, or idea; and
- a belief is part of a system that includes values and attitudes, plus personal knowledge, experiences, opinions, prejudices, morals, and other interpretive perceptions of the social world [Saldana, 2013].

Principles can be considered as "lighthouses" that describe the territory and foundation for emergency management goals, activities and conduct. Values can be considered as the maps, they reflect areas of importance and reveal how a group or organization navigates and operates in the world. In Canada, there are 11 principles that reflect the essence of emergency management, and frame the key underlying beliefs and goals of emergency management, they are: responsibility, comprehensive, partnerships, coherency of action, risk based, all hazards, resilience, clear communications, continuous improvement, ethical and governance mechanisms [Public Safety Canada, 2017].

Based on participant's experience, the following five values were identified in the chart below. They define key areas of importance for emergency managers, and are aligned to four emergency management principles:

VALUES	EMERGENCY MANAGEMENT PRINCIPLE
Leadership - maintaining comprehensive situational awareness, including anticipating systemic cascading effects	**Comprehensive** - a proactive approach that integrates risk-based measures, all-hazards, partners from all parts of society and coordinates and balances efforts across the prevention and mitigation, preparedness, response, and recovery functions.
Public Service - advocating and seeking endorsement for long-term prevention/ mitigation, preparedness and recovery planning for public safety	**Risk-based** - approach informs the four interdependent components of emergency management in Canada. Placing greater emphasis on risk reduction measures is a sustainable way to address the trend of rising social-economic costs of disasters that has occurred under approaches focused heavily on preparedness and response.
Community & Partnerships - define long term goals as a professional community, supporting local communities and building partner capacity in disaster planning and management skills	**Partnerships** - all Canadians are involved in emergency management. Good partnerships based on effective collaboration, coordination and communication are key components of federal/provincial/territorial emergency management systems.
Learning - every incident is a learning opportunity	**Continuous Improvement:** lessons learned and knowledge generated to develop "improved practices", which are then shared widely. Continuous improvement, including incremental and transformational change, is undertaken systemically as an integral part of emergency management measures and practices at all levels.
Competency - continue to expand expertise, with knowledge, training and experience	

Table 12 – Top Five Values & Emergency Management Principles

How well are emergency management organizations maintaining their alignment with these principles and values? Based on the four archetypes and systems analysis previously discussed, the external system behaviours appear to be in conflict with the internal character and the principles and values of emergency managers in this study. This situation is most likely a source of tension that can lead to confrontations, and overcoming obstacles in order to reach goals.

Emergency Management Attitude & Culture

Emergency manager's attitudes, how they think and feel about the pattern of behaviour as identified in the Shifting the Burden archetype in the litany section of CLA was explored at the beginning of this research. This pattern highlights the short term and reactive behaviour of the emergency management community. Participant attitudes fell into three main themes: sector diversity and integration, cultural shift and response identity.

Sector Diversity & Integration

There are many sub-communities within the broader emergency management professional community, this predominantly includes the public sector, private sector, humanitarian organizations, and the military. Each of these groups thinks, makes decisions and works in different ways to drive results. Some have identified a rise in new ways of thinking, innovative strategies and new people and perspectives coming into the field.

Climate change has and will continue to present new challenges and roles across and within organizations. Many feel the challenge of complexity is tilting the balance of response activities. Emergency managers see an opportunity to enhance integration and collaboration across the community. This includes military and civil services integrated planning to ensure continuity during a civilian crisis, and technology collaboration to open up opportunities in new and innovative ways and integrate knowledge and practice to mitigate issues, develop new solutions and influence change.

Cultural Shift - Strategic, Inclusive and Agile

The emergency management community thinks and behaves in different ways. Emergency managers in this study felt the profession can benefit from a cultural shift from traditional command and control (which is imperative during response), to a strategic inclusive approach before, during and after emergency events. They feel that building strategic capacity to anticipate needs and challenges can provide the ability to work in more effective and robust ways. This includes access to intelligence and an agile team of decision-makers to mitigate risk and support planning to build resilience, with inclusive approaches that tap into grassroots efforts in place, and support community mobilization. Many disaster/emergency management positions are often seen as being an "off the side of the desk" type of role in communities.

Some emergency managers don't see their role in supporting mitigation, prevention and/or recovery activities as part of the emergency management profession; they simply want to focus on preparedness and response activities, and command and control instead of considering new actions and future outcomes. This represents a conflict; a historical weight that prevents the profession from moving forward. Progress in emergency management is centered around having accessible and long-term modelling tools. This reveals a continued and strong predictive mindset towards the future, which aligns with the risk based lens and command and control approach despite growing systemic complexity and uncertainty.

This culture shift requires the ability to leave the comfort zones of traditional heuristics and embrace a proactive mindset, which includes use of methodologies to address volatility uncertainty, complexity and ambiguity (VUCA). Government mandating action is most likely needed to shift the current course direction.

Rooted Response Identity & Doctrine

The identity of emergency management is based on the paramilitary and first responder cultural lens and behaviour, organizational structure, tactics and training. There is a hurried attitude and issues management approach that seems to have permeated upward to the operational and strategic levels, with the feeling of simply "jumping from fire to fire". This identity and behaviour has kept emergency managers rooted in thinking short-term and being response focused, especially with emphasis on Incident Command System (ICS) doctrine, exercises and plans to be able to respond to emergency events.

Assumptions

Values coding of survey data was performed to understand emergency management attitudes and beliefs. At the root of the attitudes and beliefs there are three main assumptions that appear to be accepted as true for emergency management, focusing on perceptions, mindsets and actions.

Figure 20 – Main Assumptions in Emergency Management

Perception of System Performance

The lack of a unified or shared vision that represents the diverse emergency management sector makes it challenging to harmonize system goals, resulting in system fragmentation. Political and funding cycles keep the profession stuck in response mode, and reinforces this narrow role and focus. Climate change will continue to present new challenges for the profession moving into the future. A balanced emergency management cycle is needed

as mitigation, prevention and planning are just as important as response and recovery.

Historical Culture & Mindset

There is a strong paramilitary and first responder cultural lens, mindset and behaviour. Some have labelled the culture as an "ex-military boy's club". The current culture reinforces the response focus. There are parallel operations between civil protection and civil defence. Civil protection must adapt rapidly and be flexible to the changing demands to emerging risks and threats [Alexander, 2020]. A cultural shift is needed to embrace the other pillars of the emergency management cycle. More diversity within the profession and inclusive approaches are needed to shift the culture, skills sets and mindset towards disaster risk management and building future resilience.

Doctrine & Response Actions

Emphasis on ICS doctrine and command and control keeps the profession rooted in the response pillar and activities, with modeling tools aimed at predicting and controlling risk. The increasing frequency of emergency events requiring response actions will continue to pull the profession's limited resources towards being response ready.

Myth/Metaphor & Inner Transformation

The myth/metaphor level of the CLA is deeply linked to the stories that reflect our culture and long-term history. When the myth/metaphor is combined with the worldview, and framed within a social context it assists to better understand the litany of problems. Carl Jung identified 12 universal, mythic character archetypes that reside within our collective unconscious. These twelve primary types represent the range of basic human motivations [Neill, 2018].

Table 13 outlines different perspectives across the CLA levels. As identified in column A, the emergency manager personality most aligns with the Hero and Warrior archetype, as one who battles threatening forces for survival and recovery. The Hero/Warrior is known for their talent of competence and courage. Their strategy is to be as strong and competent as possible to prove their worth through acts of courage, and to develop expert mastery that improves the world. They are motivated by risk and achievement, and look to make their mark on the world. Their greatest fear is weakness and vulnerability. The axis of a hero's life is power.

Table 13 below outlines the different perspectives across a system paradigm, starting with the current emergency management perspective to the potential transformed future.

As we consider the Hero/Warrior archetype within the context of an environment of increasing emergencies, disasters and extreme weather events, the ability to keep pace with the evolving frequency and maintain a high level of capability to respond and recover from events is a concern. Potential emotive dimensions of this archetype within the current litany of problems includes risk to mental and emotional health due to stress, fatigue and burnout. Figure 21 below shows how the Hero/Warrior archetype fits within the current emergency management paradigm.

Level / Layer	A: Emergency Management Perspective	B: Current Reality	C: Transformed Future
LITANY	• reactive response for short-term quick fix for "acute" issues	• crisis response gridlock, fragility to evolve	• proactive, inclusive, agile and adaptive to address underlying "chronic" system vulnerabilities and build new opportunities for resilience
SYSTEM	• potentially recreating system vulnerabilities • poor knowledge integration from response activities to advance future planning/strategies	• policy blind spots on evolving risk • growth of issues and resource underinvestment • tragedy of the commons to impact to cities/ communities with poor/missing information flows • growing system turbulence with potential for chaos and collapse • policy forecast of uncertainties that needs to be addressed	• an ecosystem of relationships and collaborative partnerships • feedback to learn, evolve and thrive in the short and long-term
WORLDVIEW	• linear and deterministic • thinking and behaviour not aligned • commanding and controlling to achieve resilience from top-down	• systemic complexity and uncertainty • dominance of crisis response mindset and actions, reinforced by legislative criteria, response planning funding and reactive funding during emergencies	• holistic and anticipatory; • empowering and proactively supporting community needs • reducing risks and building capacity from the bottom-up • organic hierarchy of resilience
METAPHOR	• strong hero and crisis warrior battling turbulent threatening forces for survival and recovery • strategy: strong and competent • known for competence and courage • mature masculine, stoic • motivation: power and control • fear: weakness and vulnerability	• fragility to evolve and embrace new paradigm • emergency management cycle dominated by crisis management (addiction) • crumbling risk management hierarchy	• collaborative and maternal protective caregiver healing system vulnerability • strategy: helping, protecting and caring for others • known for compassion and generosity • opportunities for self-correction, balance, harmony • protective feminine • motivation: stability and control • fear: selfishness, ingratitude • artist/innovator to create new culture and transform vision for growth/opportunities

Table 13 –Perspectives Across Paradigms: Towards Transformed Future

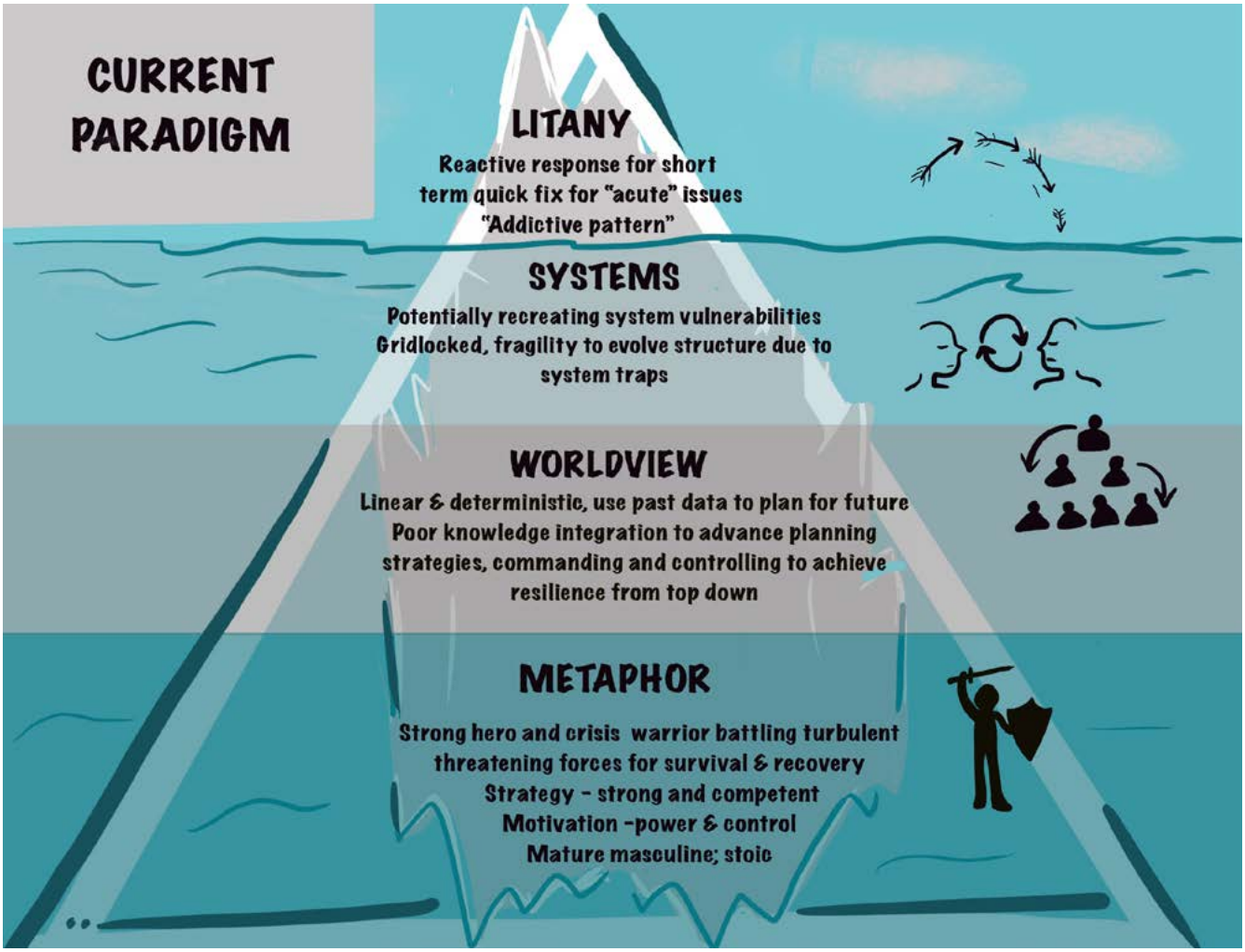


Figure 21 – Current Emergency Management Paradigm: Causal Layered Analysis

As we move towards transforming the future and building a new paradigm of resilience, what is the new metaphor that best captures emergency management's new story and the evolution of their culture, worldview and system? To achieve a transformed future, inner transformation is required.

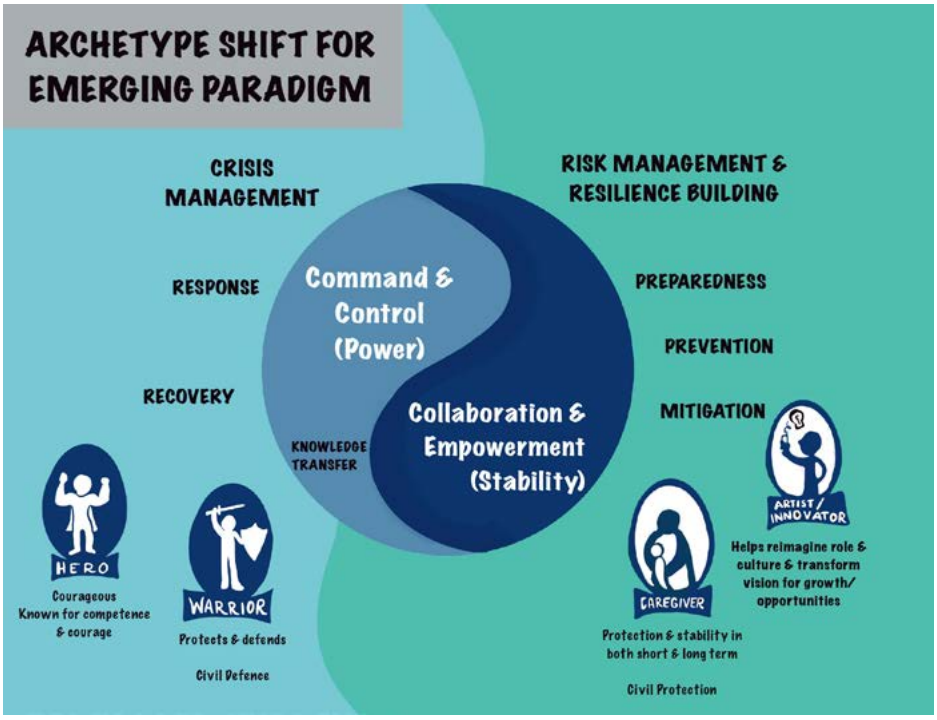


Figure 22 – Archetype Shift for Emerging Resilience Paradigm in Emergency Management

Shifting from Crisis Warrior to Protective Caregiver

One possible new narrative to emerge may be the Caregiver archetype to provide balance to the system. This archetype is known for talent of compassion and generosity, and their strategy focuses on the goal of helping, protecting and caring for others. They are motivated by stability and control, and seek to provide structure to the world. They tend to offer maternal protection to those around them, protect people from harm and try to prevent any danger or risk. A second relevant archetype is the Artist/Innovator with a talent for creativity and imagination. This characteristic will be important in order to create a new culture, and realize a new transformative vision for the future that aligns with the evolving paradigm. The Artist/Innovator is linked to the futures literacy, knowledge creation process of creative reform. This skill set can contribute to the ability to re-imagine our role and solve problems in innovative ways with the goal of adaptive continuity and building resilience. Figure 22 above shows how the new caregiver archetype fits within the risk management section of the emergency management cycle to restore the balance and functioning within the emergency management hierarchy. This archetype's focus is on protection, stability, collaboration and empowerment in both the short and long-term, and will require a different mindset and new skill-sets to be successful in their role.

This transformation journey is a paradigm shift. Figure 23 below shows how the maternal Caregiver archetype fits within a potential transformed emergency management paradigm. This archetype works to heal "chronic" system vulnerability to restore balance and harmony in the system. This is achieved through an ecosystem of collaborative partnerships, and evolution of the hierarchy from the bottom up to serve the purposes of the lower layers within the system. This evolution requires a new type of governance, with the ability to release existing power and control, in exchange for collaboration and empowerment to seek the system goal of stability and balance.

Figure 23 – Transformed Emergency Management Paradigm: Causal Layered Analysis

A full scale paradigm shift is a gestalt switch [Kuhn, 1970] or gestalt-shift, it requires a perceptual transformation and ability to perceive a new emerging pattern on the path of discovery and change. This path requires one to step into the unknown, and it takes the courage and strength of a warrior to begin this journey. And as the warrior's sword transforms from a battle tool into a symbol for truth, it requires knowledge and discernment to be able to cut away and break with tradition, and to let go of old practices that are no longer relevant. This action creates the space needed to embrace new ideas and opportunities moving into the future.

This 'break-free' and 'letting-go' is known as 'creative destruction', which can be difficult to apply to those working in the public sector. Inherent institutional limits to radical change in public sector settings not only affect which roles, competencies and values we characterize as new, but also how these have to be blended with rather than bluntly replace more traditional ones [Van der Wal, 2017]. In practice, it could mean that important long-standing roles will remain and sit alongside new and evolving ones, and that change will most likely be more gradual than radical. The emerging VUCA world, characterized by increasing volatility, uncertainty, complexity and ambiguity, will force change and will necessitate new skill sets and mindsets [Van der Wal, 2017].

"Myths are public dreams, dreams are private myths"

Joseph Campbell

Part C:
Postnormal Potentiality – Turbulence & Chaos

The role of Emergency Managers requires them to function in highly complex and turbulent situations where there is potential for chaos to emerge. The ability to understand and navigate this landscape is essential in order to recognize the characteristics of a system moving towards turbulence, potential risks, growing uncertainty, and how to uncover opportunities to move the system towards stability and balance. Understanding this context the question emerges, what are emergency manager's basic images of the future?

This research study used the Polak methodology to capture the basic property of participants "images of the future". Research participants were asked to select one of the four statements as outlined in Figure 24 that best described their relationship to the future.

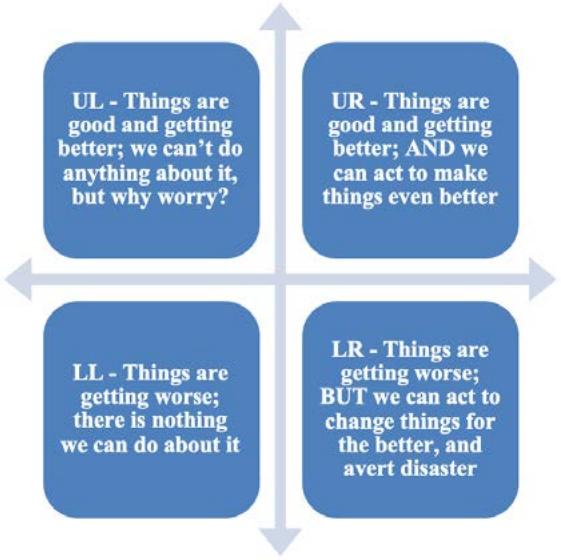


Figure 24 – Basic Images of the Future (Redrawn from Hayward, Candy 2017)

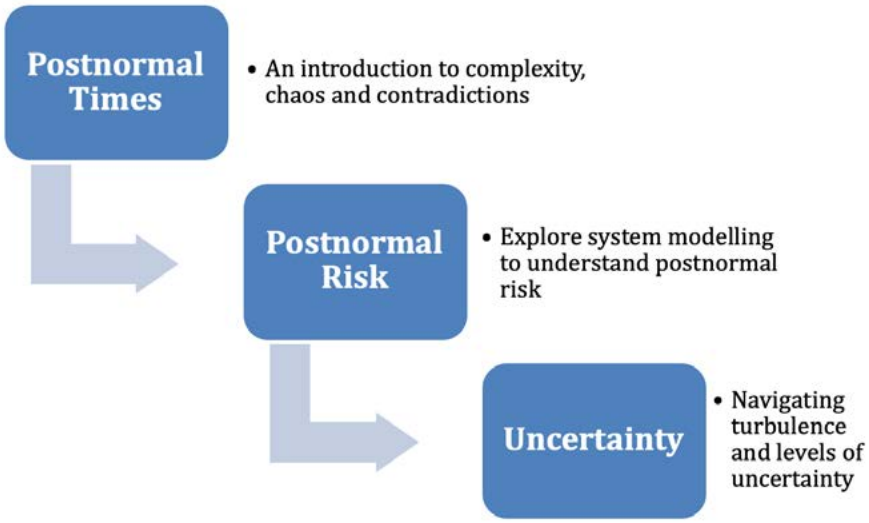
All participants (100%) selected a quadrant on the right side of the 2x2 matrix indicating a high degree of influence and optimism towards future change. Looking at the results vertically, 82% of participants chose the lower right quadrant indicating an essence of pessimism in terms of the current emergency management context, and how the situation is evolving and becoming worse over time. The intention is to draw out the perspectives, and understand what participants see or feel when thinking about the quadrants [Hayward, Candy, 2017], additional detail was captured to understand the orientation and narrative. The narrative is one of turbulence:

Emergency managers perceive a turbulent future with constant systemic change, and sources of instability potentially leading to chaos. Current systems need to adapt to ensure balance and sustainability. Actionable change is needed to create a more sustainable and regenerative future, and time is running out.

This narrative reconfirms important new values of the emerging paradigm – balance, sustainability and regeneration. In addition, it also highlights the importance of the ability to navigate turbulence, and identify actionable change to balance the system. These are new skill sets that can be found in learning about Postnormal Times.

Postnormal Times (PNT) is an era where complexity, chaos and contradictions become the dominant themes, and uncertainty and ignorance increase drastically [Sardar, 2017]. PNT demands that we get away from linearity and focus our attention on the interconnections amongst complexity, chaos, and contradictions. [Sardar, Sweeney, 2016].

This section will cover the following:



Introduction to Postnormal Times

PNT is a science for the post-normal age; it is 'issue-driven' versus applied science that is 'mission-oriented' and core science research which is 'curiosity-motivated' [Funtowicz, Ravetz, 2017]. Post normal science seeks to work with different levels of uncertainty in knowledge; it is a valid form of inquiry appropriate to the needs of the present [Funtowicz, Ravetz, 2017], and can be used as a policy forecast to identify issues of risk at different levels in the environment that require sensemaking, and where decisions need to be confronted by policy.

PNT describes a situation where normal phenomenon can move towards postnormalcy when systems become interconnected and complex, and generate positive feedback, where chaos can emerge rapidly. These issues tend to have common features that are universal in scale and long-term in their impact, and can provide guidance for the choice of appropriate problem solving strategies [Funtowicz, Ravetz, 2017]. To work with PNT, there is a need for an appreciation of uncertainty as well as of different levels of ignorance – in PNT the unknowns cannot be reduced to measurable risks [Sardar, Sweeney, 2016].

Dominant driving forces at play during PNT are complexity, chaos and contradictions.

Complexity refers to a system with a wide range of inputs and outputs and the behaviour of the components interact with each other in multiple ways, culminating in a higher order of emergence greater than the sum of its parts. The study of these complex linkages at various scales and the phenomena which emerge is known as complexity science. The relations between the system and its environment are non-linear, and create substantial uncertainties that cannot be managed as risks. These complex networks tend to generate positive feedback that can amplify a situation, are full of uncertainty, multiple perspectives and prone to turbulent behaviours which can lead to chaos [Postnormal Times, n.d.].

Chaos is defined as the balance between order and chaos, which relates to system stability and turbulence. Chaos theory does not imply randomness. It is the outcome of many independent variables interacting in different ways in a networked complex system, where small disturbances in the system can lead to big consequences, also known as

the "Butterfly Effect". At the edge of chaos is where a complex system can either collapse or self-organize into a new order [Postnormal Times, n.d.].

Contradictions refer to the many positions that are logically inconsistent, and the irreconcilable views and perspectives in complex systems. These views and perspectives within the system cannot be resolved, but need to be transcended to a new position that moves the system beyond its current range or limits. Contradictions is an important first sign that a system is moving towards complexity, chaos and eventually post-normality [Postnormal Times, n.d.].

System Modelling of Postnormal Risk

To examine postnormal complexity (PNC), one has to: 1) study the complexity of a system; 2) examine whether the system is interconnected; 3) whether it displays obvious contradictions; and 4) identify potential avenues of positive feedback. If these four factors are present, it is likely that the system will become postnormal [Sardar, Sweeney, 2016].

To visualize the turbulence and explore the direction of change within a system, system modelling was used to understand the dynamics of reinforcing feedback loops, also known as a "positive feedback loop". This is an amplifying type of loop that reinforces the direction of change within a system. If left unchecked, a system can destroy itself. The emergence of 'positive feedback' loops signal the possibility that a post-normal potentiality has been activated, and the system may begin to show signs of chaos. When chaos takes over, the system becomes post-normal [Sardar, Sweeney, 2016].

The postnormal system modelling process includes:

- identifying reinforcing feedback loops creating system turbulence;
- consider the source of system growth (i.e explosion, erosion or collapse);
- type of cycle (i.e. vicious or virtuous cycle to drive system behaviour);
- direction of change (towards collapse or stability);
- signs of chaos and system risk; and
- identifying opportunities to slow the growth or balance the reinforcing loop to move the system towards stability.

This process also provides an opportunity to visualize system turbulence, to facilitate dialogue and uncover opportunities to move the system towards stability and balance. Slowing the growth of a reinforcing loop is a powerful leverage point in systems, it provides an opportunity for several balancing loops within a system to function collectively to slow down the loop's growth.

"The greatest danger in times of turbulence is not the turbulence; it is to act with yesterday's logic"

Peter Drucker

Risk Models & Turbulence

Figure 25 below shows the system modeling done for the reinforcing loop related to the Fixes-that-Fail archetype.

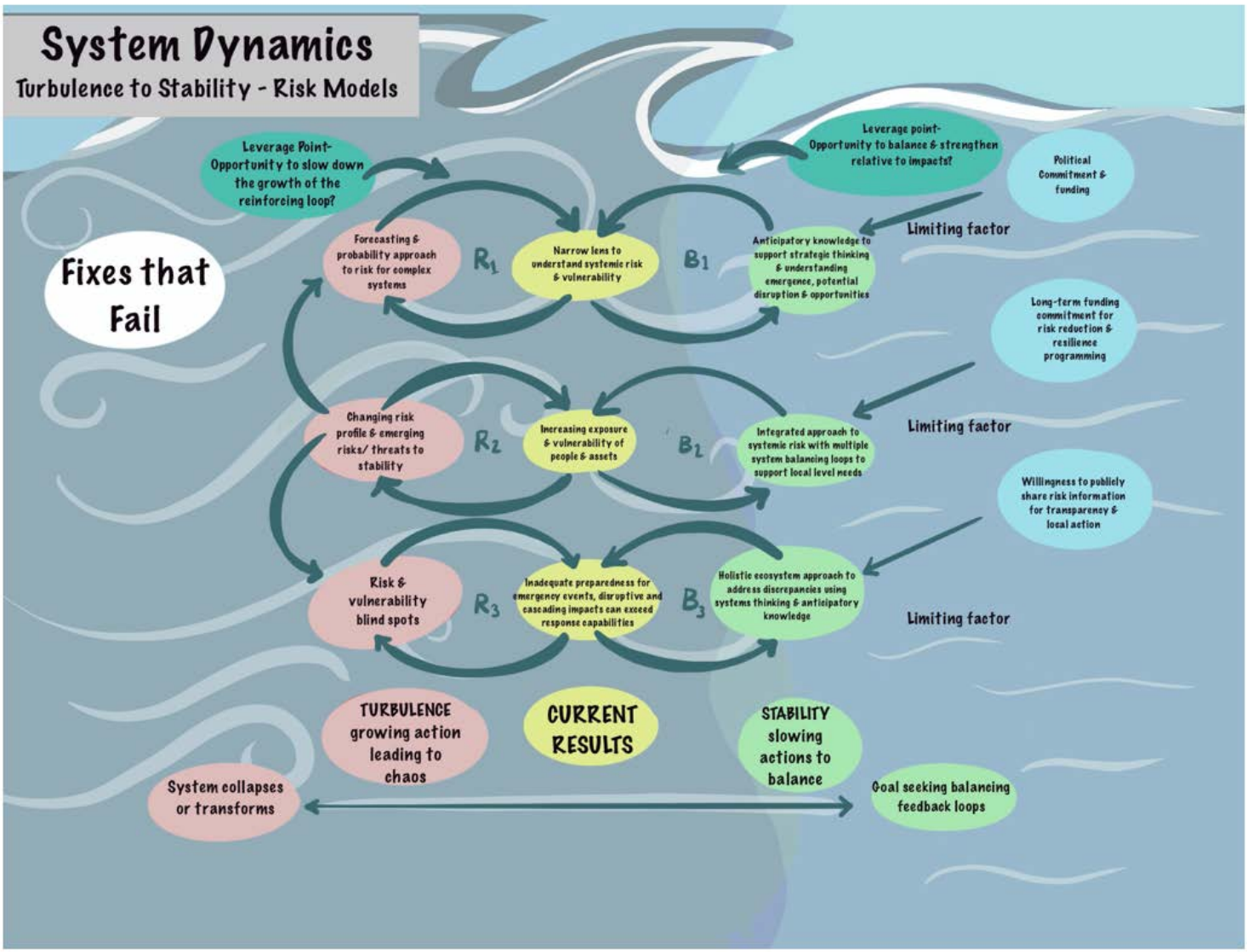


Figure 25– Modelling System Dynamics: Turbulence to Stability – Risk Models

The loops in Figure 25 relate to conflicts in the system concerning the current hazard risk approach. The hazard risk lens and assessment serves as the rules of the emergency management system, a high leverage point. Rules of the system reveal the deepest malfunctions of systems, it's important to pay attention to the rules, as well as who has power over them [Meadow, 2008].

These conflicts and contradictions in the system are important to monitor because they create turbulence. According to The Centre for Postnormal Policy & Futures Studies, *"at the edge of chaos, complex systems can collapse or self-organize into a new order"*. The direction of collapse represents a system that is not sustainable in its current environment. The potentiality for a system to move toward collapse has much to do with the degree of severity of contradictions. This also highlights an opportunity for change, and may require the need to transcend to a new position to resolve the issue, and allow the system to self-organize and evolve. This will also require new capabilities to bridge both short-term challenges and need for risk reduction, while building towards a new vision of long-term resilience in the face of uncertainty.

The following three reinforcing loops are linked to the Fixes-that-Fail archetype. This archetype was selected for its connection to the rules of the system, which are high leverage points. The following growing actions contribute towards the strength of these loops:

- **Prediction & Probability:** Risk, forecasting and probability lens for complex and interconnected systems, resulting in a narrow and short-term lens to understand systemic risk, vulnerability, system emergence and potential disruption;

- **Evolving Hazard Profile:** Changing hazard risk profile and emerging risks/threats to stability, resulting in an increasing exposure and vulnerability of people and assets; and

- **Blind Spots:** Risk and vulnerability blind spots (missing system feedback), results in inadequate preparedness to address vulnerability and potential cascading impacts prior to an emergency event. There is a high risk of local level needs during emergency events exceeding response capacity, and overwhelm response capabilities.

Opportunities to slow the growth of the reinforcing "positive feedback" loops may include:

- Adjusting resilience activities based on complexity and uncertainty, and exploring potential of robust adaptive strategies to evolve and transform the current paradigm;
- Leveraging systems thinking to understand systemic interdependencies and complexity;
- Leveraging anticipatory systems for emergence and novelty to understand systems change, potential disruption and uncover blind spots;
- Add feedback loops to capture missing system information to understand local level vulnerability and coping capacity; and
- Explore plausible and possible scenarios to challenge mental models and underlying assumptions in support of anticipatory adaptive behaviours.

Opportunities to balance the system may include:

- **Anticipatory Systems:** adding a new tier to explore anticipatory systems for emergence and novelty to support strategic thinking;

- **Integrated Approach to Systemic Risk:** with multiple system balancing loops to support local level needs; and

- **Holistic Ecosystem Approach:** to address discrepancies in knowledge of local vulnerabilities, with a process to share access to information for transparency, local action and accountability.

Understanding the reinforcing loops linked to the Fixes-that-Fail archetype highlights opportunities to slow the growth and balance the system. This can serve as the foundation for a new framework to serve the emerging paradigm, and build the necessary skill sets to support the role in healing the underlying system vulnerability and moving towards system balance and harmony. Additional details on the potential building blocks to support a framework are outlined in Appendix A.

Organized Behaviour Models & Turbulence

When external drivers trigger the system (e.g. extreme weather events), existing patterns and underlying vulnerabilities will provoke a "reactive" organizational emergency response behavior as outlined in Figure 26 below. This will trigger a new set of turbulent reinforcing loops within the system. This again presents an opportunity to intervene and tap into the system leverage points to either slow the growth of the reinforcing loop, or balance the feedback loop.

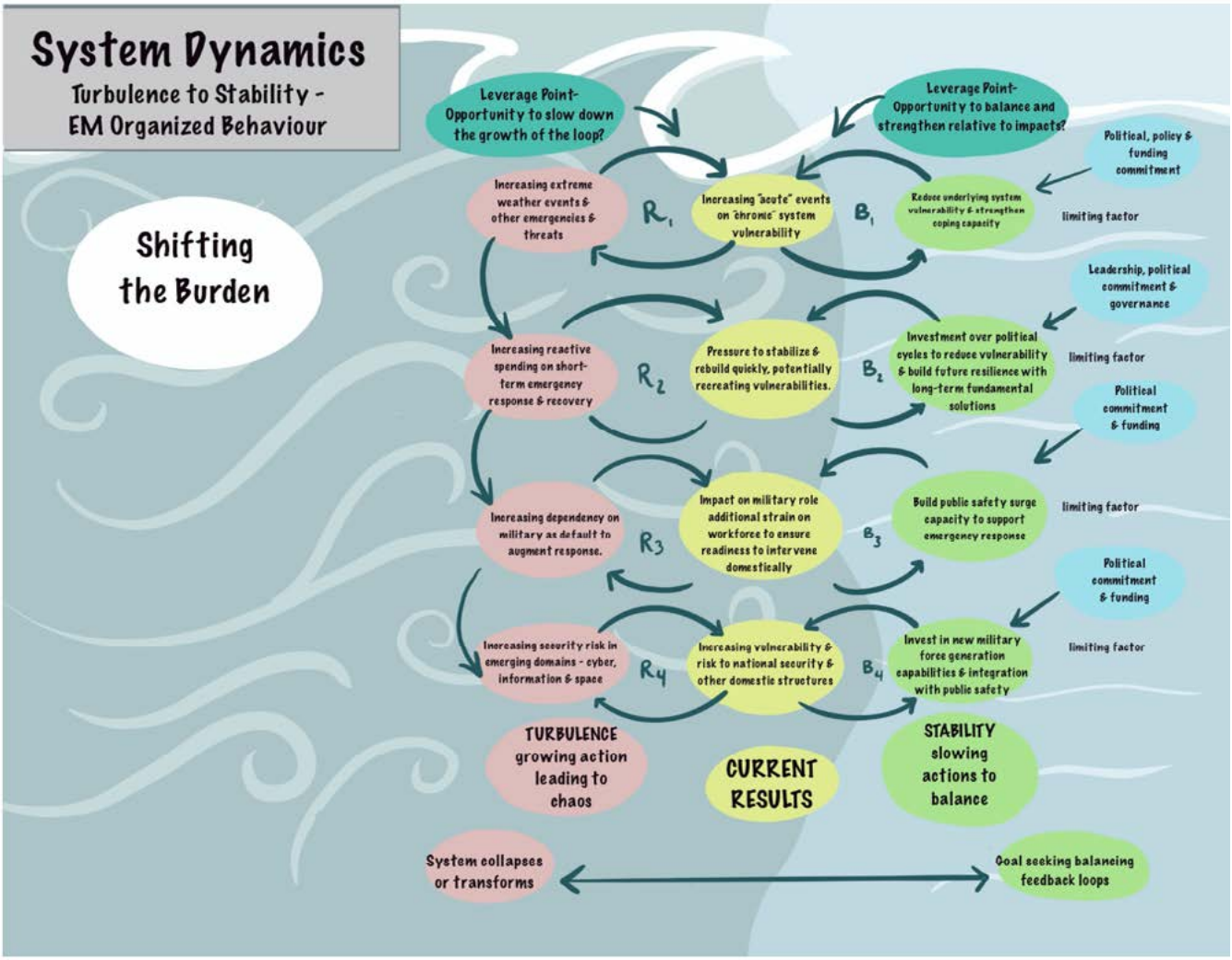


Figure 26 – Modelling System Dynamics: Turbulence to Stability – Organized Behaviours

Growing actions contributing towards reinforcing organizational response loops include an increase in:

- **Acute-on-Chronic Vulnerability:** extreme weather events and "acute symptoms" of hazards and threats impacting local areas of vulnerability amplifies to create a situation of "acute-on-chronic" system vulnerability;
- **Recreating Vulnerabilities:** reactive spending on short-term emergency response and recovery, resulting in pressure to stabilize and rebuild quickly, potentially recreating vulnerabilities;
- **Military Requests for Assistance (RFA):** the dependency on the military as default to augment response capacity, this has a direct impact on the military's role and creates additional strain on the military workforce to ensure readiness to intervene domestically to support emergency response. This may have potential consequences on strategic growth opportunities for military force generation capacity and capabilities in response to emerging national security risks; and
- **Emerging Security Risk:** security risk in emerging domains in cyber, information and space resulting in new areas of vulnerability, and an increasing risk to national security and other domestic structures.

Opportunities to slow the growth and balance the system may include:

- **Invest to Reduce Vulnerability:** to reduce underlying system vulnerability and strengthen coping capacity to emerging issues/threats;
- **Long-term Fundamental Solutions:** leadership, and long-term investment for fundamental solutions over political cycles to reduce vulnerability and build future resilience;
- **Invest in Surge Capacity:** invest in public safety surge capacity for domestic emergencies, to stabilize the system and increasing capacity of buffering stock; and
- **Emerging Cyber & Information Capabilities:** invest in new military pan-domain force generation capabilities and protect military capacity in an evolving security environment. Explore opportunities to collaborate and coordinate cyber and information domain capabilities across military and public safety structures.

Navigating Turbulence and Uncertainty

Reinforcing feedback loops that continue to grow unchecked, can result in increasing turbulence, potentially leading to chaos, where the system may collapse. If possible, the preferred path is to tap into a leverage point to slow the growth of the loop, instead of just focusing on strengthening balancing loops. By slowing down the loop, it buys additional time for the balancing loop activities to self-organize, evolve and adapt. How long can the system sustain this type of turbulence, and at what point will the system start to decline?

The combination of both the Shifting-the-Burden and Fixes-that-Fail archetypal patterns and their reinforcing feedback loops can lead to increasing system turbulence, beyond the ability to bounce-back in the short-term. This creates further instability, and can potentially lead to system collapse. The ability to navigate PNT is not about management and control; these notions are redundant and even dangerous in PNT [Sardar, Sweeney, 2016].

To avoid system collapse, transformation is required and self-organization is a necessary property to provide system balance on the path to create a more sustainable system. The process can be unpredictable, it requires the ability to embrace experimentation and some disorder to produce new structures and ways to operate. This power to evolve the system structure is the strongest form of resilience. This definition of resilience is beyond surviving and "bouncing back", but is also the ability to continue to operate within a variable environment. There is a level of agility that exists, with feedback loops to support self-organization with the ability to learn, create and evolve as required. This can be done with simple organizing rules or principles that potentially can have a significant impact on structures and system diversity. This can also lead to opportunities to establish a preferred future or vision for system transformation, with longer-term restructuring and collaboration across system stakeholders to achieve larger system goals.

In addition to strengthening and balancing feedback loops, there is an opportunity to focus and be aware of ignorance in its three varieties, to further understand the complexity and uncertainties involved and anticipate postnormal potentialities, leading to an ability to chart a viable way forward [Sardar, Sweeney, 2016]. PNT science moves beyond the confines of forecasting and prediction to identify system characteristics that have the potential to become turbulent, moving the system towards postnormal potentiality. During PNT the unknowns cannot be reduced to measurable risks, these empirically observable trends need to be taken into account in order to understand the mechanisms that produce signs of postnormality [Sardar, Sweeney, 2016].

Types of Future Uncertainty

The combination of complexity, chaos and contradictions results in uncertainty. As we look towards the future, it is important to be mindful of the different types of uncertainty and ignorance that we carry into the future. This study used the Three Tomorrows Framework to understand and navigate PNT, uncover hidden ignorance and uncertainty to establish a policy risk forecast.

The Three Tomorrows Framework has three different levels of uncertainty as identified in the chart below: surface, shallow and deep uncertainty. Each type of uncertainty is associated with a particular category of ignorance. Simple or plain ignorance can be defined as the absence of knowledge, and it relates to those items or phenomena that we do not comprehend. This is the ignorance we may encounter in a complex or contradictory situation [Sardar, Sweeney, 2016].

The experience of PNT is shaped by the level of uncertainty and type of ignorance, which becomes an implicit product of future dimensions.

To describe the principles of this uncertainty to be used for further analysis, Table 14 below provides a summary of the different levels of uncertainty, associated metaphor, description and forward approach.

Level of Uncertainty	Metaphor	Description	Approach
Surface Uncertainty **Extended Present**	**Black Elephants** *(known unknowns)*	Direction of change is known, magnitude, probability and consequences cannot be estimated Extremely likely and widely predicted events by experts that are usually ignored (e.g. economic crisis to pandemics)	Can be managed if there is an openness to reveal and discuss solutions
Shallow Uncertainty **Familiar Future**	**Black Swans** *(unknown unknowns)*	The space where nothing is known and cannot be known because it lies beyond our worldview (personal, collective, expert). These outliers are not perceptible or articulated even by experts, are very fragile to miscalculation, and severe under/over estimation. In practice, working with black swan boundaries of space are perceptual, relative to the context, and of those making the inquiry.	Unthought space, need new models of inquiry to confront
Deep Uncertainty **Unthought Future**	**Black Jellyfish** *(unknown knowns)*	Things we know and understand, but turn out to be more complex and uncertain that we expect, power is often underestimated Scale – small things lead to big impact, rapid escalation with positive feedback, the increase in growth leads to systemic instability.	Cannot be managed, requires deep understanding of root issues to create system balance

Table 14 – Summary of Different Levels of Uncertainty (Redrawn from Sardar, Sweeney 2016)

Postnormal Policy Forecast for Emergency Management

This section will cover the three types of uncertainty, and the associated metaphor of black elephants, black swans and black jellyfish that describes the system characteristics.

Black Elephants - Surface Uncertainty in the Extended Present

The most basic variety of uncertainty emerges when the direction of change is known but the magnitude and probability of events and consequences cannot be estimated - the known, unknowns or Black Elephants [Sardar, Sweeney, 2016]. Black Elephants are issues that need to be urgently addressed, these are potential postnormal risks that sit on the tipping point of a system, and can push the system towards post-normalcy.

Based on the Three Tomorrow's Framework, survey participants were asked to *identify issues or things they felt those working in emergency management were afraid, embarrassed, and/or uncomfortable to talk about.* These are essentially the hidden 'black elephants' in the room and reflect an ignorance we carry into the future as a profession if not addressed. Survey responses were analyzed to reveal the following four themes:

- Leadership
- Systems
- Knowledge & Learning
- Human Centered Issues

Opportunity for Action: attempts to reduce surface uncertainty as outlined in the themes in [Table 15] can be made by reviewing and analyzing available information to generate hypotheses that could shed some light on the issues. Additional information will most likely be needed. The type of ignorance in this horizon is considered to be simple and plain.

SURFACE UNCERTAINTY
TIPPING POINT ISSUES

LEADERSHIP & DECISION-MAKING

- continued hiring of command and control type leaders
- the "white savior" complex and long traumatic history behind global powers and their treatment of (largely) global south countries and vulnerable populations
- inability to accept a changing world, the old 'ways' we approached emergency management are becoming invalid, and is no longer the way forward
- leadership and decision-making failures, the lack of examining the root causes of why things didn't go well during post-incident debriefs
- loss of reputation to organization due to management behaviours
- making decisions to building better, e.g. constructions code, zoning regulations
- succession planning and the need to make room for the "new guard"

POLITICAL & ECONOMIC

- colonialism - colonial legacies as unnatural disaster, command and control frameworks of dominant culture, and professional approaches that exhibit colonial patterns such as legislated government control, paternalistic forms of engagement and forced evacuation from land [Dicken, Yumagulova, 2017]
- willingness to invest political and economic capital for the longer-term
- impact of required climate reform on local economies
- directly addressing industries that are contributing to the environmental risk problems (e.g. oil & gas and mining sectors)
- regional economic impact and reduced purchasing power for procurement
- national resilience, importance of alliances and partnerships, CAN-US relationship

RISKS, THREATS & SYSTEM FRAILTY

- risk assessments not leading to investment to support capacity and capability to mitigate and respond in an emergency situation
- concurrent multi-hazard and threat management capability
- frailty of our systems – health/medical, communication, transportation

SURFACE UNCERTAINTY TIPPING POINT ISSUES
SYSTEMS & CHANGE
• large systemic issues in emergency management, response culture focus and reluctance to reframe to address social vulnerability • lack of interest in climate change and human activity • competing tension between professionals focusing on climate change mitigation and resilience work
ROLE, RESOURCES & CAPABILITY
• emergency management is often a bolt-on role and status, there is underfunding for long term capability development • uncertain job security and lack of human resources support • lack of interest in community development and risk reduction • the need to move resources from response/recovery to support other pillars of emergency management (risk management)
KNOWLEDGE & LEARNING
• insufficient level of trained professionals with the appropriate level of knowledge and competence working in this profession • cultural views of not "knowing" as a weakness, leading to a lack of acknowledgement of areas of uncertainty • the inability to learn from other disasters, the feeling of being stuck on "repeat" and doomed to repeat failures others have already experienced
HUMAN CENTERED ISSUES
• human rights, humanitarian and emergency relief issues • systemic racism, increased vulnerability of racial and ethnic minorities, disparity in disaster preparedness and recovery [Rodriguez-Diaz, Lewellen-Williams, 2020], long standing inequalities in disaster response policies [Frank, 2020] • gender mainstreaming in emergency management, gender-sensitive approaches to disaster risk management [Enarson, 2008] • mental health and psychological distress during emergencies [WHO, 2019] • opioid crisis - national public health crisis that devastate individuals, families and communities

Table 15 - Black Elephants - Surface Uncertainty and Tipping Point Issues

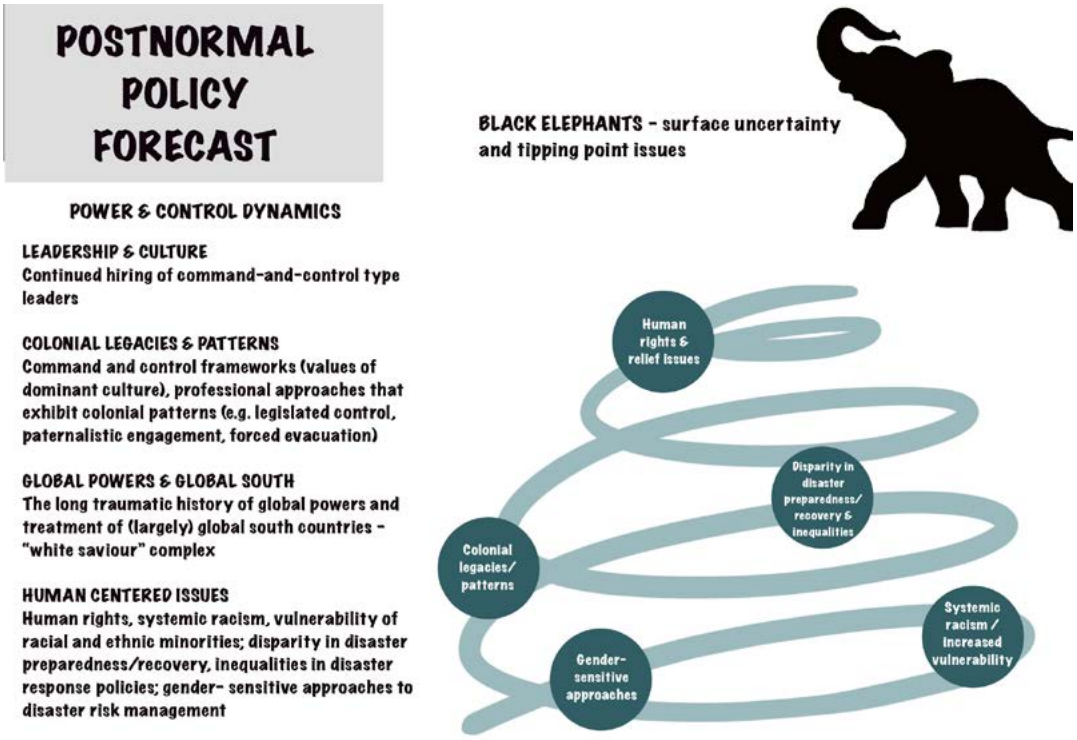


Figure 27 – Black Elephant Tipping Point Issues that Relate to Power & Control Dynamics

Power & Control Dynamics

At the level of surface uncertainty, also known as the "black elephants" in the room, are tipping point issues that relate to power and control dynamics in emergency management and reflect an ignorance we continue to carry into our collective future. This includes issues such as:

- **Leadership & Culture:** with continued hiring of command and control type leaders;

- **Colonial Legacies & Patterns:** tthese include colonial legacies viewed as an unnatural disaster, with professional approaches that exhibit colonial patterns such as command and control frameworks of the dominant culture, legislated government control, paternalistic forms of engagement and forced evacuation from land [Dicken, Yumagulova, 2017], structural dependency and outright entanglement in colonial relationships [Moulton, Machado, 2019] and how procedural vulnerability is deepened through disasters and subsequently leveraged to deepen coloniality [Rivera, 2020];

- **Global Powers & Global South:** the long traumatic history of global powers and treatment of (largely) global south countries, known as the "white saviour" complex ; and

- **Human Centered Issues:** human rights, humanitarian and emergency relief issues; systemic racism, and increased vulnerability of racial and ethnic minorities; disparity in disaster preparedness and recovery [Rodriguez-Diaz, Lewellen-Williams, 2020] and long standing inequalities in disaster response policies [Frank, 2020]; and gender mainstreaming in emergency management, with gender-sensitive approaches to disaster risk management [Enarson, 2008].

Black Elephants are issues that need to be urgently addressed, and have the potential to push the system towards post-normalcy. Figure 27 highlights important "tipping point" issues that relate to power and control that need to be discussed and addressed within emergency management.

Black Swans - Shallow Uncertainty in the Familiar Future

Black swans events are those events that come as a surprise, have a major effect, and are often rationalised after the fact with the benefit of hindsight. The black swan theory developed by Nassim Nicholas Taleb explains the disproportionate role of high-profile, hard-to-predict, and rare events (extreme outliers), that are beyond the realm of normal expectations.

Black swan events defy scientific models of probability and prediction, and highlight a psychological bias that blind people to uncertainty. In practice, working with black swan boundaries of space are perceptual, relative to the context, and of those making the inquiry. It also requires a higher level of perspective and analysis. Black swans can be both positive or negative. A positive black swan may illuminate previously unimagined opportunities, while a negative black swan can serve as a signal for emerging postnormal activity.

Again based on the Three Tomorrow's Framework, survey participants were asked - *what they thought could never happen?* This question was posed to help understand participants' perspectives, and what they believe to be beyond the realm of possibility based on their perspective. These are potential black swans. Many participants found this question difficult to answer because of their acknowledgement of the many unknowns in the environment, and their belief that now anything is possible, especially since the Covid-19 experience.

An interesting observation from participant responses to this question was the significant amount of positive black swan statements shared. These statements highlight the unimagined opportunities and align with the characteristics of a future vision of resilience. Based on participant's perspectives, these statements also suggest that the political will to drive meaningful change, and opportunities for dedicated resources, investment and integration are perceived to be outside the realm of possibility in emergency management. This strongly speaks to the system's current patterns of behaviour, and the locked-in narrative, worldview and structure of emergency management. In contrast, the negative black swan statements appear to have elements with postnormal potentiality, such as terrorism, conflict and security, and famine South of 60 in Canada (i.e. sixtieth parallel north, which separates the Canadian territories from the provinces).

Opportunity for Action: The increasing uncertainty of this horizon requires a need to determine new lines of inquiry to possibly produce the appropriate knowledge, and the time horizons involved in acquiring that knowledge. The type of ignorance in this horizon is understood to be vincible.

Table 16 below outlines the knowledge themes that may present unimagined opportunities (positive) or signals of emerging postnormal risk (negative) in the familiar future. Figure 28 further highlights potential positive and negative Black Swan extreme outliers, the unthought space beyond the current emergency management worldview.

SHALLOW UNCERTAINTY OPPORTUNITIES & RISKS (EXTREME OUTLIERS)	
POSITIVE Unimagined Opportunities in the Familiar Future	**NEGATIVE** Risks in the Familiar Future
EMERGENCY MANAGEMENT	
• creation of dedicated emergency/disaster management positions in every sector and at every level • reduce expectations and pressure on Fire Chiefs to reduce the gap and cover emergency/disaster management responsibilities • jurisdictions communicating effectively and take responsibility for their roles • seeing value in pre-incident investment • bringing together a team of people thinking about resilience from all angles • good oversight of all the work happening, with effective mobilization and integration • more women than men in the industry	• disaster/emergency management and civil protection functions move back under sole responsibility of the military
TERRORISM, PEACE & SECURITY	
• world peace!	• nuclear annihilation • military troops on the street assisting a police security incident • armed conflict on Canadian soil • force reduction plan
POLITICAL	
• politicians defending emergency management activities and pressuring jurisdictions to support with funding and resources • political will to drive meaningful change towards a green economy	
ENVIRONMENTAL	
• acceptance of climate change risk • decarbonization of the economy within the next 20 years • reducing carbon emissions • implementing mitigation/prevention initiatives • doing community development work	• famine (in Canada, south of 60)

Table 16 – Black Swans – Shallow Uncertainty: Unimagined Opportunities & Post-normal Risk

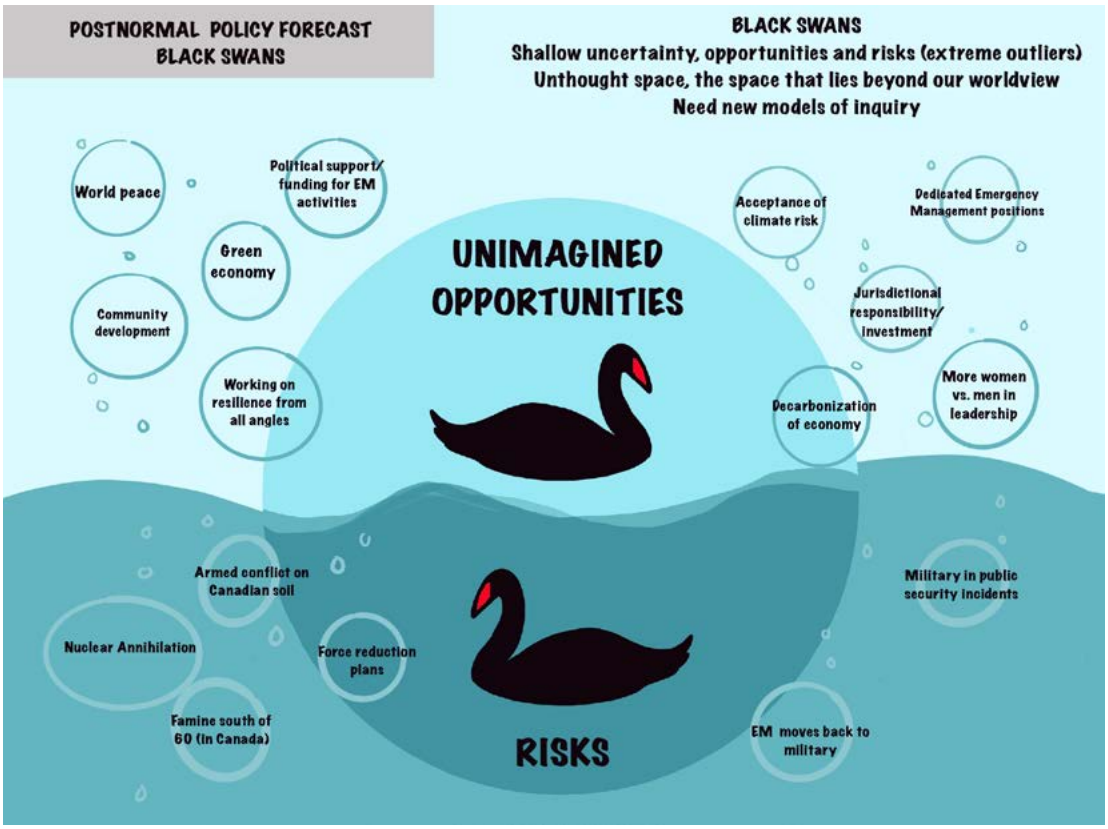


Figure 28 - Potential Positive and Negative Black Swans and the Unthought Space

Black Jellyfish - Deep Uncertainty in the Unthought Future

Uncertainty in the unthought future is represented by the Black Jellyfish. Black Jellyfish are normal phenomena that can be driven towards postnormalcy due to systemic shifts. This can lead to reinforcing positive feedback loops or increasing growth resulting in systemic instability and potentially a high impact event. Black Jellyfish are the unknown, knowns - things we know and understand, but turn out to be more complex and uncertain that we expect, with power often underestimated [Sardar, Sweeney, 2016]. Scale and rapid escalation leading to instability are key defining characteristics.

Using the Three Tomorrow's Framework, survey participants were asked the following question: *are there situations that have the potential to quickly escalate into something with an extreme impact?* The purpose of this question was to understand areas where issues may be emerging and have the potential to become 'catalytic events' with unthought possibilities, consequences and impacts. Participant responses identified situations of deep uncertainty along the following themes: social, environmental, political, terrorism and infrastructure.

Opportunity for Action: In this horizon potential situations can reach a chaotic stage. Consideration needs to be given on whether the current paradigm is able to deal with these situations; if not this would indicate the presence of invincible ignorance. In this situation, the most appropriate action is to work toward an alternative, and better paradigm [Sardar, Sweeney, 2015] that seeks to address the root cause of the issues in these situations.

Table 17 below outlines themes collected that reflect areas with potential emerging issues that may have significant consequences and impacts. Figure 29 further highlights the themes and issues that have the potential for rapid escalation and causing systemic instability. A deep understanding of root issues is required to balance. The power is often underestimated. Participants in this research project identified a pandemic as a Black Jellyfish event with deep uncertainty.

DEEP UNCERTAINTY EMERGING ISSUES & POTENTIALITY
SOCIAL
• systemic racism, inequality and oppression (failure to address vulnerability) • social unrest, social crisis, instability and activism • health - pandemic / infectious disease outbreak • evacuations – vulnerable populations and potential scenario of evacuating significantly more children than adults to a host community without child wellbeing agencies at the planning table
ENVIRONMENTAL
• climate change - fast moving extreme weather events and potential for morbidity and mortality • critical infrastructure failure due to extreme weather risk/exposure • food security and food shortages (physical and economic access) • space - solar activity and impact to satellites and power grids
POLITICAL
• populism and political approach to appeal to those who feel disregarded • populism and impact to disaster response or risk reduction (i.e. funding and political backing) • foreign policy and political tensions • conflict / threats at regional and international level with impact to society, economy and quality of life with domestic unrest
TERRORISM
• terrorism and complex coordinated terror attacks • technological terrorism
INFRASTRUCTURE
• prolonged critical infrastructure failures (power loss, telecommunication outage)

Table 17 – Black Jellyfish – Deep Uncertainty: Potential Emerging Issues

As we look across the three horizons of uncertainty with black elephants (surface uncertainty), black swans (shallow uncertainty) and black jellyfish (deep uncertainty) it is important to acknowledge the type of uncertainty associated with a particular category of ignorance. Awareness of the three levels of uncertainty and ignorance provides an opportunity to understand and chart the degree of actual and perceptual post-normalcy surrounding a particular issue, system or horizon.

To understand whether a system has the potential to move towards post-normalcy, confirmation is required on the following aspects:

- understand and assess the system's complexity;
- examine and understand the level of systemic interconnections;
- observe the system for displays of obvious contradictions; and
- identify potential areas where positive reinforcing feedback could be generated.

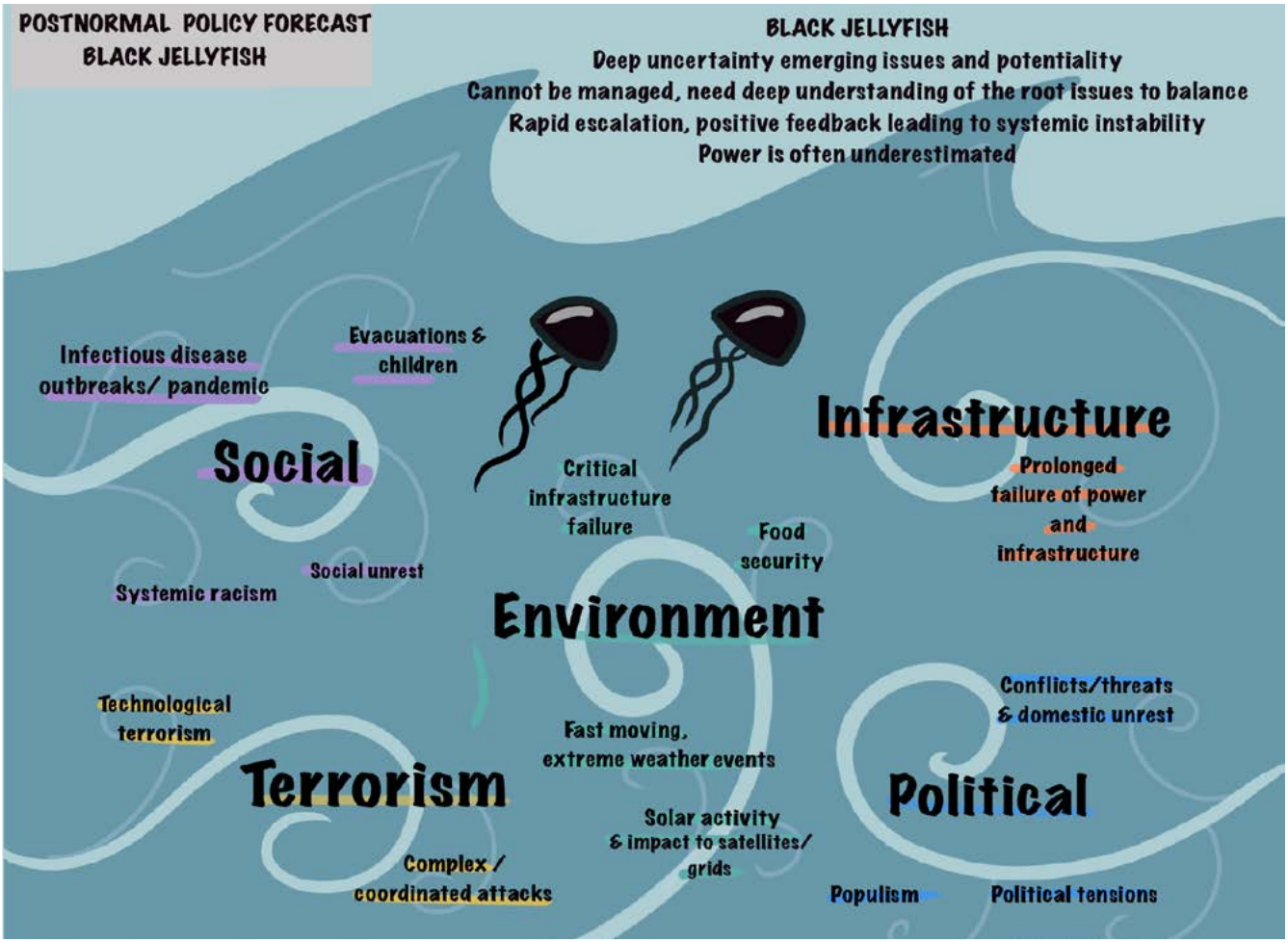


Figure 29 - Black Jellyfish, Emerging Issues and Potential Rapid Escalation

Systems with institutions and structures that are highly complex and networked can potentially go postnormal anytime. When the above four factors are present, it is likely that the system will become postnormal [Sardar, Sweeney, 2016]. Post-normalcy tends to develop along three phases and requires different policies to address each phase:

PHASE ONE:

- The system is complex and interconnected but continues to function.
- If ignorance or uncertainty is ignored, a small change or perturbation in the system can rapidly produce consequences that cannot be controlled, leading to postnormalcy.

PHASE TWO:

- As positive feedback emerges and grows it activates a postnormal potentiality, and the system begins to show signs of chaos.
- At the edge of chaos is where a complex system can either collapse or self-organize into a new order.

PHASE THREE:

- Chaos takes over and the system becomes postnormal.

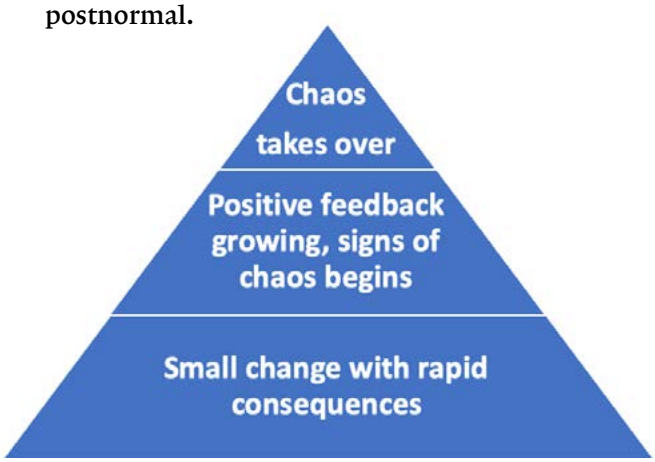


Figure 30 – Three Phases of Post-normalcy Development

Discussion

Thomas Kuhn who wrote about the greatest paradigm shifts in science has stated, a full-scale paradigm shift is a prototype for revolutionary reorientation. It requires a break from tradition, it's like a gestalt-switch where perception suddenly changes from the previous paradigm to embracing a new paradigm. A vision of this emerging paradigm is needed to inspire evolutionary change. This aspirational future vision is missing in the field of emergency management.

This research project seeks to achieve the following: advance discussion concerning a paradigm shift in emergency/disaster management; and identify opportunities to support the emerging paradigm by bridging knowledge systems and acquiring new skills in futures, foresight and design.

A paradigm analysis was performed to understand the structure of the anomalies in the current paradigm, it was used as a diagnostic to identify opportunities to shape the new paradigm. In addition a systems analysis was done to understand turbulence and potentiality for a system to move towards chaos or post-normalcy. This analysis also highlighted opportunities to balance the system through developing new mindsets towards the future, and slow the growth or balance the system though risk reduction and resilience building efforts.

Crisis can provide an opportunity to understand the parts of the system that are no longer working, and can provide the necessary data to break from tradition and move towards an evolutionary paradigm shift. This type of evolutionary transformation challenges our thinking from a scientific perspective, this reorientation displaces the conceptual mental model through which one views the world [Kuhn, 1970]. This is significant for emergency management because at the heart of their paradigm is the risk assessment process or 'system rules', it is rooted in science and oriented towards forecasting and predictive analytics. This results in a deterministic approach towards the future, and a mental model centered around prediction and control. This conflicts with the high level of system complexity and uncertainty that exists in today's world, and the emerging paradigm expressing a change in values of collaboration, cooperation and the whole of society approach moving into the future.

Reorientation and mental model displacement are necessary steps to be able to switch back and forth between ways of seeing the current and emerging paradigm. This ability is critical for emergency / disaster management professionals if committed to shifting the current paradigm.

The Sendai Framework for Disaster Risk Reduction impels a move away from an obsession with prediction and control, calling to embrace multiplicity, ambiguity and uncertainty [Gordon, Williams, 2020]. In addition, resilience is not just about bouncing back, but also about building forward to envision and achieve a resilient and prosperous future. [Mizutori, 2019]. This expanded definition of resilience highlights the growth aspect and opportunity for risk-informed investments at the prevention end of the emergency/disaster response cycle directed to social, economic and environmental challenges. This ability to embrace these new characteristics requires a shift in thinking to cultivate

new mindsets and skill sets, which can be found in futures thinking, system thinking and design. The growth aspect of resilience needs creativity to consciously reimagine a new vision to inspire actions to pull the profession forward, and strategically shape a new structure based on current strengths and emerging opportunities to ensure the field continues to be fit for purpose in a changing environment.

In order for growth and change to occur, emergency management will need to become conscious of the anomalies of the current paradigm, and use it as a learning opportunity for growth. This also requires a deeper awareness and understanding of the profession's relationship to the present, and how decisions made solely based on the familiar past restrict the evolution of the profession's future.

"Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world"

Albert Einstein

"Change is not merely necessary to life - it is life"

Alvin Toffler

Current Paradigm & Change

Change requires conscious effort to shift out of our routine and familiar patterns of our subconscious mind. Embracing change can be uncomfortable and filled with uncertainty, which is difficult for many people.

The Beckhard and Harris Model of Change considers the factors necessary for change to take place in a simple way. The model was initially devised for change and resistance in organizations [Ospina, 2020]. It includes the following mathematical formula for change to complete the model's theory:

D x V x F > R

D = Dissatisfaction
V = Vision
F = First step
R = Resistance

This formula is being applied at a paradigm level as an organizing principle in this research project to converge insights, identify considerations and next steps. The formula requires motivated actions on the left side of the equation in order to overcome the resistance to change. All three factors must be addressed to drive the change process.

This research project focused on making visible the emergency management paradigm, and understanding the system from an external and internal perspective. The paradigm analysis represents the **dissatisfaction part of the change formula** and consists of:

- system anomalies or archetypal traps that are observed externally;
- a deeper understanding of the internal perspective and mental model in which that paradigm is based; and
- systems modelling to understand patterns of turbulence and anomalies that elevate the risk for a system to move towards postnormal potentiality.

External Systems View

Identifying system conflicts and anomalies assist to understand relevant patterns, and highlight opportunities to shape the new paradigm through deeper examination of system leverage points. Four system archetypes were identified based on the anomalies. These archetypes also function as 'system traps' that need to be released in order to evolve the system.

Key insights from the four system archetypes includes:

Shifting the Burden: highlights the system anomaly of an "addiction" to quick short-term quick solutions causing the system to be gridlocked in crisis response, and fragility to evolve. This pattern suggests a malfunctioning of the hierarchy, and can result in erosion of the risk management sub-system and sub-optimization of the system.
Action: System balance is required, with the emergency management hierarchy to function to assist the lower sub-systems and evolve from the bottom-up. This includes support and proactive

investment for long-term restructuring to address system vulnerabilities and build resilience. Consideration also needs to be given to the strength of the crisis response stock, to ensure it is resourced and designed to balance disruption and impacts in an evolving and uncertain environment. Additional opportunities to influence the system by working with system leverage points are outlined in Table 1.

Fixes that Fail: highlights the system anomaly of "policy resistance" and a bounded mental model that creates a limited perception of risk, which does not reflect the dynamic changing external environment. This constrains risk management activities leading to assessment discrepancies and inadequate anticipatory behaviours. This pattern reduces the ability to address underlying vulnerabilities, and can elevate chronic system vulnerability over the longer-term. Risk assessments function as the rules of the system, and are powerful leverage points for change and to shift behaviours.
Action: Consider harmonizing system goals. One option is to evolve the risk model and move towards an understanding of dynamic and systemic risk by examining system feedback loops. In addition, building futures literacy can be layered on by adding an anticipatory lens to engage with emergence, identify system changes, potential disruption and opportunities for new adaptive anticipatory behaviours. Consideration needs to be given to the "knowledge stock" of collective intelligence and risk data, that is more inclusive and reflects the underlying drivers of risk. Additional opportunities to influence the system by working with system leverage points are outlined in Table 3.

Growth & Underinvestment: highlights the system anomaly of the reinforcing growth and underinvestment to keep pace with system change, demands and needs. This can result in a stretched system, and can create an erosion of performance standards.
Action: there is a need for capital planning and investments to maintain critical system stocks to avoid a decline in response performance standards in the short and long-term. Investment decisions can be anchored to demand/needs, as well as the external signals of change just over the horizon. This will require futures literacy and the ability to work with emergence. Building institutional capacity is an important knowledge stock to ensure future capabilities to support risk management and resilience activities. Other important physical stocks include maintaining critical infrastructure (e.g. hospitals, transportation systems and electricity and power generators). Generally these structures need to be able to continue to operate with maximum efficiency, and situations that can potentially strain its capacity need to be prevented. More awareness regarding natural capital and collaborative partnerships is required to build this system stock. Additional opportunities to influence the system by working with system leverage points are outlined in Table 5.

Tragedy of the Commons: highlights the system anomaly of escalation or growth in a commonly shared environment – cities and communities. This tragedy arises from missing or delayed feedback on the growth patterns creating system blind spots, and lack of adequate resources available. This can elevate vulnerability and lead to erosion beyond the ability to

recover, potentially leading to loss of sustainability. **Action:** An important system stock includes building social capacity and citizen/community participatory process to support decision-making to reduce risk and build local resilience. An anticipatory commons governance framework that uses participatory process can be used to generate system feedback to protect and build local resilience. Anticipatory governance taps into diversity to harness the intelligence and wisdom of its citizens, and provide opportunities for citizens to be agents of change and chart intelligent directions for their community. Additional opportunities to influence the system by working with system leverage points are outlined in Table 7.

Internal Perspective/Worldview

An important element within a paradigm is the internal perspective. This is the worldview and discourse analysis exploring mental models, culture, values and deeper assumptions behind the problem. Exploring mental models assists to understand the perspective that supports the paradigm. Unexamined deeply entrenched mental models can create inertia, despite the strong systemic insights. In this study additional steps were taken to understand the emergency management mental model, and anticipatory system towards the future.

Anticipatory Narrative

The anticipatory narrative consists of four structural properties that reveal practical applications: a scientific mindset of data, prediction and risk; a systems mindset with sense-making; decision-making for investment and impact (resource optimization); and fit for purpose (organizational capacity). Additional details include:

- The mindset and relationship towards the future is one of prediction, which is rooted in the foundation of science that seeks to identify risk and propose interventions to control and/or minimize impact of the changing risk profile.

- Change is seen as a potential threat to the status quo, once a certain risk/threat level is reached, it motivates civil defence / civil protection actions.

- In emergency management, the anticipatory skills appear to be used at the operational level to enhance situational awareness, and to support practical decision-making and investments to optimize planning, resources and impact. **Action:** There is an opportunity to use anticipatory systems to shape organizational capacity to ensure continued strategic fit moving into the future as it emerges. Anticipatory capabilities at a strategic level (beyond 3-5 year horizon) can assist to understand emergence, disruption and potential future opportunities to reimagine and self-organize for operational advantage in the future.

Futures Literacy

The emergency management profession tends to work at an operational and tactical level. The worldview does not routinely consider other factors of complexity, systems change, emerging issues that can lead to disruption, or potential opportunities to enhance resilience and sustainability.

The emergency management anticipatory knowledge structure and processes sit within the preparedness and planning domains of futures literacy, used for conceiving and organizing human agency for today. This includes:

- the use of anticipatory methods for emergence appears limited to understanding trends to identify potential risks or threats;
- the exploration of typically mature mainstream trends/issues;
- anticipation being primarily focused around a taxonomy of risk, from an internal, external and network perspective;
- working with uncertainty is not part of the emergency management operational/planning paradigm; and
- working at the strategic level to consider opportunities for growth and adaptation to build future resilience is typically not explored.

According to survey participants, 88% identified the use of strategic thinking to sense and make-sense of emergence. This reveals a shift in thinking and orientation within the profession towards a holistic approach that overlaps between knowledge systems, in order to understand and navigate an organization within a changing environment.

There is a disconnect between capturing lessons learned and informing future preparedness and planning activities. Organizations are failing to structurally anchor or institutionalise the lessons learned in between emergency cycles. This situation can lead to a learning and knowledge discrepancy, which can create a situation of reactive learning. In reactive learning, actions are re-enacted habits that end up reinforcing pre-established mental models.

Wisdom in emergency/disaster management has more recently emerged with the recognition of Indigenous knowledge and ways of being, and local community wisdom:

- Indigenous knowledge (First Nations, Inuit, and Metis) is strongly linked to the natural world and as a complex ecosystem of relationships;
- balance and holistic harmony are essential tenets of this knowledge and subsequent cultural practices; and
- embedded is a belief in both adaptability and change, but change that further promotes balance and harmony.

Action: There is an opportunity to bridge knowledge systems and introduce new capabilities to support emergency management such as: futures literacy, strategic foresight, systems thinking and design to assist in developing innovative system solutions to support anticipatory adaptive capacity, as well as opportunities for transformation. This includes:

- expand their use of anticipation to include emergence, using a horizon scanning frame to understand system shifts, emerging issues, weak signals of change;

- uncertainty and potential future opportunities, navigating disruption and/or turbulence; and
- creative processes in different ways to acquire this knowledge, to support adaptive and innovative solutions.

Mental Model

There is a conflict in the way the emergency management community thinks (long-term/proactive) and behaves (short-term/reactive). This may be due to their role and function in the current organizational structures.

The identity of emergency management is rooted in a paramilitary/first responder cultural lens, behaviour, organizational structure, tactics and training. This identity, thinking and behaviour is short-term and response focused at its core.

The profession can benefit from a cultural shift from traditional command and control (which is imperative during response), to a strategic inclusive approach before, during and after emergency events, it requires:

- the ability to leave the comfort zones of traditional heuristics and embrace a proactive mindset;
- shifting the cultural view of not "knowing" or perceiving uncertainty to be a weakness;
- not having an "off the side of the desk" type of role in communities; and
- ensuring the role of mitigation, prevention and/or recovery activities are seen as an important part of the profession.

At the root of the attitudes and beliefs are three main assumptions accepted to be true for emergency management:

- the lack of a unified vision that represents the diverse emergency management sector, resulting in system fragmentation;
- a strong paramilitary and first responder cultural lens, mindset and behaviour reinforces the response focus; and
- emphasis on ICS doctrine and command and control keeps the profession rooted in the response pillar and activities, with modeling tools aimed at predicting and controlling risk.

Action: More diversity within the profession and inclusive approaches are needed to shift the culture, skills sets and mindset towards disaster risk management and building future resilience.

Postnormal Potentiality

Systems with institutions and structures that are highly complex and networked can potentially go post-normal anytime. It's important for emergency managers to acquire system thinking skills to understand complex adaptive systems, especially patterns of reinforcing growth that can lead to turbulence, chaos and potentially system collapse. By making these patterns visible, it facilitates a conversation on opportunities to move the system towards balance, stability and transformation.

This approach provides a bridge between systems thinking and post-normal times theory and includes:

- identifying system anomalies that permit unconstrained growth, and use as a system diagnostic to understand system direction, and post-normal potentiality;

- identifying opportunities to slow the growth of the feedback loops, and/or balance the loops in order to move the system towards a state of balance, stability and transformation; and
- awareness of the three levels of uncertainty and ignorance to provide an opportunity to understand actual and perceptual post-normalcy surrounding a particular issue, system or horizon, and to take action to address these issues. Post-normal issues are represented by the metaphors black elephants, black swans and black jellyfish.

Power & Control

A review of the four archetypal patterns reveals a strong historical pattern of power dynamics in the system, this holds the system in its current position. While this structure provides a level of stability, it can also lead to system rigidity and the inability to adapt to a changing environment. This has implications for the ability of the emergency management system to embrace a paradigm shift, which requires an openness to explore a perceptual transformative vision and a revolutionary reorientation of the system.

To shift the current emergency management paradigm towards the emerging and transformed paradigm as outlined in Figure 31, it will require two shifts:

- a culture shift, moving from traditional command and control with a centralize power structure, to a new structure that embraces local/community empowerment; and
- a governance shift, moving from a top down paternalistic approach to engagement and competition for limited resources, to a bottom-up participatory governance structure to accommodate a whole of society approach and provide opportunities for societal collaboration and cooperation.

There is a need to urgently address surface uncertainty and reflect an ignorance we carry into our collective future. These are Black Elephants, which are "tipping point" issues that have the potential to push the system towards post-normalcy. Many of these issues relate to power and control that need to be discussed and become a turning point for change within emergency management such as:

- leadership and culture of command and control;
- colonial legacies and patterns within professional approaches;
- structural dependency and outright entanglement in colonial relationships;
- procedural vulnerability that deepen coloniality; and
- human centered issues such as increased vulnerability of racial and ethnic minorities, disparity in disaster preparedness and recovery, long standing inequalities in disaster response policies and gender-sensitive approaches.

Transforming the emergency management paradigm will require an internal transformation of culture and the mental model to ensure alignment with the new values and principles of the new paradigm. This will require the willingness to:

- break with tradition, and to let go of old practices that are no longer relevant;
- create space and step into the unknown to embrace new ideas and future opportunities; and
- embrace a new archetype role – crisis warrior to protective caregiver:
  - to support the risk management section of the emergency management cycle, to heal "chronic" system vulnerability and work to restore balance and harmony in the system; and
  - by cultivating new mindsets and skill-sets that bridge knowledge systems and introduce new capabilities to support emergency management such as: futures literacy, strategic foresight, systems thinking and design.

This evolution requires a new type of governance, with the ability to shift existing power and control structures, in exchange for collaboration and empowerment to seek the system goal of stability and balance.

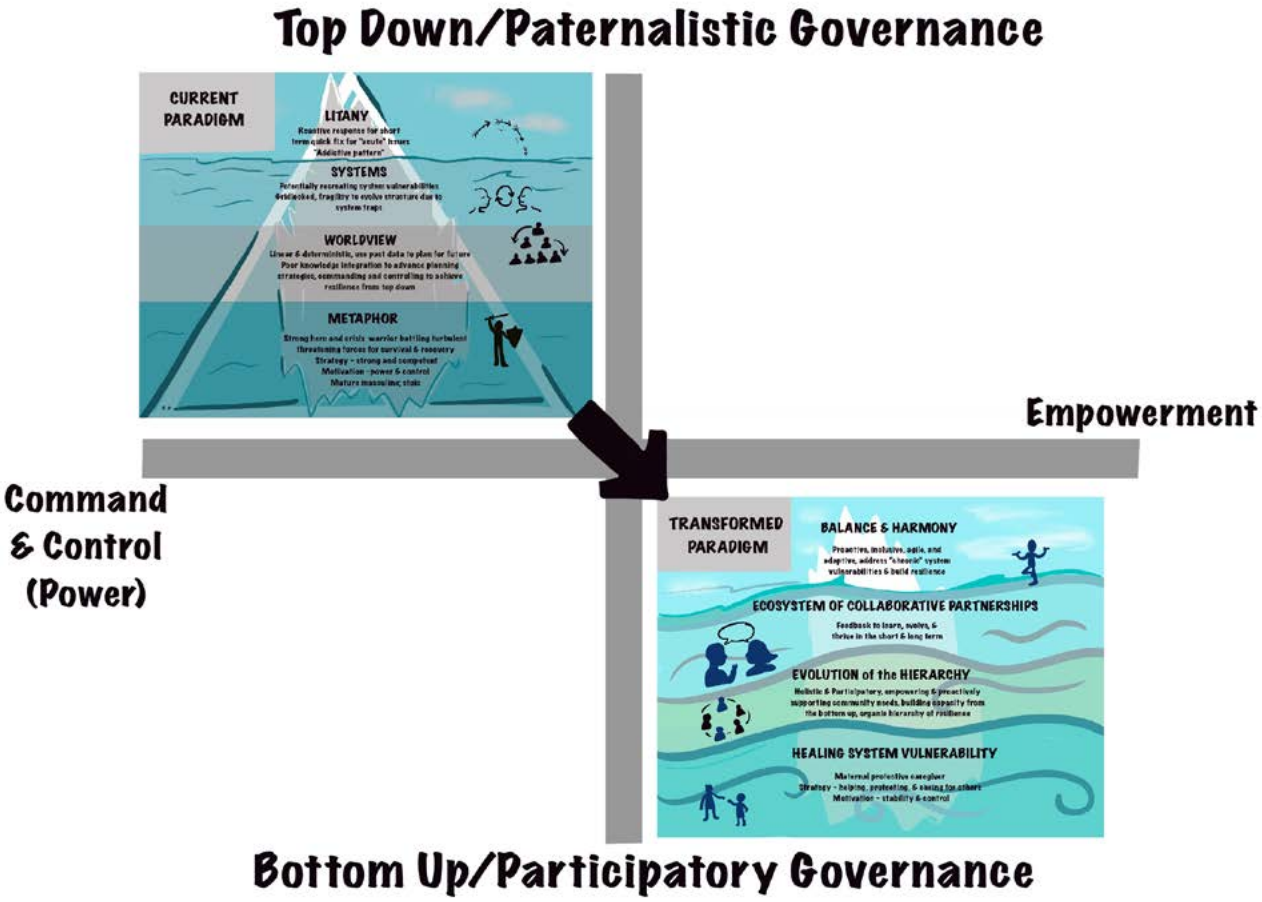


Figure 31 - 2 X 2 Matrix: Shifting Paradigms, Culture & Governance

Learning Pathway: Leadership and Vision for the Future

This section represents the **vision part of the change formula.** Leadership and a sense of responsibility for the future are important to establish a vision, and understand the need for change in both the short and long-term.

The pathway to move from the current paradigm to a transformed paradigm requires an openness to learning and exploration. This means shifting away from reactive learning and re-enacted habits that reinforce existing mental models, to proactive approaches to consciously learn and acquire new knowledge to shift perspective, thinking and behaviours moving into the future. Shifting our mental models is key to moving knowledge forward and creating coherence.

To strategically move in the direction towards building a resilient future requires two things:

- a vision of that future paradigm – new structures, functions and processes that complement the new goals, rules and self-organization of the system based on the new paradigm's principles and values; and
- an expanded understanding and application of the term resilience that includes a growth mindset, with adaptive strategies that tap into emergency management's growing edge and leads towards the vision of transformation.

Transformation requires an aspirational vision and supporting narrative of the future in order to intentionally direct and re-imagine system changes. This also requires the ability to leave the comforts of the known past, embrace uncertainty and new possibilities for the future.

There is currently no unified vision for the future of emergency management, one that is aligned with the principles of the emerging paradigm of resilience. Based on the behaviours in the current paradigm, characteristics of a resilient future were captured as positive black swan statements in this research project. This means that the characteristics of a resilient future is perceived to be far outside the realm of emergency management's current paradigm and perspective – a black swan! This insight highlights an unimagined opportunity for the profession, and the need to create a vision of resilience to pull the profession forward and towards the emerging paradigm. Having a vision is an important ingredient in order to create the necessary tension for change to occur. Vision is needed to be able to speak and act with assurance from the emerging paradigm, drive meaningful change and create new opportunities.

Futures & Design – Exploratory Building Blocks for Transformation

This section represents the **first step part of the change formula**. A first step to move forward and create change is to cultivate new mindsets and ways of thinking, with skill-sets that support the emerging paradigm and assists to map a future vision of transformation.

The turning point to transformation is a choice to elevate thinking to a new level of future potential

and possibility. Disaster risk management and resilience building is a new narrative for an emerging paradigm in emergency/disaster management. To embrace a new paradigm, this narrative requires a vision, strategy, structure and investment in resources to realize its potential.

A new paradigm is a revolution in thinking and a reorientation of familiar existing structures, it requires confronting the status quo and changing patterns and behaviours that are no longer working or aligned to the vision and overarching goals of the emerging paradigm. Paradigm transformation is about leadership and the ability to break from tradition, lead through change and embrace the unknown. This type of leadership challenges the existing culture and hierarchical structures to create space for a larger vision and model moving into the future, one that evolves from the bottom up, serves the lower subsystem and vulnerabilities at the local level. This type of leadership style is more aligned with the mindset of servant leadership, which embraces traits such as empathy, compassion, self-awareness, humility and open-mindedness to collaboration.

A variety of different futures/foresight and design methods could possibly be leveraged to support leadership capabilities to build new mindsets to support the emerging paradigm by activating a new level of consciousness, a way of thinking about the future and working with emergence and change. These might open up new opportunities to build on existing strengths to remain human centered, future ready, and have an advantage in potential future operational environments. More research into optimal approaches are required, however. These following methods could be considered as potential building blocks that can be combined in a variety of ways to advance conversations that support active learning, re-examine future possibility and generate new knowledge to advance the decisions made today concerning the future. Based on insights from this research project, Figure 32 below outlines potential exploratory building blocks of relevance to emergency management that can potentially support development of a learning framework. These building blocks include: decolonizing futures and long standing inequalities that hold us to the past, and anticipatory governance linked to embracing emergence and changing environment. The blocks within the center of the framework provide a variety of system level interventions and approaches to support learning and decision-making in the present, towards consciously building a better future. Together these blocks can provide an opportunity to use different knowledge creation processes to build collective intelligence and establish deeper insights to mobilize action towards a preferred shared vision of the future.

Additional details and descriptions of these possible building blocks are provided in Appendix A.

"Change is the process by which the future invades our lives"

Alvin Toffler

Figure 32 – Exploratory Building Blocks to Uncover Future Potential and Possibility

Next Step – Waves of Change

This research project seeks to advance discussions concerning a paradigm shift in emergency/disaster management. To achieve this requires the ability to cultivate new mindsets and shift our thinking about the future, and can be considered a first step to bridge knowledge systems to meet the needs of the emerging paradigm.

To support this first step, there needs to be greater awareness about the current paradigm, and openness to recognize system anomalies and choosing to embrace the potential for transformative change. This requires a willingness to create space to have proactive conversations and consciously explore opportunities to achieve long-term fundamental solutions and build resilience. This includes discussions regarding cultural shifts and evolution of governance and system structures to allow for more diversity and inclusion across stakeholders. These new conversations to support waves of change can be layered in a tiered structure as outlined in Figure 33 below.

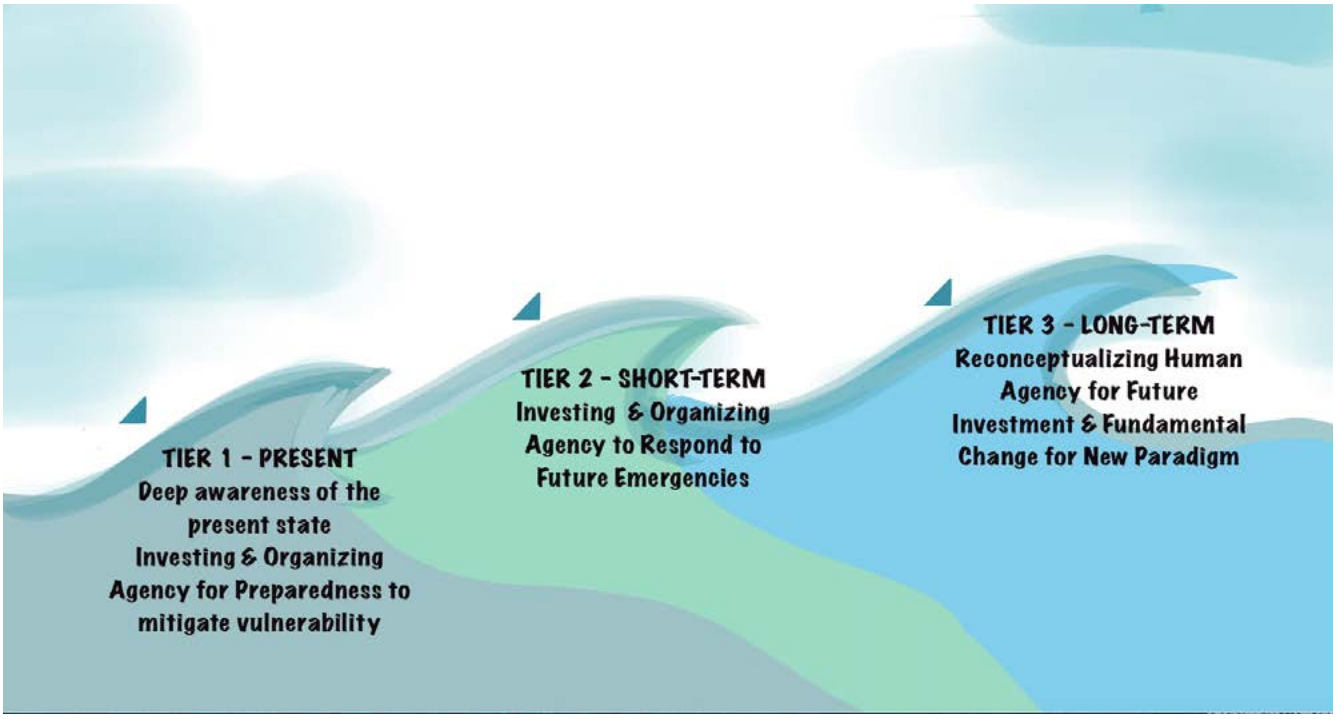


Figure 33 – Conversations to Support Waves of Change

TIER 1 - PRESENT STATE

This tier focuses on building a stronger and deeper understanding from a systems perspective through awareness of interconnections, information flows, identifying anomalies and root cause issues. There is an opportunity to integrate various forms of knowledge, wisdom and information, including inter-organizational information across resilience professionals from various sectors. Attention should be given to identifying missing information flows, critical uncertainties that can impact operations and surface uncertainties that are potential tipping points for policy issues. This tier has the potential to tap into a consciousness focused on awareness and connection in the now, not past or future. Insights from this deeper and holistic perspective can reflect a realization of inner nature, and harmony with the external environment. These insights can assist to identify opportunities to break away and let go of old ways of thinking, in order to create space for new ideas, potential and future possibilities.

TIER 2 – SHORT TERM

This tier focuses on adaptive capacity and organizing agency to navigate uncertainty and operate within a changing environment. This requires anticipatory and adaptive capabilities to understand system changes, potential disruption and opportunities to re-configure while maintaining critical functions. The use of strategic foresight and using future scenarios can assist to develop adaptive robust strategies to inform decision-making about resources and investments. These insights can inform opportunities to learn, create and evolve system structure as required to support organizational capacity moving into the future.

TIER 3 – LONG TERM

This tier focuss on transformation and reconceptualizing human agency for future investment and fundamental change. Futures thinking and strategic foresight can assist to tap into potentiality and possibility to creatively reimagine and transform models and structures that generate new value, unlocking new opportunities for growth and efficiency. This approach challenges organizations to re-think their vision and examine their assumptions of how they will continue to generate value in a changing environment.

In summary, there is an opportunity for emergency/disaster management to move towards a new paradigm of risk management and building resilience. To overcome resistance to paradigm change requires the ability to expand the current worldview/perspective, and conceive of two opposites paradigms simultaneously – the current paradigm with its anomalies, and a vision of a transformed paradigm that is a revolutionary reorientation. A choice to remain in a state of gridlock and fragility to evolve system structures, is a choice of not adapting in order to align with changes in the outer environment. This adaptation breakdown contributes to the risk of growing turbulence and vulnerability, which may build beyond the ability to recover or bounce back. This can potentially lead to system chaos, where the system is overwhelmed by change and is forced to transform rapidly or face potential system collapse. The first step to change and transformation requires a shift in mindsets to develop the cognitive agility to switch back and forth between "ways of seeing". This allows movement

from reactive thinking and actions, to consciously proactive thinking. The addition of new skills sets provides the capability to identify actions to address system anomalies, and reimagine new potential and possibilities to transform structures to support long-term fundamental solutions. The turning point for change to transform our paradigm, take responsibility to consciously shape, and leadership to build a resilient future is now.

The next steps for this research includes:

- exploring surface uncertainties that are potential tipping point policy issues for emergency management (also known as the "black elephants" in the room) that relate to the power and control dynamics that we carry into our collective future. This includes colonial legacy patterns and human centered issues;

- expanding the perspective with horizon scanning of trends, emerging issues and critical uncertainties that impact emergency management operations, this will assist to generate future scenarios that can facilitate new conversations about the future; and

- deepen understanding of evolving emergency management perspectives about the future through stories of local wisdom, decolonizing futures, indigenous futurism, and those championing resilience to shape and transform the future.

"Our moral responsibility is not to stop the future, but to shape it. To channel our destiny in humane directions and to ease the trauma of transition"

Alvin Toffler

APPENDIX A - Possible Building Blocks for Emergency Management

A brief description of possible building blocks for emergency management are presented below and can potentially serve as a pathway to developing a future skills building framework for the profession.

Empathy & Human Centered Design

Human-centered design is about building a deep empathy with the people you're co-creating with and/or designing solutions for. Empathy is standing with others and connecting to the emotions that underpin an experience [Brown, 2018]. It assists to see a situation from a different perspective, understand how others may experience a situation and to communicate this understanding. Empathy is one of the linchpins of cultures built on connection and trust [Brown, 2018].

Human-centered design using empathy can provide deep insights that can inform opportunities to address pain-points and provide new solutions to create value. Preparedness planning and recovery in emergency management deals with a range of issues such as vulnerabilities, disparities, need for gender-sensitive approaches, and inequalities in preparedness and response policies that can benefit from the insights uncovered through inclusive human-centered approaches. The practice of empathy is at the core of human-centered design to build connection and compassions, key skill-sets for servant leadership capabilities.

Decolonizing Futures

Within settler colonialism, narratives of hierarchical power exist that positions the dominant culture and its stakeholders at the top. Parallels can be drawn between contemporary settler colonialism and the field of practice of emergency management such as military roots, command and control frameworks, values that align with the dominant culture and professional approaches that exhibit colonial patterns [Dicken, Yumagulova, 2017]. In terms of aid and development, "colonization" refers to the idea that Western researchers and practitioners impose their ideas on countries with low resources, without involving people from those places and while controlling key resources such as money [Devex, 2020]. The process of decolonization involves multiple stakeholders, an understanding of colonial legacies as unnatural disasters, structural dependency and outright entanglement in colonial relationships [Moulton, Machado, 2019], procedural vulnerability [Rivera, 2020], dismantling colonial narratives, instilling new ways of thinking, creating new narratives of decolonized futures, and reimagining the distribution of power.

Participatory Futures

Participatory futures refers to a range of approaches for involving citizens in exploring or shaping potential futures. It aims to democratise and encourage long-term thinking, and inform collective actions in the present [Ramos, Sweeney, Peach, Smith, 2019]. Participatory activities are diverse and can involve engaging citizens at the local-regional-national levels. It can be part of a policy-to-strategy process led by government organizations, citizen/community groups or a combination of both, and act to enhance the ability to produce public value in times of uncertainty and support decision-making.

It can be used as a social process to unleash the intelligence of citizens and unlock the assets of communities in creative ways. Participatory futures roles to support decision-making includes: mapping horizons, creating purpose, charting pathways, acting together/collaborative action and testing ideas to generate feedback [Ramos, Sweeney, Peach, Smith, 2019].

Organizational Learning

Learning in organizations means the continuous testing of experience, and the transformation of that experience into knowledge that is accessible to the whole organization, and relevant to its core purpose [Ross et al,. 1994]. The emphasis is on how members within an organization think and interact, with the point of orientation shifting from outward to inward. [Ross et al,. 1994].

Looking inward requires awareness of tacit truths, aspirations and expectations. Examination of mental models and system thinking can assist to identify and change patterns. Changing the way we interact includes organizational structures, as well as patterns between people and processes. Redesigning these structures can benefit from creating a shared vision, systems thinking and team learning. This approach provides an opportunity to become conscious of thinking and interactions, and can be used to address barriers created by expectations, beliefs and habits that are reinforced and never challenged.

Adaptive Capacity

Resilience has been defined as "the degree to which a complex adaptive system is capable of self-organization and can build capacity for learning and adaptation" [Adger et al, 2005], it suggests a more positive and action oriented response to current challenges. Systems with high adaptive capacity have the skills and mechanisms to be able to re-configure without significant changes in crucial functions or declines. This requires the ability for the system to be anticipatory, with a degree of agility and flexibility to be able to cope with changes within the environment. The ability to self-organize is the strongest form of system resilience. A system that can evolve can survive almost any change, by changing itself [Meadows, 2008].

Vulnerability is the exposure and difficulty of individuals, families, communities, and countries in coping with shocks and risks. Vulnerability can be considered as the opposite of adaptive capacity.

Systems Thinking

A system is an interconnected set of elements that is coherently organized to achieve a function or purpose. A system is more than the sum of its parts. It may exhibit adaptive, dynamic, goal-seeking, self-preserving, and sometimes evolutionary behaviour [Meadows, 2008].

Interconnections are the rules of the system. Many of the interconnections in systems operate through the flow of information. Information holds systems together and plays a great role in determining how

they operate [Meadows, 2008]. Missing information flows is also important to understand, as it is the most common cause of system malfunction. A system's function is expressed through the operation of the system, and the purpose is best revealed by the way the system behaves. An information-feedback system is fundamental to how a system operates and runs itself, this mechanism is known as a feedback loop. The understanding of the different types of feedback loops provides the ability to understand a system's pattern and direction of turbulence towards growth, chaos or collapse. This understanding from a holistic perspective provides an opportunity to engage with system leverage points to influence the system's goals towards balance and stability to address vulnerability and support needs. An important skill set in today's turbulent world.

Strategic Foresight

In times of increasingly rapid change, complexity and uncertainty, there is a need to be able to face and prepare for the unexpected. When there is a high degree of uncertainty due to changes within an environment, strategic foresight is a highly valuable and required skill-set. These types of environments, also known as the VUCA (volatility, uncertainty, complexity, ambiguity) operating environment are to an extent 'unknown' environments, and necessitate the cultivation of new mindsets and skill sets to navigate and lead in a changing environment.

Strategic foresight assists to building these anticipatory and adaptive leadership capabilities by:

- expanding perspective using horizon scanning to understanding emerging patterns of change and uncover hidden blind spots of potential risks;
- exploring potential disruption and new possibilities;
- proactively working with a policy forecast of uncertainties by creating future scenarios of potential operational environments that stimulate a strategic conversation to:
    - challenge current mental models and assumptions about the future;
    - create an opportunity to proactively address tipping point policy issues;
    - shift mindsets and unlock new opportunities to invest;
    - articulate a preferred vision for the future; and
    - identify robust adaptive strategies to ensure future operational readiness and align strategic planning and investment efforts to support emerging capabilities and resources. This can provide benefit in both the short and long-term to address system vulnerabilities and build future resilience.

Scenarios used in strategic foresight are different from scenarios used in risk management, which are based on forecasting information and expert knowledge. Scenarios based on data forecasts include probable scenarios (probability/impact) and worst-case scenarios that considers what the most severe outcome or impact could be in a given situation based on current data and assumptions. Both use a risk/threat lens towards the future, which supports development of contingency and confront strategies in times of crisis. Some general limitations of using these type of scenarios include the following:

- limits on ability to work with system complexity leading to potential blind spots;
- assumptions used are based on past experience and may not be challenged;
- the process does not identify and integrate the use of critical uncertainties;
- the approach does not build on existing strengths to uncover growth opportunities for competitive advantage moving into the future; and
- it does not routinely consider the human factor, and the biggest wildcard of how people and society will respond to the situation and crisis.

Ignoring uncertainty can limit the ability to take corrective action in regards to situations that could have been avoided. It can also result in poor policies, missed chances and opportunities, and can lead to inefficient use of resources with adverse consequences.

Anticipatory Governance

Responsible governance requires preparing for the unexpected. This becomes even more critical in times of increasingly rapid and unpredictable change, complexity of change, disruptive emerging issues and critical uncertainty. Cities and communities need to prepare for both threats and opportunities in order to thrive and prosper in the future. Anticipatory governance focuses on preparing for horizons of change, and it requires both anticipatory (foresight) and adaptive leadership capabilities while moving towards a preferred future. These capabilities need to be supported by systems thinking and inter-organizational cooperation across an ecosystem, as well as cultural and institutional shifts that support experimentation to drive learning and impact.

Anticipatory Governance denotes collaborative and participatory processes and systems for exploring, envisioning, direction setting, developing strategy and experimentation for a region. It allows a region, whether city or state, to harness the collective intelligence and wisdom of collaborating organizations and citizens, to deal with strategic risks and leverage emerging opportunities for meeting development goals. It is an approach for "social navigation" – the ability of a society to navigate the complex terrain of social change [Ramos, 2020].

Key resources to support building anticipatory governance include institutional futures, participatory futures, and adaptive organizational capacity, and requires the ability to tap into the following:

- institutional knowledge: creating an inter-organizational system for sharing knowledge on a topic of shared concern, leveraging existing strengths to identify quick wins;
- citizen knowledge: can create the requisite awareness of change that provides agility and new pathways for regional policy, strategy and change efforts; and
- organizational capacity to adapt: creating a bridge between anticipation and experimentation [Ramos, 2020].

Anticipatory governance includes processes that are compatible with future directions in emergency/disaster management that seek to support a whole-of-society approach to reduce risk and build future resilience.

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