SANCTUM **LABO-CRISE**

RESEARCH AND EXCHANGE WORKSHOP

ANTICIPATING TOMMOROW'S CRISIS SITUATIONS AND ADAPTING THE MEANS TO RESPOND TO THEM

Proceedings of the September 28, 2022 seminar
and summary of the 2022 workshops

MINISTÈRE
DE LA TRANSITION
ÉCOLOGIQUE
ET DE LA COHÉSION
DES TERRITOIRES

WORKING DOCUMENT

EU-HYBNET

SANCTUM LABO·CRISE [CRISIS-LAB]

MINISTÈRE DE LA TRANSITION ÉCOLOGIQUE ET DE LA COHÉSION DES TERRITOIRES

Anticipating Future Crisis Situations and Upgrading the Means to Meet Them.

The crises of the last decade prompted us to take an in-depth look at how to identify the newcharacteristics for these crises. In late 2021, when the Covid-19 pandemic began to recede , we felt that this step should no longer be postponed; and this lead to the creation of LABO-CRISE, a workshop integrated into the SANCTUM* project.

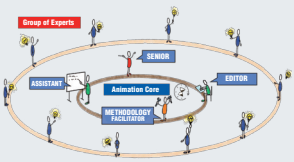
THEMES OF WORK

- Typology of future crises (foresight)
- Overview of crisis rooms in France and abroad
- Making the most of collaborative tools for analysis efficiency of analysis and responsiveness to the situation
- Upgrading the architecture and layout of crisis rooms
- Making the most of digital and innovative AI-based tools and Big Data for decision support
- Paying attention to well- being during the crisis
- Draw inspiration from similar approaches abroad (benchmarking)

MOBILIZING COLLECTIVE INTELLIGENCE

While mastery of complex concepts is fundamental at the individual level, the development of decision-making scenarios requires cross-disciplinary vision at the collective level.

Its efficiency is based first and foremost on know-how and well-being in the workplace.



ANTICIPATION CELL

RENOVATING THE ARCHITECTURE AND LAYOUT OF CRISES ROOMS

The massive introduction of communications media should not hinder the need to stand back and offer an environment that does not appear cluttered.

PEOPLE AND CRISIS-MANAGEMENT

Whatever the times and circumstances, and given the unknown crises of the future yet-to-be, human intervention remains crucial.

TYPOLOGY OF TOMORROW'S CRISES

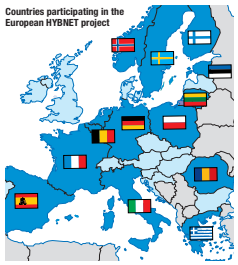
LABO-CRISE is based on the observation that crises have become protean: almost always systemic, they can be sudden and brief or, on the contrary, slow-in-coming and long-lasting. Emergent crises can also result from a hybridization of threats.

USE OF INNOVATIVE TOOLS

Human intervention must be enabled to make the most of digital technology and innovative tools based on AI and Big Data processing to increase the relevance of decisions

Virtual reality system developed by IMT-Mines Albi

Countries participating in the European HYBNET project



PARANGONAGE

LABO-CRISE takes its inspiration from comparable approaches around the world, and particularly in Europe, thanks to funding mechanisms for research projects.

*** SANCTUM: Système d'ANticipation de Crise par Traitement Uchronique Modélisable [Crisis Anticipation System by means of Uchronic Modeling Treatment] -** Project to upgrade crisis management supported by MTECT's SHFDS.

SANCTUM Labo-Crise

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Hôtel de l'Industrie

4 place St-Germain-des-Prés, Paris

Proceedings of the September 28th, 2022 seminar and summary of the 2022 workshops

Paris, June 2023

FOREWORD

This document presents the “proceedings” of the "LABO-CRISE" work group, which was active throughout the year 2022. Their work culminated in a seminar on September 28th, 2022, at the Maison de l'Industrie in Paris, in the presence of two "key speakers": the President of the French Red Cross, Philippe DA COSTA, and Army General (2S) Richard LIZUREY.

The texts presented here reflect the socio-professional — and thus editorial — diversity of their authors, as well as the diversity in their respective approaches to the issues at hand.

Developed within framework of studies and research, they do not bind the government administration.

This document was originally written in French and refers to French organizations and projects. However, it is likely to be of interest to an international audience, and we wanted to present it to the participants of the HYBNET project meeting in Helsinki, September 2023.
The English translation was done under tight time constraints, so we ask for the readers' understanding in case of translation inaccuracies or lack of contextualization.

"In easy times, mechanically organized minds are enough. In times of crisis, you need genius and feeling."

Charles de Gaulle

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Labo-Crise participants *74 - 75*


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LABO·CRISE

GETTING STARTED

Christian DESPRÉS
Head of Research Mission
SHFDS, MTECT

Anne-Marie DUVAL
Research Director
SHFDS, MTECT

Major events such as the Seine floodings, Charlie Hebdo, the Gilets Jaunes or the Covid-19 Pandemic have made the headlines at one point in time but have now become part of our collective unconscious.

In the future, many more events will come to extend this list. Everything can be considered and must be.

This is what LABO-CRISE's mission is all about...

A REALITY THAT COMPELS

In our post-modern world, some events that our collective memory has eclipsed are bound to come back to surface, such as:

- the reactivation of an old virus, previously preserved under the permafrost and released by global warming,
- global food crises: the war in Ukraine and the resulting pressure on resources of all kinds, as well as climatic and political events make this hypothesis more and more likely.

We must also imagine next generation events, such as electromagnetic saturations or the fall of meteorites or spatial objects. In fact, the existence of a grey zone between science fiction and reality must now be taken into consideration.

For all those involved, these events are potentially CRISES. Throughout history, the term "crisis" has crystallized an emotional charge and conveyed notions of "uncertainty", "elusiveness", and ultimately "fear". What face does this term present to analysis today?

TODAY'S CRISES ARE CHARACTERIZED BY THEIR COMPLEXITY

In a world full of interconnected networks, we are led to work on systems with increasingly vast contours, leaving behind a linear logic. With the rise of the cyber age — which is pushing us towards of interwoven sources of danger — we are confronted with the hybridity of threats.

Complexity, hybridity... these are all concepts we can explore further.

CRISIS MANAGEMENT ITSELF IS NOT A NEW SPECIALTY

There is every reason to believe that crisis management is as old as the occurrence of crises themselves. But the present era is more sensitive to events that disrupt it, whether accidental or ill-intentioned, and this has created a need for more effective ways of addressing and responding to them.

A semantic shift has led to the use of the anxiety-inducing term "crisis" to describe a situation that previously required specific efforts and extra resources, but whose exceptional nature was only felt in quantitative terms.

Structural changes are also taking place. Our societies are leaning towards more integrated ways of functioning, and the growing importance of networks of services and infrastructures requires us to develop tools capable of mastering this complexity, letting go of traditional sector-based approaches.

This is the case for tools based on artificial intelligence, big data, virtual reality, quantum computing... It is now time to begin understanding these innovations and to initiate a new age in crisis management through their use.

THE SANCTUM PROJECT AND THE LABO-CRISE

These evolutions led, in the mid-2010s, the *Service du Haut Fonctionnaire de Défense et de Sécurité* (SHFDS) of the Ministry of Ecological Transition, Territorial Cohesion, Energy and the Sea, to develop SANCTUM (*Système d'ANticipation de Crise par Traitement Uchronique Modélisable*), a project aimed at modernizing crisis management, focusing on anticipation and decision-making support.

The importance of such a project was further enhanced by the Covid-19 pandemic crisis. The unprecedented nature and scale of the pandemic, and the need to navigate with the newly emerging requirements and opportunities led to a complete shift in crisis organization. This is for example the case with the rise of teleworking practices.

The LABO-CRISE working group was founded to support and nurture such transitions.

The working group grows from year to year. In 2023, it brings together the contributions of around fifty participants. This group will keep growing with the participation of more and more participants in the coming years, joining not only from France but also from other EU countries and perhaps even beyond.

PARTICIPANTS OF LABO-CRISE COME FROM A WIDE RANGE OF BACKGROUNDS

First and foremost, these are the public authorities: the central and decentralized administrations of the ministries, federated by the *Secretariat Général à la Défense et la Sécurité Nationale* (SGDSN). While all ministries are involved — sometimes in an essential way in the case of sectoral crises or crises affecting specific disciplines — nationwide crises are always systemic in nature, giving rise to consequences that bestow a particular role to the Ministry of the Interior.

Those referred to as "operators" play a key role in assessing, mitigating and repairing the impacts caused by crisis. Operators of crucial importance immediately spring to mind, but they themselves may face significant disruptions if other operators they rely on are paralyzed, creating a chain reaction.

NGOs, although often less visible because of their wide range of experience — either historically or because they regularly operate beyond national borders — are also valuable participants.

On a longer timescale, academic bodies — *Grandes Écoles*, universities, public and private research centres — that allow for the development of conceptual, methodological, scientific and technical, as well as human and social aspects, which underlie the understanding and theoretical and practical advancements of crisis management.

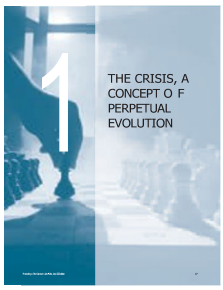
During this initial phase of Labo-Crise, the seminars and workshops have allowed us to explore the new territories of crises and question our future needs.

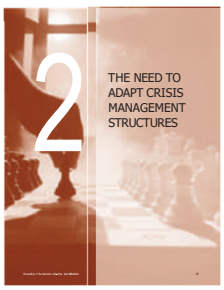
BEFORE EMBARKING ON A NEW PHASE, AN ASSESSMENT OF THE SITUATION WAS NECESSARY

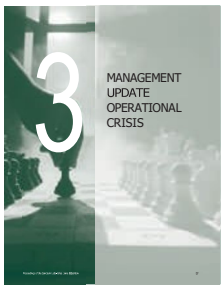
This is the purpose of the proceedings included in this document, which start from the most conceptual level to reach practical level, through experimentation. The content is sectioned as follows:

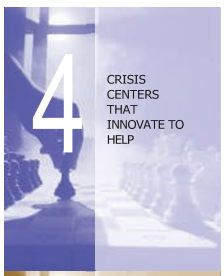
First, we need to grasp the very concept of crisis in a rapidly changing world. **Chapter 1** begins with "Crisis, a concept in perpetual evolution". It identifies the characteristic elements of a crisis, and suggests some of the crises we may face in the future.

Chapter 2 invites us to reflect on "The need for structural adaptations in crisis management". The challenge is to consider the reality of complex and interconnected systems that the crisis will disrupt, by developing systemic analyses and prospective tools.









Chapter 3 takes stock of operational crisis management at selected operators and, as an example, compares European and American viewpoints on power system crisis management.

Thanks to the diversity of Labo-Crise's participants and their concrete involvement in crisis management, **Chapter 4** brings together numerous examples and analyses of "Crisis centres innovating to facilitate decision-making".

Finally, in **Chapter 5**, the credibility of Labo-Crise's work required us to report on the experiments carried out within it, with the aim of testing the complementarity of the two pillars on which crisis management is structurally based: on the one hand, digital and technological tools, and on the other, the quality and efficiency of human organizations, in particular thanks to the use of collective intelligence.

To bring this compilation to life, we chose to precede it with the testimonies of two individuals who, through their roles and personal commitments, have directly experienced of or managed crisis situations. They have kindly agreed to share with us the valuable lessons they have drawn from those experiences. ■

KEY SPEAKER

SPEECH GIVEN ON SEPTEMBER 28TH, 2022

Philippe DA COSTA
Chairman, French
Red Cross (CRf)

SUMMARY

Crises are becoming less and less sectoral and more and more systemic; their effects extend to the whole of society.
This trend will intensify in the future.
The response requires the coordinated participation of all stakeholders: associations, the private sector, the public sector and citizens. The focus is on national resilience.

Today, we find ourselves in a place of reflection and sharing — the *Hôtel de l'Industrie* — which, throughout its long history, has witnessed distinguished researchers, inventors and architects speak.

It is therefore a great honour for me to appear before you.

Today's theme, **"Anticipating tomorrow's crises"**, calls for humility, as foreshadowing and anticipating are both difficult tasks.

If I look at what's been happening to us collectively over the last few years, I see that crisis can arise at any moment and in any place. And it can then give rise to challenges that are themselves unexpected.

It is therefore urgent for our societies to acquire a clear perspective on the unforeseen.

To help us reflect on this theme together, I'd like to start by recalling the historic role of the Red Cross in crises. Then, I would like to share with you some of the lessons we've learned from the remarkable mobilization of its men and women; and finally present some pathways to prepare for the future.

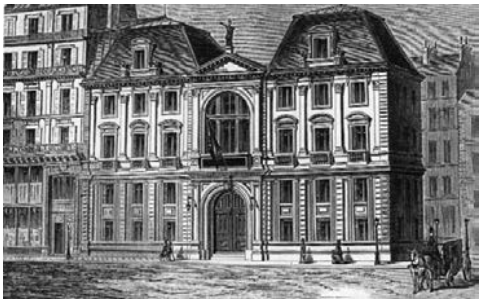
THE FRENCH RED CROSS, A WITNESS AND ACTOR OF MAJOR CRISES

• Since it was founded in 1864, the French Red Cross has been at the forefront of responding to crises, wars and disasters, both in France and abroad, whether during the two world wars, the HIV epidemic or the 2004 tsunami.

• More recently, it has been involved in the health crisis, responding to international situations (Ukrainian and Afghan crises), Cyclone Batsirai on Reunion Island and storm Eunice, both in February 2022, and forest fires in summer 2022.

• All our volunteers (both staff and volunteers) have been mobilized across all regions: this is the strength of a national association with a dense territorial network (1000 volunteer locations, 600 establishments), belonging to the world's largest humanitarian movement.

• At the same time, we carried out a prospective analysis entitled "Anticipating 2030", based on the observation that we are entering a century of ecosystemic crises, characterized by an acceleration of climate change and an increased need for preparedness (2030 strategy).



The Hôtel de l'Industrie, one of Paris's main centres of innovation in the 19th century

THE FRENCH RED CROSS' AMBITION IS TO BE PRESENT BEFORE, DURING AND AFTER CRISES THANKS TO THREE PILLARS

• Prevention and education

Observe, prepare, train and mobilize local solidarities to reduce risks, enabling everyone to protect themselves, others and unleash their potential.

• Protection

Assist people in situations of collective crisis or life disruption and tending to their physical and psychological wounds.

• Recovery through restoring social ties

Empower each individual to bounce back through participation in society.

PREPARING FOR FUTURE CRISES

Preparing for future crises means understanding that we have entered a world of ecosystemic crises, where crisis might become the norm, and everyone will likely be exposed.

This shared exposure and vulnerability necessitates mutual support and solidarity as a survival imperative, rather than just a desirable choice.

At a time when 80% of French people consider that they are either unprepared or ill-prepared for crises and disasters, the French Red Cross has put forward several proposals.

• **Establish a national day of exercises and crisis preparedness** to strengthen risk awareness and promote local solidarity, involving residents, schools, local communities, businesses, public services, associations, healthcare centres, emergency networks, etc. An opportunity for municipalities to assess their response organization, involving associations and all stakeholders.

In this respect, I commend two government initiatives that appear to be heading in the right direction:

• The organization of a "*Tous résilients face aux risques*" (All resilient in the face of risks) day on October 13th, 2022 by the Ministry of Ecological Transition and Territorial Cohesion. The French Red Cross intends to participate fully.

• The creation of a mandatory national day dedicated to major risks and lifesaving techniques, as outlined in the Ministry of the Interior's law proposal. This is a major step forward, which I believe needs to be consolidated and perpetuated.

• **Ensure lifelong access to training in lifesaving behaviours and techniques.** This access should enable 80% of the French population to be trained within 5 years.

• **Develop the dissemination of this training in schools** and encourage its implementation in companies.

• **Recognize these training courses in the "personal training account"** and allocate dedicated credits.

• **Continuously support retirees in life-saving behaviours and gestures.**

The French Ministry of the Interior's law proposal calls for all young people and workers to be trained in first aid within 10 years, with lifelong training to ensure they retain these valuable skills.

This is precisely the kind of initiatives we need to develop:

• **appoint a national coordinator responsible for better crisis preparedness.** (Importance of the interministerial dimension and coordination between the State, civil society and local authorities);

• **establish a common legal framework,** even possibly a law, to enable approved civil protection associations to take on new roles, such as assisting businesses and municipalities in developing business continuity plans and overseeing pre-hospital systems.

On this subject, among the recommendations made by General LIZUREY in his report, there is one that I find particularly interesting: strengthening the involvement of relevant public or private stakeholders in crisis management processes, in particular by involving them more closely in interministerial crisis units and fostering **the emergence of an engaged society**:

• **Facilitate employees' engagement** in companies by allowing them to take part in public works or missions of general interest, as they can already do by volunteering at fire departments.

• **Continue to develop and create new tools** by extending the personal training account to include civic engagement, via vacation and RTT donations, skills sponsorship, civic service and social intrapreneurship.

We need to develop a societal culture of risk management.

TO CONCLUDE

I would like to highlight a remarkable initiative set up by the French Red Cross in the early days of the Ukrainian crisis. Faced with the influx of refugees in train stations, as well as the surge of volunteers and newcomer willing to help, we launched the "*Croix-Rouge Bonjour*" (Red Cross Hello) initiative.

The concept is simple: a website and a telephone platform, available in French, English, Ukrainian or Russian, which serves as a gateway to provide information both for people fleeing Ukraine and the general public willing to contribute their time.

The minimalistic interface offers two options: "I need help" or "I want to help". It's straightforward, effective, and exactly what many people needed.

You'll find all the essential information for those arriving in France (housing, clothing, food aid), plus answers to practical questions about accommodation, transport, emergency services and communication services. For volunteers, the website shows how to turn engagement into concrete actions.

I believe we can draw many lessons from this innovative initiative for future crises, which will be more challenging, more destabilizing and more unpredictable:

• We'll need to coordinate a swift, agile and effective response — *Croix-Rouge Bonjour* was launched in a matter of days and served as a gateway for many people in need.

• Then we'll need citizen mobilization. We witnessed a remarkable surge of solidarity at the start of the Ukrainian crisis. The next step is to channel this energy and direct it towards practical purposes.

• Lastly, we will need to be creative, drawing upon the human ingenuity within us to find new solutions to new problems. *Croix-Rouge Bonjour*, I believe, is a perfect example of this.

Despite all the challenges we collectively face, and I particularly think of the younger generations, I would like to conclude with this quote from Antonio GRAMSCI, who, imprisoned by the Mussolini regime, wrote this powerful message of hope in his prison diary:

"We must to combine the pessimism of the intellect and the optimism of the will".

The Red Cross, today and for the crises to come, will be present, with unwavering optimism, to aid the public.

Thank you. ■

Philippe DA COSTA then handed over to General Richard LIZUREY.

KEY SPEAKER

SPEECH DELIVERED ON SEPTEMBER 28TH, 2022

General Richard LIZUREY
Army General (2S), former head of Gendarmerie, author of a report to the Prime Minister on the health crisis (June 2020)

SUMMARY

Crises are and will remain unpredictable; we need to restore the value of the word "planning": as a tool to prepare services to work together, rather than just an anticipatory document.
The core of our efforts to improve crisis management must focus on collaboration between services and ministries, under the auspices of the Prime Minister, to provide decision makers with the information they need to make informed decisions, and on communicating decisions to the public.
Automated sharing tools that facilitate conflicting exchanges will accompany this approach.

General LIZUREY begins by offering his definition of a crisis, applicable to both collective and individual contexts.

"THERE IS A CRISIS WHEN YOU STEP OUT OF YOUR COMFORT ZONE".

He casts doubt on our ability to anticipate crises: experience is no more than the sum of accumulated errors, and the context is constantly evolving. The only factor that has been central to every crisis, and will remain so in the crises of tomorrow, is the human factor; it is on this factor, the individual, that we must focus our efforts.

At the forefront, particularly during the explosion at the AZF factory in Toulouse in 2001 (at the local level) and during the crisis associated with hurricane IRMA, that struck Saint-Martin and Saint-Barthélemy in 2017 (at the national level), he emphasizes the relative effectiveness of plans in both cases. For AZF, a plan that was activated late, when the situation was practically stabilized; and for IRMA, the existence of multiple plans (each one having its own). It is also important to get accustomed to working without plans. This is not to say that plans are useless, but that their effectiveness lies elsewhere: they primarily serve to prepare services to work together.

In contrast, the General highlights the paramount importance of communication and collaboration between services and the different decision-making levels.

This involves maintaining the communication system (which went down during IRMA), keeping directories up to date, building interministerial collaboration — which he believes currently doesn't exist — and ensuring mutual respect between crisis managers and political decision-makers. Experts must leave the decision-maker room for maneuver, and not impose a solution; decision-makers must rely on crisis managers and trust them.

For the Covid-19 crisis, the General was commissioned by the President of the Republic and the Prime Minister, who gave him complete freedom to analyze the management of the crisis. The main lessons he drew are as follows:

Weakness of interministerial collaboration

There is little information sharing between ministries and services, and the withholding of information is sometimes deliberate.

▶ He advocates the implementation of a shared information system, fed in real time and continuously updated.

Incoherence in the downstream information chain

Conflicting information, changing daily, was given to the public.

▶ He stresses the need to define a single source, such as the *Centre Interministériel de Crise* (CIC) at Beauvau. Local authorities, associations, professionals (pharmacists, etc.) would be invited to join

the CIC to update their understanding of the situation before relaying it to the public, each at their respective level. It is also important that, in the event of media pressure, politicians and crisis managers consult each other and collaborate, so that the former can defer to the latter when the subject is technical.

Excessive judicialization

A minister subjected to a search during a crisis — as was the case during Covid — no longer has the calmness required for crisis management. Under pressure, he fears making mistakes and is reluctant to take risks.

▶ One solution is to work proactively with magistrates. This is what was done to manage the Notre-Dame-des-Landes operation, where public prosecutors were permanently on hand to advise decision-makers.

The problem of leader complacency

The general describes the *"stockholmization*[(1)]*"* that grips the team around their leader. Out of fear of displeasing the leader, everyone ends up endorsing their positions, to the point extent that the leader feels increasingly powerful. From that moment on, *"we're all heading for a crash together*!" he humorously notes.

▶ He stresses the need dissenting voices. If no one wants to play this role, then it must be assigned.

Throughout his speech and in the ensuing exchanges, the General consistently advocated for interministerial collaboration, both at national and territorial level, insisting that national crisis centers and regional governors should be placed under the Prime Minister's authority rather than that of the Ministry of the Interior.

▶ He points to the importance of adequately staffing operational services and shares his concerns about the next crisis to be announced: that of the 2024 Olympics, where delays have already set in...

In conclusion, the General reiterated his fundamental position: to focus on the human factor.

He expressed caution regarding automated decision support systems, in a context of crisis judicialization. In the light of the updated facts, the danger lies in accusing the decision-maker *a posteriori* of not heeding the machine's advice.

▶ On the contrary, he argued for giving full space to human decision-making, not constraining it with an appearance of determinism to the point of precluding any other option, and developing interministerial collaboration. ■

(1) Neologism referring to the "Stockholm syndrome" which chracaterizes the fact that victims tend to side with the hostage-taker.

CRISIS, A CONCEPT OF PERPETUAL EVOLUTION

CRISIS, A CONCEPT OF PERPETUAL EVOLUTION

• WORLD COMPLEXITY AND CRISIS MANAGEMENT

Laurent BIBARD

Professor at ESSEC, Edgar Morin Chair in Complexity

• INTEGRATING THE POLITICAL AND PHILOSOPHICAL DIMENSIONS OF CRISES

Eric BARBAY

Ingénieur des Ponts, des Eaux et Forêts, SHFDS of MTECT

• A LOOK INTO TOMORROW'S CRISES

Magali REGHEZZA-ZITT

Senior Lecturer at the École Normale Supérieure, CERES, and member of the Haut Conseil pour le Climat (High Council for Climate)

• CRISIS MATHEMATICS: THE PRINCIPLE OF LEAST ACTION

Benoît CLOITRE

Amateur mathematician.
Head of department, MTECT SHFDS

Antoine-Tristan MOCILNIKAR

Doctorate in Applied Mathematics. General Mining Engineer. Strategy advisor.
MTECT SHFDS

• PRESENT AND FUTURE CYBER ASPECTS OF CRISIS

Mathieu COUTURIER
Deputy Division Manager. Digital Security Management, Strategy Sub-Directorate, at the French Information Systems Security Agency (ANSSI)

• HYBRID THREATS AND ENERGY

Antoine-Tristan MOCILNIKAR
Doctorate in Applied Mathematics. General Mining Engineer. Strategy advisor.
MTECT SHFDS

• THE CRISES OF TOMORROW: A PROSPECTIVE APPROACH

Olivier PARENT
"Le Comptoir Prospectiviste" company

WORLD COMPLEXITY AND CRISIS MANAGEMENT

Laurent BIBARD
Professor at ESSEC,
holder of the chair of Complexity
"Edgar Morin"

SUMMARY

The complexity of our world has four facets: uncertainty, contradiction, emergence and empowerment. In this same world, human beings aspire to simplicity. Real complexity arises from the tension between complexity and need. simplicity. In crisis management, this must lead us to balance the need to control the situation with an open approach that favours listening and expression.

WE LIVE IN A COMPLEX WORLD

The complexity of our world can be broken down into four key facets: uncertainty, contradiction, emergence and *empowerment*, or a "voice for all".

1. Uncertainty

Uncertainty refers to events that no one could have imagined in advance. In a society fascinated by control, our relationship with uncertainty is generally negative: that which is unimaginable in advance is considered bad. This a priori position is unfounded and unjustifiable: by making upstream judgements about an unknown we haven't yet encountered, we attribute an unfounded quality to it, which may prove to be false when the unknown takes shape. In fact, the unknown may very well refer to a positive wonderment, or actualize itself in an unheard-of encounter. For Hannah ARENDT, in *"Condition of Modern Man"*, it is the unfathomable, and she compares it to children: it can bring the worst, but also the best.

This understanding of uncertainty is crucial in crisis situations. Approaching uncertainty from the angle of control and fear can lead to missed opportunities for action. While models and forecasts are necessary, it's also essential to listen for the unheard-of, and to know how to adjust action to the situation — even to the point of disobeying external injunctions from the authorities if, in specific cases, the terrain demands it (for example, the successful ditching of US Airways flight 1549 in 2009, against the advice of the control tower — see the film "Sully").

2. The contradiction

Today, our need for coherence is so great that contradiction tends to be excluded. However, to avoid controversy is to distort reality, which is made up of contra- dictions and therefore of possible disagreements: two individuals with divergent opinions can be right at the same time. It's imperative to leave room for divergent interpretations, and not to immediately start looking for who's wrong, at the risk of falling into scapegoating and misinterpreting a situation, particularly a crisis.

3. The emergence

A complex world is a world that is not yet visible. Beneath the visible, a reality that we don't know is everywhere and always already underway, without anyone yet being able to see it clearly. This reality in the making is announced by faint signals, which we can intuit or sense.

4. *Empowerment*

The permanent emergence of a new reality (possibly uncertain in the sense mentioned above) can be sensed by anyone. A weak signal doesn't need expertise to be heard, because it's intimately linked to our personal perception of the world.

This modality of complexity underlines the importance of listening to each other, of being attentive to alerts that can come from anyone. To achieve this, we need to create the conditions that will enable everyone to speak out, in the clearest possible communication [*cf. below on the effectiveness of talking about what you know*].

WE EXPRESS THE IRREDUCIBLE AND LEGITIMATE NEED FOR A SIMPLE WORLD

We do, however, need a minimum of evidence and preconception to live. This human need for simplicity is defined in opposition to complexity. It is characterized by:

- control, as a counterpoint to uncertainty,
- coherence, as a counterpoint to contradiction,
- transparency, as a counterpoint to emergence,
- classic hierarchical leadership, as a counterpoint to *empowerment*. Experts have the right to have others follow them, because they have the knowledge. In so doing, they respond to the need for meaning and control in all of us.

REAL COMPLEXITY ARISES FROM THE TENSION BETWEEN THE NEED TO RECOGNIZE COMPLEXITY AND OUR NEED FOR SIMPLICITY

Our need for simplicity should not lead us to avoid the unexpected. It is inevitable and should not be ignored.

ignored, but rather "taken in" and integrated into our quest for meaning.

Real complexity cannot be reduced to the four characteristics described above. It consists in the coexistence of the complexity of the world and our aspiration to simplicity. These two registers are true together. From complexity comes the primordiality of listening to one another, and from simplicity the primordiality of always and everywhere paying attention to our need for coherence.

In crisis management, the challenge is to play both roles successfully, combining a mastery of reality with the ability to listen and adapt.

CONCLUSION

The short term unteaches us how to speak. In the urgency of efficiency, language becomes a code and loses its function of revealing our real relationship.

It's up to us to make ourselves available to complexity, so that language can regain its communicative function, enabling each of us to express what we perceive in the most appropriate way.

This is the prerequisite for giving meaning to our actions, in the crisis unit and elsewhere. ■

EXTENSION ON SPEAKING

To help us live and act effectively in the complexity of reality, we need to change our habits. We too often ignore what works well: when things go well, they go "without saying". As a result, we unlearn to talk about what we know how to do. We urgently need to re-learn and reappropriate this ability to speak out, so that skills, interpretations of reality and best practices can be shared. To achieve this, an excellent method is **feedback** on successes, as well as failures, which should enable a time of exchange during which everyone speaks in simple language but with precision about what they have done. ■

INTEGRATING THE POLITICAL AND PHILOSOPHICAL DIMENSIONS OF CRISES

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MTECT SHFDS

SUMMARY

Crisis management mobilizes technical resources, but the crisis itself is a political notion. It involves institutions whose effectiveness is put to the test, and a population driven by collective affects. A philosopher like SPINOZA is a very interesting way of thinking about this situation. Starting with the Political Treatise and the Ethics, we show how it is possible to build a model to support dialogue between all the stakeholders in the crisis, with a view to strengthening our democracy.

Often, crisis is accompanied by the collapse of the most sophisticated systems, and the need to rebuild on deeper, older foundations.
Our lives are increasingly dependent on machines whose rhythms we must respect. The crisis brings us back to the dialogue between popular movements and institutions.

Some of the great names in philosophy have sought to think about these situations, they've pre-conceded us and launched their ideas like bottles into the sea. What can we do with them?

In this article, we aim to break new ground in the world of crisis management.
First of all, let's consider that crisis is first and foremost a political notion, which characterizes a risk of destabilization in our human organizations.
From there, we can draw on the reflections of exceptional thinkers who have worked on the essential mechanisms that govern the way our societies function.

SPINOZA is a particularly interesting case in point: in his study of the Human Being (EH), he sought to identify eternal laws, which we should therefore be able to extend today, by cleansing them of anything current in his writings.

THE RESOURCES OF SPINOZA'S WORK

We can draw the following conclusions from two of SPINOZA's major works.

1. A realistic anthropology based on affects.

In his main work, "*Ethics*", written using the formalism of mathematics, SPINOZA explains that the human being is not free, but subject to the passions, whose mechanics he describes in detail and the way they enslave him; he also shows that he can free himself from them and increase his power (to act, to think) by accompanying and understanding his own functioning and that of his environment. By becoming active in this way, EH experiences joy.

SPINOZA aims to describe the real HE, who is neither the reasonable citizen of the Enlightenment, nor the *homo economicus* of economic models, but a being inevitably habited by passions and by the desire to appropriate his power, or desire for joy.

2. A state model based on its anthropology.

SPINOZA wrote the "*Political Treatise*" (an unfinished work) during the turbulent period of the Dutch republic, in order to determine the conditions for state stability, whatever the regime in place. He shows that what makes and breaks the "social contract" is the driving and shifting power of collective passions (fear, dread, indignation).

Baruch SPINOZA (1632, 1677) is a Dutch philosopher who devised an ethic and principles of government based on the mastery of the human being. affects and the development of reason.

In this model, we can see institutions as dikes regulating the fluid power of affects. Stability is a dynamic notion: it requires a balance of power, and must encourage the emergence of political solutions in line with the human desire for liberation, i.e. towards an increase in the power of the state and of individuals; we refer to this as a growth orientation.

3. A possible model for crises.

Let's start with a model of a state that satisfies the dynamic equilibrium conditions set out in paragraph 2, i.e. an institutional scheme that is not perfectly balanced, as this does not exist in reality, but whose instability is permeated by a democratic impulse that steers it towards human growth.

Returning to our hydraulic analogy, we can interpret crises as situations where there is a risk of imbalance in the model; these are situations where affective power becomes turbulent and difficult to contain by the institutions in place, in other words, where popular anger or fear leads to a risk of socio-political disorder or a drift towards a securitarian regime that abandons our values.

When we let the balance of power play out within living institutions that listen to the people, the regime remains stable, and the rise in power of the passions can become an opportunity to move our institutions forward.

HOW CAN SUCH CONSIDERATIONS BE APPLIED TO REAL-LIFE CRISIS MANAGEMENT?

By looking at our institutions through the prism of SPINOZA's work, **we can begin to design a state model based on collective passions.**

- On the one hand, we need to clarify the relationship between institutions and the body politic (according to our constitution).

- On the other hand, we can postulate that any significant failure of institutions (operators, ministries...) — as we observe during crises — favours an increase in passions; for example, the alteration of an essential public service, or the feeling that a national assembly is not representative of citizens' concerns, will lead to popular discontent [(1)].

In order to explain certain passional overflows, it will also be necessary to question the needs that are not met by current institutions.

Adjusting the model's parameters means using it during events.

Its designers and users need to be "at the centre of the arena", in tune with popular demonstrations and keen to capture their true expression.

(1) I proposed the outline of such a model in an article entitled: *"Institutional balance and the interplay of affects in a crisis management model"*, available at: https ://hal.science/hal-03435417v1

They guide and accompany the dialogue between the stakeholders in the crisis; they facilitate the matching of institutions, to be re-established or developed in a spirit of systemic cohesion, with the output of institutions and the aspirations of citizens. It is important for the nation's components to be able to globally appropriate the institutional framework, seeing in it prospects for opening up to the future, so as to break out of the passional confinement of the crisis.

Research into a model of this type requires the collaboration of a wide range of stakeholders: crisis managers, philosophers, jurists (constitutional law), sociologists and politicians in the field. The socio-political sensitivity and empathy of crisis managers feed it: with a better understanding of EH and its environment, they are increasingly receptive, and this change is a condition for improving the model and the institutions themselves.

In fact, the model is "anthropo-numerical", and its ever-recurrent conception is in itself an act of personal and collective growth.

ETHICS AND CRISIS MANAGEMENT

This approach seems to us to be a very interesting one to push forward in the field of crisis management, for the following reasons:

- **The model is located at the right level of representation, which is that of all institutions (ministries, operators, etc.) in contact with the population.**

The Covid-19 crisis showed the extent to which the disruption of one sector of activity affected other sectors. A major flood situation, involving evacuation of the population, cannot be dealt with by a hydro-geo-meteorological model; it is important to anticipate disorders in the fields of education, health, etc., and regular revisions of priorities between and within these different fields.

We need a socio-political model that articulates sectoral models; crisis situations that seem localized will be thought through without losing sight of this systemic environment.

• **For decision-makers, the ultimate indicators of crisis are popular passions associated with subjective perceptions of the situation, and these are the foundations of our model.**

Our usual indicators describe the effects of the crisis: the number of victims, the number of demonstrators on the Champs-Élysées, the number of trains at a standstill, the number of schools closed... But for the decision-maker, how to arbitrate between all these "dysfunctions" when the situation becomes complex?

The problem of the heterogeneity of indicators can be solved by returning to their common destabilizing potential, i.e., the passionate, living power that underlies them and spreads throughout the population.

These elements deserve to be shared: current research, focuses on a characterization of potentially destabilizing popular movements (Gilets Jaunes, all movements born of social networks) by passions and their power to contagion on a larger scale; Pierre ROSENVALLON, in his book "*Les Épreuves de la Vie*", suggests setting up observatories of affects and the demands they can carry.

• ***Last but not least*, SPINOZA's approach is deterministic and lends itself to a form of modelling,** provided, as we have seen, that it is conceived from "the dedans de soi", while retaining confidence in the affective dynamics that are expressed, particularly during crises, because the model finds its regulation in the reciprocal expression of the actors.

The heart of the model is not artificial intelligence, but a human ethic to be developed. ■

A LOOK INTO TOMORROW'S CRISES

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SUMMARY

New crises can be the result of sudden shocks or diffuse stress; their effects are systemic, extending over space and time, and the climate of uncertainty that accompanies them feeds the media and public debate. They can no longer be confined to one sector of activity; they affect numerous stakeholders and require cross-functional working. Crisis management systems must adapt, otherwise their vulnerability will form the breeding ground for future crises.

THE QUESTION OF THE EMERGENCE OF NEW CRISES HAS BEEN REVISITED SINCE COVID THROUGH:

- the appropriation of the subject by the media and the general public, who have made the "crisis" the subject of public debate,
- the emergence of a principle of uncertainty which means that a crisis can no longer be managed as before, the same principle of uncertainty which gave rise to the notion of resilience (in the social sciences).

NEW CRISES CAN BE THOUGHT OF IN TWO WAYS

- **As mega shocks**

Global shocks with mass casualty events (e.g. nuclear wars, earthquakes, volcanic eruptions, etc.),

- **As more diffuse stressors**

These are "systemic crises" or "crises outside the framework", such as the Covid pandemic. These crises are multifaceted and affect all sectors and territories.

An "out-of-the-box" crisis goes beyond the usual framework of crisis management doctrines. It will put pressure (in crisis) on existing crisis management systems and organizations. It highlights the vulnerability of the crisis management system.

NEW CRISES CAN HAVE THREE CHARACTERISTICS

- The timing of a crisis does not necessarily correspond to the timing of hazards, given that 2 types of hazards can be distinguished: sudden shocks and chronic stresses with domino effects (droughts, pollution, etc.),

• a mix (in emergency situations) of civil security and homeland security issues, with confusion in the roles of those involved, and where crisis managers may themselves be victims of the crisis,

• a series of domino effects, which means that damage is taking on different forms and that crisis managers must work across the board, in close collaboration with a growing number of local partners.

However, during Covid, crisis managers tended to close in on themselves and isolate themselves.

THE NEW CRISES ALSO HAVE FOUR SPATIO-TEMPORAL CHARACTERISTICS

• **ubiquity:** distant territories are hit at the same time, with a significant disjuncture between the initial point of impact of the hazard and the points in crisis. This may be due to the nature of the hazard (diffuse pollution-type hazards), but also to interconnection between territories, exchange logics and domino effects,

• **shifting** effects in time and space with resurgences,

• **non-linearity,** with a set of overlapping phases,

• **singularity,** where decisions are taken blindly, without being able to benefit of past examples.

THREE KEY MESSAGES

• **A crisis doesn't trigger anything:** it produces and grows out of existing fragilities/vulnerabilities, including crisis management systems,

• **A crisis is never inevitable**, but damage due to it is mitigable, even avoidable,

• **A crisis can lead to resilience by working on:**

- immediate adaptation with a reactive response that can be anticipated and prepared,
- incremental adaptation which, through necessary adjustments, will lead to an adaptation of the resources to which we have access,
- structural adaptations through ecological transition. ■

CRISIS MATHEMATICS: THE PRINCIPLE OF LEAST ACTION

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SUMMARY

Alongside the use of philosophy, the long-term vision of "tomorrow's crisis management" should be based first and foremost on fundamental science. The search for in-depth understanding precedes the search for operational efficiency.

The principle of least action or theory of least action is a physical concept which states that a system evolves in such a way as to minimize a certain quantity called action.

This principle can be used, for example, to describe the behaviour of matter and light in various physical situations.

The use of the mathematical theory of least action can be particularly relevant in crisis situations, where the factors of time, uncertainty and complexity play a crucial role. Each crisis has its own characteristics and complexities. The application of least action theory needs to be adapted to the specific context of each situation, taking into account available data, relevant models and particular constraints.

This is the case with natural disaster management.

When a natural disaster occurs, such as a hurricane, earthquake or flood, the theory of least action can help anticipate the trajectory of the catastrophe and take appropriate preventive measures. By analysing meteorological, geophysical and oceanographic models, it is possible to determine likely trajectories and plan evacuations, resource allocation and mitigation measures. It can also be applied to public health crises. In the case of epidemics or pandemics, the theory of least action can be used to applied to model the spread of disease and to determine optimal strategies for prevention, control and treatment. Using mathematical models based on the principles of least action, researchers and decision-makers can assess the effectiveness of different interventions, such as social distancing, vaccination campaigns or containment measures.

The same applies to emergency response planning.

In the event of an emergency, such as an industrial accident, a major fire or an act of terrorism, the theory of least action can be used to optimize responses and interventions. By analysing time constraints, available resources and specific objectives, it is possible to determine priority actions that minimize damage, save lives and reduce negative consequences.

It's also conceivable that economic and financial crises could also be treated in this way.

Least action theory can also be applied to the management of economic and financial crises. By analysing economic indicators, market models and the interactions between the various economic stakeholders, it is possible to anticipate financial crises, put in appropriate regulatory policies and minimize economic disruption.

"When there is a change in nature, the amount of action required for this change is as small as possible."

Maupertuis

Pierre-Louis De Maupertuis (1698-1759) can be seen as a pioneer in crisis management with the publication in 1744 of his memoirs on "the Accordance of different laws of nature that had previously seemed incompatible", which describes the "principle of least action".

A natural question also arises in social science and decision theory in the context of crisis management. Can it be applied to human actions in crisis management?

This would imply that humans always act in such a way as to optimize some criterion, be it their well-being, safety, profit or morality.

Yet it is clear that human actions are often influenced by irrational, emotional, social or cultural factors, which cannot be reduced to a simple minimisation of action. What's more, crisis management often involves ethical dilemmas, uncertainties and risks, making it difficult to define optimal action. At first glance, therefore, it would appear that the principle of least action does not apply to human actions, at least not universally and absolutely.

It can, however, be used as a heuristic tool to analyse certain aspects of human behaviour, assuming that they obey a bounded rationality or probabilistic logic. This could prove useful in crisis anticipation, where we have no choice but to make such suppositions.

Let's try to model a crisis management actor, the one who has to take stock of the situation at a given moment T.

A situation report is a document that summarizes the information available on a given situation, identifying causes, consequences, stakeholders, issues and possible scenarios. It enables the crisis management decision-maker to make appropriate and effective decisions. To draw up a situation report, the decision-maker must collect, process and analyse data from a variety of, sometimes contradictory, sources. They must also cope with temporal, spatial and organizational constraints. How can we apply the principle of least action to this process?

It can be assumed that the actor is seeking to halfway mobilize the action required to produce a satisfactory situation, i.e., one that meets the needs and expectations of the recipient, in this case often the crisis manager. Action can be measured by the time, energy or resources mobilized by the actor. An action function can then be defined, depending on the parameters of the process, such as the number and quality of information sources, the level of detail and reliability of data, the degree of uncertainty and ambiguity of situations, the number and complexity of scenarios envisaged, and so on. The principle of least action implies that the stakeholder chooses the parameter values that render the action function minimal.

For example, if the actor has little time to establish the situation (which is often the case!), he may choose to reduce the number or quality of sources of information, or to simplify the possible scenarios. If, on the other hand, he has more time, he may choose to increase the number or quality of information sources, or to make the possible scenarios more complex. The optimal choice depends on the actor's context and objectives.

This shows that the principle of least action can be used to model the behaviour of a crisis management actor within a simplified, idealized framework.

It identifies the factors that influence decisions and actions. It does not claim to reflect the complex and dynamic reality of crisis situations, nor the psychological and social aspects that come into play. Rather, it is a theoretical tool that can help to understand and improve professional practices in crisis management.

These are just ideas that deserve further development and testing. But having seen how powerful the theory of least action has been in solving some of the most complex physical and mathematical problems over the last 200 years, it would be a pity not to take this theory into account when attempting to mathematize the crisis.

Since Georges-Yves KERVERN and his risk analysis, there has been a French culture of maintaining this mathematization crisis. ■

Georges-Yves KERVERN (1935-2008) is a French mining engineer, industrialist and researcher. His name remains associated with "cindyniques" — the science of risks — which largely inspired the SANCTUM project.

PRESENT AND FUTURE CYBER ASPECTS OF CRISIS

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SUMMARY

Due to the growing interdependence between organizations and digital systems, cyberattacks can affect entities on a global scale, with significant impacts both nationally and across borders. A race of speed is underway between cybercriminals, who are gaining in maturity, and their potential targets, anxious to prevent and parry attacks. ANSSI presents its response: national crisis governance and guides for public and private stakeholders.

CHARACTERISTICS OF CYBER THREATS

• A daily threat

Cyberattacks target all sectors of activity and all stakeholders. Increasingly, SMEs and local authorities are being targeted by cyberattacks, often with catastrophic consequences for the organization affected.

• Mature, well-equipped stakeholders

Cybercriminal groups have become professionalized, with coordinated actions and substantial resources. In some cases, these groups can even draw on state resources. The case of Costa Rica is emblematic in this respect, as numerous public services had to be shut down due to multiple cyberattacks on ministries.

Espionage and sabotage should not be underestimated either. This type of cyber-attack, often carried out by governments because it requires considerable resources, is less widely publicized but nonetheless very present.

• Systemic impacts due to the interdependence of digital and physical systems

The widespread, but poorly controlled, use of digital technology is creating vulnerabilities that can be exploited, with increasing dependence on the digital supply chain (digital tools provided by third parties) or on the historical supply chain, which is now increasingly digitalized.

One example is the paralysis of gasoline distribution on the West Coast of the United States in 2021. The attack did not directly affect industrial systems, but rather the billing systems. The interdependence of systems between the management, production and distribution layers brought production to a standstill.

THE EFFECTS OF CYBER-ATTACKS

Cyberattacks can have many impacts on organizations.

- Blocking a service or system
- Spying
- Destruction of information systems
- Data exfiltration and publication
- Data compromise leading to a loss of trust between stakeholders
- Ransomware

These effects can be just as devastating in the short term (blockage) as in the long term (loss of confidence among partners or the public). The diversity of impacts, and the systemic nature of the interdependence of stakeholders, lead us to consider major cyberattacks as "extreme shocks", requiring the implementation of specific preparation and response systems.

THE CHALLENGES OF PREPARATION; MEDIA COVERAGE AND CROSS-BORDER DIMENSIONS

Public and private stakeholders are making progress in the fight against cyber-attacks, particularly ransomware. This progress has been made visible through inter-ministerial exercises, which train all ministerial departments in the proper management of a large-scale cyber crisis. That said, cybercriminals are also becoming more professional, and are increasingly targeting the most vulnerable organizations: SMEs and local authorities.

The effects of a cyber crisis can quickly become visible and be relayed by the cyber eco-system, which is very active on the Internet, and by journalists specializing in the subject. In this case, the resulting media coverage can create a crisis within a crisis. It is therefore essential to prepare your crisis communication properly, so that you can master it on the big day. To achieve this, cyber crisis management and communication skills need to be coordinated.

The potentially international nature of a cyberattack needs to be taken into account, both from a geopolitical and diplomatic point of view, but also from an operational point of view, where the shutdown of certain services in one country can have an impact in other countries. However, the European dimension is proving to be an effective response, thanks to collaboration and information sharing between organizations and between states.

A "cyber" crisis is "just" a cyber crisis, with operational impacts. The management of a crisis of this type must therefore be consistent with the management of impacts, while keeping in mind the specific features that make them atypical crises.

SPECIFIC CYBER CRISIS TOOLS FOR CRISIS UNITS

Cyber crisis management requires specific tools to complement standard crisis management tools:

• **IS mapping,** including interdependencies with partners. This information, generally known to CIOs, must be passed on to the crisis unit to identify the potential impact of the attack and its consequences on the ecosystem.

• **The list of major applications and critical services to be prioritized in the event of a crisis.** This information can generally be found in BCPs.

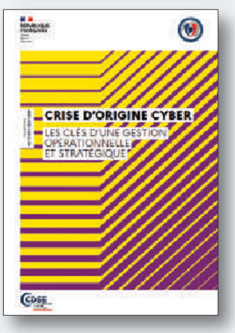
• **Secure, resilient communication tools.** There is a risk that these tools may be compromised by attacks that could even go so far as to spy on the exchanges of crisis team members.

• **Improving the** cyber **capabilities** of crisis cells is now a major challenge, to facilitate synthesis, better understand interdependencies and facilitate decision-making in light of the impact of certain decisions (shutting down a system or not, for example).

ANSSI CRISIS MANAGEMENT

ANSSI is the authority in charge of cyber crisis management in France. As such, the system in place enables it to play a full role in informing decisions with operators and authorities, and to coordinate with all stakeholders concerned:

• the operational level, run by CERT-FR (formerly COSSI, Centre Opérationnel des Systèmes de Sécurité de l'Information);
• the strategic level, led by the ANSSI Directorate;
• a contribution to sectoral crisis plans;
• a contribution to the Cellule Interministériel de Crise (CIC) to shed light on cyber elements;
• a contribution at European level, through participation in existing cooperation networks: *CSIRT-Network*, *Computer Security Incident Response Team Network* and *EU-CyCLONe*, *The European cyber crisis liaison organisation network*. ■



ANSSI guides

-

"Anticipating and managing cyber crisis communication"

-

"Organizing cyber crisis management"

-

"Cyber crisis: the keys to operational and strategic management"

Agence nationale de la sécurité des systèmes d'information (ssi.gouv.fr).

HYBRID THREATS AND ENERGY

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SUMMARY

Hybrid threats are threats that fall outside conventional classifications: they are large-scale, but not warlike; they are discretionary in nature and do not have the same impact on the environment. are not part of probabilistic risk analysis, their manifestation is systemic. Network infrastructures (such as energy, telecommunications and transport) are particularly concerned. MTECT's SHFDS is working on this topic within the EU-Hybnet project.

In terms of consequences, hybrid threats are characterized by the fact that they do not progress beyond the stage of war. Hybrid threats are characterized by the fact that, in terms of consequences, they do not progress beyond the stage of war. But the definition of this concept depends on the author. However, this issue is central: the fact that we are not in a war stricto sensu raises many questions. The situation that preceded the war in Ukraine is typical.

For the French public authorities, hybridity means "hybrid strategy": *"The use of an integrated and deliberately ambiguous combination by a state or non-state stakeholder..."*.

This is a far cry from the military declaration of war, which sends the enemy into a tizzy. These old concepts have been revived with the recent name of "hybrid warfare", a concept that has also acquired a dynamic linked to our modernity and the rise of digital technology.

HYBRID THREATS INTEGRATE EVERYTHING

Beyond the (unlikely) definitions, it's a concept that integrates systemics, including in the response. This threat also completely changes risk analysis, since we're not dealing with a classic probabilistic risk, but with a discretionary action.

Since 2016, the concept has become part of NATO's framework and its "orality". Hybrid threats are now part of the register of attacks and elements to be analysed. There is now a conceptual framework that enables the European Union to organize decisions in this field.

MTECT is a partner in the European expert network EU-HYBNET, which focuses on the analysis of hybrid threats, with the JRC, the European Center of Excellence on Hybrid Threats. Labo-Crise participants are warmly invited to join this expanding pan-European network.

ENERGY SECTOR

This specific field includes numerous angles of entanglement that are likely to be exposed to hybrid threats. These include:

- First of all, energy concerns all sectors. This interdependence affects everyone. And the game of hybrid threats is to attack everything that's interconnected.
- If energy is central to a nation's survival, it is more specifically a prerequisite for communications and transport networks, as well as for the energy supply of the national defence system.
- The question of supply, which is highly exposed to hybrid threats in terms of energy prices, is also worth exploring.
- Last but not least, there's another link with energy: the poly-risk system, which is very difficult for insurers to take into account (see Cécile WENDLING's article below).

It is in response to these challenges that SHFDS, through the work of the Labo-Crise, has put on the agenda the study of hybrid threats under various aspects: preparation, planification, operational watch, R&D, crisis management, economic security... ■

THE CRISES OF TOMORROW: A PROSPECTIVE APPROACH

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SUMMARY

The text is a reflection on the nature of foresight in our "VUCA: volatile - uncertain - complex - ambiguous (1)" world. It's about being realistic - responding to the indeterminacy of the future with several scenarios - and including the ethical dimension: preserving the possibility of action for subsequent generations; but also strengthening our resilience to prepare for the uncertain - complex. To consider controlling the future under the deterministic assumption would be inadequate.

Beyond its work, the question posed by Labo-Crise — "Anticipating tomorrow crises and adapting the means of responding to them" — is tantamount to questioning the very meaning of a discipline, of an intellectual approach. It's all about prospective.

Whether we're talking about the Anglo-Saxon school of foresight — operational, serving the development of a company or an influence — or its European counterpart conceived by Gaston BERGER to build a desirable social future, we're interested in the future in order to build it desirable from the point of view of the challenges of the present.

Didn't the French father of foresight say: *"Tomorrow is less to be discovered than to be invented"?* For the record, this understanding and use of foresight goes back to the years following the end of the Second World War.

As the decades have passed, the practice of foresight has given rise to new orientations. One of these is supported by UNESCO and is called *Future* Literacies.

This anglicism refers to the set of skills that individuals and organizations need to acquire in order to remain agile, efficient, resilient... in the face of a reality that is more complex and unpredictable than ever.

This focus on skills that could prove useful in the future gives meaning to the acronym VUCA, which is often applied to today's world, in an understanding that must now link present and future: volatile, *uncertain*, complex and ambiguous.

This acronym allows us to grasp a reality that we humans find hard to admit: the world is non-deterministic. It obeys the rules of chaos, not in the common sense of disorder, but in the more interesting sense of the absence of determinism.

In his time, NEWTON, a great determinist before the Eternal — but who could blame the man who gave mankind its first mathematical laws describing the observable? — came up against the textbook case of a body that refused to remain within the equations of universal gravity, even though these worked so well on the scale of the solar system. The refractory body was the Moon, which systematically left the calculation determinism after a while...

Two things eluded NEWTON and its successors. The first was the impossibility of measuring the initial conditions of the Earth-Moon pair with absolute precision, and the second was the invisible set of tiny but real gravitational influences to which the Moon was subjected by the Sun and the giant planets of the Solar System... This is known as the N-body problem, with N greater than 2 (it wasn't until Raymond POINCARÉ and his chaos mathematics that the Moon was brought back to its senses...).

Based on this analogy, we understand that it's pointless to predict the future: no human model is capable of grasping the infinite complexity of reality — the initial conditions — or the influences stemming from this complex, which constantly modify reality beyond all perception.

(1) *VUCA: Volatility, Uncertainty, Complexity and Ambiguity*

SO IS FORESIGHT A FUTILE EXERCISE?

If it's a question of building the future from the present, then the answer must be: yes! To the above logical demonstration, we must add an ethical dimension that Riel MILLER, former director of UNESCO's Future Literacies Laboratory, summed up with the scathing phrase: *"The present doesn't have to colonize the future, but it does have to prepare for it!*

A notion that, in his own time (1979), Hans Jonas expressed in the face of the challenges of the future as the contemporary need to conceive a new ethic that includes unborn future generations, whether we're talking about humans or any other form of life. Thus, we could say that, while ensuring the well-being of the living in the present, human actions must not hinder — obviate — the freedom to be and to act of future generations...

The first is to switch from the singular to the plural when talking about the future, a semantic nuance that includes indeterminacy. The second is to accept — to understand — that every act has consequences. Narrating the future then shapes the "action, reaction" dynamic.

Finally, the third reminds us that it's up to the present to prepare for the inevitability of an uncertain, complex and ambiguous future. So, once and for all, mankind must admit that whatever actions the present undertakes, the future will never be — even remotely — fixed, certain, simple or distinct!

This being the case, it would appear that the Labo-Crise approach, formalized in the phrase *"Anticipating tomorrow's crises and adapting the means of responding to them", is* in line with the need for the present to prepare for the future.

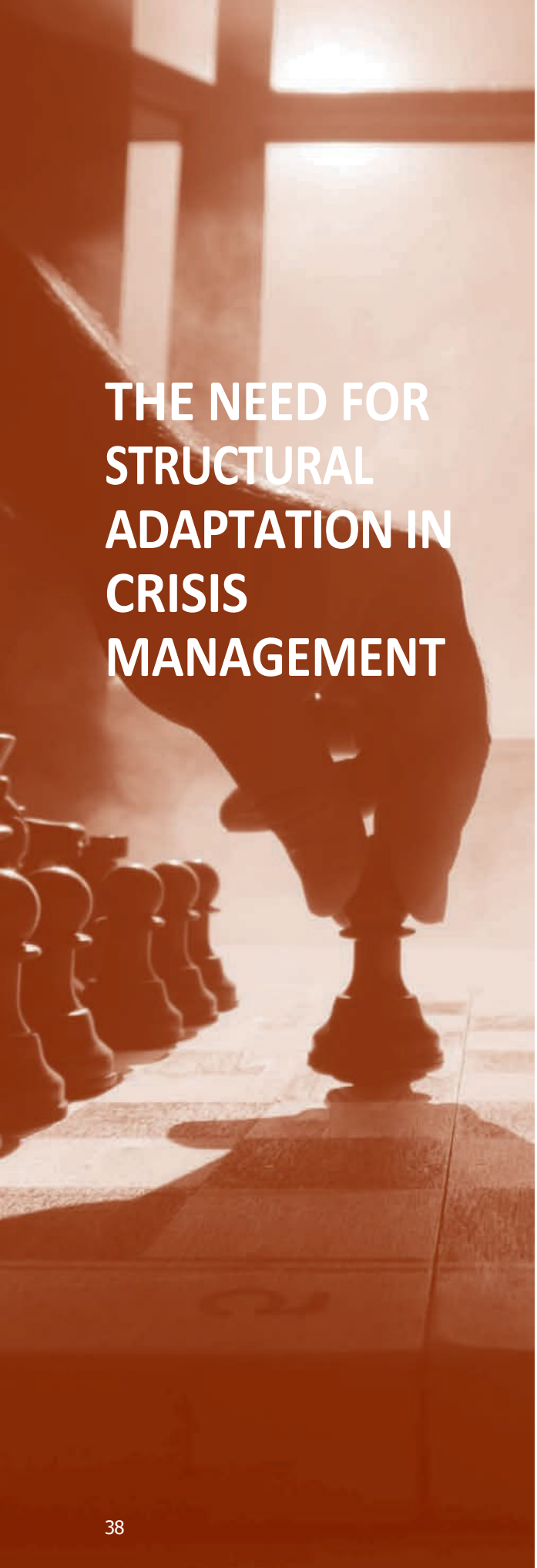
Through rigorously thought exercises, Labo-Crise is committed to exploring *Futurae Terrae Incognitae* to find the clues — the weak signals — that can become future literacy recommendations for developing the means to respond to tomorrow's crises, whatever form they may take.

The opposite — attempting to control the future — could be equated with a negligence of responsibility for the present, or even selfishness, which is what science fiction essayist Ariel KYROU expresses when he says: *"my desirable future, my utopia can be a dystopia for someone else"!*

■

2

THE NEED FOR STRUCTURAL ADAPTATION IN CRISIS MANAGEMENT



THE NEED FOR STRUCTURAL ADAPTATION IN CRISIS MANAGEMENT

• REINTEGRATING CRISIS MANAGEMENT INTO SOCIAL LIFE

Philippe CLERC
Chairman of the Academy of Economic Intelligence

• SENDAÏ: A DYNAMIC INTERNATIONAL FRAMEWORK TO PREVENT THE CRISES OF TOMORROW

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• TOWARDS AN OVERHAUL OF NATIONAL SECURITY PLANNING

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Jean-Charles COSTE General Secretariat for Defence and National Security (SGDSN)

• THE NEED FOR A SYSTEMIC APPROACH TO ANTICIPATE TODAY AND TOMORROW'S CRISES

Louis DELANNOY
STEEP team at INRIA, Grenoble-Alpes University

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• TOOLS TO ANTICIPATE TOMORROW'S RISKS

Cécile WENDLING
Director of Security Strategy,
of Threat Anticipation and Research at AXA

• INTERACTIONS BETWEEN SECTORS: THE NEED FOR CONSISTENCY AND PROSPECTIVE MODELLING

Maxime EFOUI-HESS
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Baptiste ANDRIEU
Doctoral student

The Shift Project **Association**.

• STRENGTHENING DIALOGUE BETWEEN RESEARCHERS AND PRACTITIONERS AT EUROPEAN LEVEL

Philippe QUEVAUVILLER
European Commission (DG HOME Affairs)

REINTEGRATING CRISIS MANAGEMENT INTO SOCIAL LIFE

Philippe CLERC
Chairman of the Academy of Economic Intelligence (1)

SUMMARY

Today, crises are managed at the prefecture level with a view to control, using a top-down approach; the limitations of this approach are due in particular to the compartmentalisation between the stakeholders. In line with the thinking on global security, it is proposed to rely more on the (collective) intelligence of territories, by developing citizen resilience rooted in local communities, with networking of all the stakeholders.

This contribution follows on from the work undertaken by the Ministry of Ecological Transition with the *Alters* think-tank in 2018 at the *Assises de la sécurité globale des territoires.*

These events gave us the opportunity to pursue our thinking on global security by examining the reality of disaster intelligence in the sense of situational awareness. It seemed to us that this approach was lacking not only among the people living in areas subjected to lightning and destructive shocks, but also among the decision-makers responsible for crisis management and recovery.

In this vein, this contribution to the theme of "Anticipating tomorrow's crisis situations and adapting the means of responding to them" proposes a way forward: "re-embedding" crisis management in social life.

RETHINKING? MOVING AHEAD? SHIFTING THE PARADIGM?

Rethinking crisis management, going beyond what already exists, changing the paradigm (2). In fact, we are faced with a lack of risk assessment in a crisis management approach that needs to be overcome. Crises and disasters are seen here as a prism through which to view our conception of crisis and crisis management.

Various perspectives highlight the limits — *"maladjustment"?* — the failings or weaknesses of the prevention, protection and *"recovery"* (3) systems. It is not a question of *"decreeing the end of crisis management"*.

The conventional management systems currently in place remain very useful as a buffer against crises and disasters. The RetEx approaches piloted by the prefects are exemplary. The tools deployed therefore appear to be appropriate and the teams competent.

However, these systems need to be re-examined and revisited. Three weaknesses have stood out over the years, which could well develop into failures.

• **First of all,** organizational intelligence flaws, such as compartmentalization and silos in ministerial departments or local authorities, are all organizational flaws.

They give rise to "cognitive pathologies", blinding the situational intelligence at the heart of crises and, of course, disasters. They prevent any consolidation of information, any mapping that would lead to a hierarchization of risks and a more precise orientation of action.

(1) Philippe CLERC is also an expert advisor for Studies and Foresight at CCI France. He is speaking here on behalf of the Académie de l'intelligence économique.
(2) According to Thomas Kuhn, a paradigm shift occurs when a body of knowledge accepted by the scientific community at a given time is overturned by anomalies, or when a new theory or model is proposed.
(3) Philippe DA COSTA, President of the Red Cross, used the term "resilience" at the Sanctum LABO-CRISE seminar on the 28th of September 2022.

NaTech accidents" (contraction between "This concept, which was invented in the 1990s [4], illustrates a cognitive pathology in crisis management. According to Franck GUARNIERI (Director of Research at the CRC, Centre de Recherche sur les Risques et les Crises), it has slipped under the radar of publications. The aim is to understand the link between natural phenomena and industrial phenomena such as Fukuyama (2011) or Hurricane Harvey (which caused serious hydrocarbon leaks in 2017). More characteristically, there are two risk cultures that co-exist without interaction: that of natural risk experts (community vulnerability studies) and that of technological risk experts (*"ignorance of the socio-economic impact of vulnerability and the link with the surrounding context"*).

• **Secondly,** the approaches adopted by the prefects seem to remain focused on a linear vision of the process: before, during and after. They focus on resources, or even performance and efficiency plans, when the aim is to avoid the worst.

This observation leads to a radical critique of crisis management, defined by practitioners as Taylorian [5]. Crisis management is therefore incapable of responding with agility to contexts that are now unreadable, unpredictable, unknown and unprecedented. "*Crisis management is an outdated concept that needs to be reformed*".

• **Finally,** at the 9th *Printemps de la prospective*[6], Noémie FOMPEYRINE, head of urban resilience for the city of Paris, highlighted the continuing failure to take account of the role of capital and social ties in global reconstruction.

It is this last point that seems essential to us. It guides our approach: the insufficient centrality given to societal management in the management of crises and disasters. We can regard it as the primary risk! Experts and scientists are developing models of protection and planning that take away from local populations their own knowledge and culture of risk.

"Adapting the means of responding...

In the quest for approaches designed to consolidate the process of understanding crises, disasters and their anticipation, territorial intelligence — again in the sense of understanding territorial situations — is a useful and remarkable approach.

In particular, it involves building the capacity to monitor, diagnose, analyse and develop collective intelligence. The aim is to reduce risk-taking in strategic choices, to organise the overall security of the region and to ensure constant responsiveness with fluid and constant decision/strategy support systems. They use new ways of reading and

(4) GUARNIERI F. "*Du risque naturel au risque industriel*", Le Monde, 25-26th of September 2022 in Dossier *"Une nouvelle économie des risques"*.
(5) COMBALBERT L., DELBECQUE E, *"Le leadership de l'incertitude"*. Paris: Éditions INHESJ, Vuibert; 2010.
(6) Société française de prospective, 9th Printemps de la prospective (March 2021), with Futuribles International *"Chocs, ruptures et transitions dans le monde de la COVID-19"*.

new operating methods that support the implementation of global territorial safety by controlling the most diverse risks: social, civil, public, environmental, economic and digital.

Territorial intelligence proposes ways of organising and working, of collaborating and of thinking: those of collective intelligence. In particular, the concept and approach of societal intelligence have been developed.

As a complementary approach, it allows us to place crisis management and disaster management strategy in a richer context, in which cultural factors structure the analyses in order to take into account cultural singularities, social practices and imaginations, and specific know-how.

It's about mobilising the anthropological foundations of a territory, of a city: the religious background, family structures, linguistic dispositions, solidarity practices right through to funeral practices, but also reactions to crises. Here, the memory of crises, *"the forgotten memory of disasters* [(7)]*"* becomes a major tool for *"recovery"*.

In the same vein, and to take a step further towards understanding extreme, lightning-fast situations characterised by a loss of control, let's return to the concept of resilience. The psychologist and organisational specialist Karl E. Weick analysed it on the basis of a disaster (a fire) which was marked by its uncontrollable nature.

So how can we anticipate lightning-fast crises, those that are undetectable, unpredictable, and have become uncontrollable, leading to the *"sudden death"* of any crisis management mechanism?

Recently, a new climatic phenomenon known as *"sudden and extreme drought"* was detected. It strikes without warning over a micro-territory and destroys the crops in a matter of days. Karl E. Weick suggests an initial proposal consisting of *"an attitude of wisdom"*. This requires a posture of cognitive distance in order to avoid cognitive bias and misinterpretation of the information gathered.

Faced with a situation of rupture, he recommends a second attitude: improvisation or bricolage, *"a cunning way of knowing"* outside the field of rationalities, procedures, standards and measures, or even performances and efficiencies. This is where solidarities are born and thrive. When circumstances dominate, we need to use the potential of the situation, particularly in society. "Drawing strength from disorder and uncertainty will enable us to rise again…" Soufyane FRIMOUSSE writes in his *"Guide de l'antifragilité" or "How to evolve in and through chaos by becoming antifragile"?* (Éditions EMS, *Management & Société.* 2022).

Cultural matrices and *the 'spirit of the people'*, the memory and culture of crises, form the basis of this approach to the creativity needed to emerge from crises and recover from disasters.

It's all about reincorporating crisis management into social life. ■

Karl E. WEICK, University

American, professor of psychology and professor of organisational science at the Ross School of Business at the University of Michigan, world-renowned for his work on organisational theory.

Soufyane FRIMOUSSE

Senior lecturer. Qualified to direct research.

(7) Granet-Abisset A-M, *"La Mémoire Oubliée des Catastrophes"*, Le Monde, 25-26th of September 2022. Dossier *"Une nouvelle économie des risques"*.

SENDAÏ: A DYNAMIC INTERNATIONAL FRAMEWORK TO PREVENT FUTURE CRISES

Roland NUSSBAUM
Anne-Marie LEVRAUT
AFPCNT

SUMMARY

If tomorrow's crisis management is a matter of doctrine and innovation, its corollary, disaster risk reduction, which can only be conceived on a large scale, requires institutional cooperation on a global scale. This is currently the case for the "Sendaï Action Framework".

CHRONOLOGY OF THE UN'S CONSIDERATION OF NATURAL DISASTERS UP TO 2015

On 14 December 1971, the resolution creating UNDRO *(United Nations Disaster Relief Organization)* was adopted, affirming the need to provide a rapid and effective response to governments in the event of a disaster.

On 11 December 1987, the International Decade for Natural Disaster Reduction (IDNDR) was inaugurated. The aim was to reduce the loss of human life, material damage and economic perturbation caused by disasters.

In 1994, halfway through the IDNDR, the Yokohama Strategy *for a Safer World* was launched. It implemented the first disaster prevention policy orientation plan, with a social focus.

In 2000, the International Strategy for Disaster Reduction was launched, in conjunction with sustainable development policies.

In 2002, the Johannesburg plan was adopted, with *"an integrated, multi-hazard and inclusive approach to vulnerability, risk assessment and disaster management..."*.

Disaster risk reduction: a pressing global obligation.

In 2005, the Hyogo Framework for Action (Kobe, 2015) set out to *"strengthen the resilience of nations and communities to natural disasters"*. It takes a broad view of the potential impact of disasters as exogenous threats to national security, and advocates a global approach to the protection and development of territories.

In 2015, the Sendaï Framework for Action (horizon 2030) acknowledged the conceptual change in the notion of disaster. The endogenous risk is now taken into account in the search for an affirmed perspective of sustainable development.

At the halfway stage, it has to be said that the chances of achieving these objectives are slim. The pandemic and the situation in Ukraine are only part of the explanation.

THE SENDAÏ FRAMEWORK (2015-2030)

The Sendai Framework for Action is the result of intergovernmental negotiations led by the UN General Assembly and supported by the UN Office for Disaster Risk Reduction (UNDRR).

The scope of application has gradually been extended to include both natural hazards and those linked to human activity and their damaging consequences, as well as environmental, technological and biological hazards and risks.

The resilience of medical structures is widely highlighted. The analysis therefore goes beyond simply dealing with the hazard (considered exclusively as the source of the danger) to document the social, political and economic conditions that make a society vulnerable.

This successive work led in 2015 to an integrated conception of the objectives of disaster risk reduction (DRR), adaptation to climate change (Paris Agreement) and the universal Sustainable Development Goals (SDGs).

The Sendaï Framework is organised around 4 priorities

- **Priority 1**: Understanding disaster risks,
- **Priority 2**: Strengthen governance of disaster risks to manage them more effectively,
- **Priority 3**: Invest in disaster risk reduction to build resilience,
- **Priority 4**: Improving preparedness for effective intervention and *"Building back better"* (BBB)

These priorities are reflected in 7 quantitative targets

1. By 2030, achieve a significant global reduction in mortality from disasters, so that the global average death rate per 100,000 population for the decade 2020-2030 is lower than the rate recorded for the period 2005-2015;

2. By 2030, significantly reduce the number of people affected by disasters, so that the global average rate per 100,000 inhabitants for the decade 2020-2030 is lower than the rate recorded for the period 2005-2015;

3. Reduce direct economic losses due to disasters by 2030;

4. Reduce significantly, by 2030, the loss of basic services and the damage caused by disasters to essential infrastructure, including health and education facilities;

5. To significantly increase the number of countries with national and local disaster risk reduction strategies by 2020;

6. Significantly improve international cooperation with developing countries by 2030 by providing appropriate and continuous support to complement their national efforts to implement this Framework;

7. To significantly improve, by 2030, people's access to multi-hazard early warning systems and to information and assessments relating to disaster risks.

GLOBAL GOVERNANCE OF PREVENTION BASED ON COMMITMENT MECHANISMS AND LOCAL PLATFORMS

To operationalise the "whole-of-society" approach advocated by the Sendai Framework in support of effective disaster risk reduction at all levels, a Stakeholder Engagement Mechanism (SEM) was established in 2018. This structure provides a space for representation of all "non-state" stakeholders.

International coordination of the framework is carried out by platforms operating at different levels:

• **The global platform,** which facilitates dialogue and exchanges between governmental and non-governmental parties by meeting every 2 years (2022, Bali). Its work contributes to the deliberations of the United Nations' governance bodies and mechanisms.

• There are 6 **regional platforms**: Asia Pacific, Arab World, Africa, North America and the Caribbean, South America and Europe. The regional platform for Europe and Central Asia, based in Brussels, interacts with the 55 countries in the region and convenes the *European Forum for Disaster Risk Reduction* (EFDRR) every two years.

• **The national platforms** are essential links in the chain of risk awareness and reduction at national level. They federate various national colleges and participate in their regional and global platforms.

IMPLEMENTING THE SENDAÏ FRAMEWORK IN FRANCE

The French national platform is chaired by an elected official, with the support of the Director General of Risk Prevention (DGPR) at the Ministry of Ecological Transition, who is also the UNDRR focal point for France.

To raise awareness and promote a culture of risk, the DGPR can rely on the AFPCNT, which federates and coordinates the "civil society" component of the French national RRC platform: the *Conseil d'Orientation pour la Prévention des Risques Naturels Majeurs* (COPRNM).

In particular, the AFPCNT assists the DGPR in monitoring the implementation of the Sendaï action framework. ■

TOWARDS AN OVERHAUL OF NATIONAL SECURITY PLANNING

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Jean-Charles COSTE
General Secretariat for National Defence and Security (SGDSN)

SUMMARY

Given the dispersal of sectoral plans and the growing integration of different contexts, the the SGDSN is proposing to overhaul crisis planning through the current draft general multirisk directive, which aims to protect 12 activities essential to the nation against 8 risks/threats; cross-cutting components are also envisaged.

One of the issues is the vocabulary and grammar we use to understand each other, describe a situation and identify concrete responses when faced with a crisis. The principle of subsidiarity must be respected at every level.

We are faced with a situation marked by an accumulation of multiple crises, sometimes intertwined, originating from various sources. There are latent crises and sudden crises, which ultimately generate very diverse signals: they can be slow and long-lasting or, on the contrary, rapid and limited in time. It is evident that we are currently dealing with multisectoral crises or crises that quickly become multisectoral due to the increasing interconnectivity between different sectors of activity. We also have crises that are intertwined (double shock): how can we manage a new crisis when we are already dealing with another?

The paradox for those working in crisis management planning and anticipation is: how do we think about the unthinkable? To do this today:

1ST FINDING

We have a general directive (DGI 320, which dates from 2015) that provides a framework for the State's various crisis plans (more than fifteen), but unfortunately these are not always operational in line with the kinetics of the crisis (a plan is opened at the very start of a crisis, but then quickly becomes obsolete). So how can these plans be made more operational?

2ND FINDING

While plans take time to draw up, they are based on a certain number of reference situations, but all these reference situations must be available beforehand. They can also quickly become out of date in terms of content (it can take several years to update them).

3RD FINDING

These plans can be criticised for their structure.
Today, therefore, planning is being rethought to provide a multi-risk response that is adapted to all crises.

THE CURRENT REFORM

- Threat and risk analysis: the underlying reason for bringing these two concepts together is that, in the end, those working in the field are involved in both prevention and crisis management. Threats and risks are therefore two concepts that need to be brought together.
- Question of vocabulary:

  - 1 threat = 1 risk = 1 plan, but there are still some inconsistencies

  - Vocabulary difficulties. For example, the notion of "victim" is perceived in different ways by different stakeholders.

  - The need to ensure consistency across the board, including in the response to themes that could be re-examined.

to be found by department and at local level throughout the national planning process.

- A shared planning culture among operators, decision-makers and local stakeholders. Defining the issues together to facilitate the development of responses.

- How can we better anticipate emerging risks?

• In the end, eight threats/risks were identified as having the potential to trigger major crises, and their consequences, along with the means of circumventing them (means of remediation) to achieve one of the nation's major objectives (the 12 key activities).

• To avoid a silo effect, eight cross-functional components have also been identified.

• The study of threats is followed by the drafting of plans that serve as immediate response tools in the event of an event. We then start to anticipate other scenarios.

• So, when it comes to taking emerging risks into account — something unforeseen or in a different form than usual, with different consequences, etc. — there's a link to be made.

CONCLUSION

Ongoing work on crisis management planning should ensure that the nation's response capability is sustainable and robust to all crises, whether planned or unplanned. ■

DIARY UNTIL THE OLYMPIC GAMES TO MAKE APPOINTMENTS CONTACTS

• Ministerial agreement on vocabulary,

• Implementation in the regions,

• Development of digital tools to facilitate access to documents and objectives, which will make it possible to complete the doctrine,

• Appropriation of this common culture by the stakeholders, professionalisation of crisis management stakeholders and creation of a pool of people who know each other,

• The final challenge is to draw conclusions from the Covid crisis so as to give the country the capacity to deal with such crises, with the help of NATO and the European Commission. The protection policy must also go beyond the SAIV directive; it must also come from local stakeholders/citizens,

• Finally, logistics have a cost but need to be further structured, as does the logistical response capacity, so as to provide a concrete and realistic response on the ground, based on existing systems.

THE NEED TO ADOPT A SYSTEMIC APPROACH TO ANTICIPATE THE CRISES OF TODAY AND TOMORROW

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SUMMARY

Today's societies are characterised by a high level of interconnection between numerous economic sectors. This creates vulnerabilities and systemic risks, whether linked to long-term trends (climate change, pollution, increasing scarcity of global resources) or to socio-economic destabilisation on a regional scale. The response involves a systemic and transdisciplinary approach, to understand how the system works and what we can do to bring it back into balance.

Modern societies are characterised by a high level of interconnection between many sectors of economic activity. The resulting widespread interdependence creates intrinsic, or systemic, risks of instability (Longaretti, 2020).

In practice, it is possible to distinguish between two broad categories, depending on the processes involved: long-term trend risks (decades) and short-term systemic contagion risks (months or years).

LONG-TERM TREND RISKS

Long-term trend risks emerge from the dual relationship between complexity and energy (societal or civilisational risks) and from the transgression of the bio-physical limits of the current global system (environmental risks). The latter are linked to the growing competitive tension between:

- our use of resources,
- our ever-increasing production of varied and often diffuse pollution,
- the limited capacity of our natural environment to absorb the associated impacts,
- as well as the difficulties we have in anticipating the consequences of the global environmental changes that are taking place and acting to reduce them. The main risk is that of a partial or total collapse of the planet's biocapacity, and its consequences for the human population.

SHORT-TERM RISKS OF SYSTEMIC CONTAGION

Short-term systemic contagion risks refer to the spread of crises across different sectors of activity, originating in a specific sector.

They offer the prospect of rapid contact (a few weeks or months), while being more intermittent and random.

If crises of this type become sufficiently numerous and/or large, they can lead to the system's inability to return to a state similar to its previous state.

This type of process is characterised more by a series of successive cumulative stages than by a single major disruptive event, or a slow but continuous deterioration. A particular danger arises when this multitude of crises "resonate" and becomes interlinked in a systemic manner.

The ability of the private sector, local authorities, national governments and the international community to deal with these types of risk is one of the key factors for a sustainable future.

In this context, it is possible that digital simulation tools could be useful either for decision support (to help draw up policies aimed at reducing vulnerability, for example), or for simulating crisis management exercises.

It is imperative that this approach be part of a systemic and trans-disciplinary approach. Approaches that are too sectoral would be counter-productive, as they would give an insidious impression of control and prevent the identification of inter-sectoral links and feedback loops between sectors. As the problems we face today are multi-factorial and require us to mobilise several levers of action from different sectors simultaneously, sectoral approaches also tend to lead us to treat the symptoms rather than the causes of the problems.

THE SYSTEMS APPROACH

Inherited from system dynamics, the systemic approach consists of studying a complex system (1) not by the sum of its sub-systems, but by analysing the inter-relationships between them. The difficulty lies in the level of abstraction, and therefore the selection of the components of the system under study. In addition to the modeller's experience, drawing the analysis boundary requires a good understanding of the question to which the model is intended to provide an answer.

Numerical risk models adopting a systems approach are few and far between. For long-term risks, there is the iconic *World3* (Meadows et al., 1972) or its claimed heirs *World7* (Sverdrup et al., 2020), *Earth4* (Dixson-Decleve et al, 2022) and MEDEAS (Capellán-Pérez et al., 2020), as well as the more stylish *TranSim* (Jackson & Jackson, 2021), *EUROGREEN* (D'Alessandro et al., 2020) and *TEMPLE* (Jacques et al., 2022).

For short-term risks, only the *ERRE* (Pasqualino & Jones, 2020) or *E3ME* (Cambridge Econometrics, 2019) models seem interesting, without however departing from the framework of neoclassical economics, which is not very relevant for this type of exercise (neoclassical models, by construction, cannot predict or take into account crisis phenomena as such and are, at best, placed in a perspective of weak sustainability).

(1) "A system is a set of things - people, cells, molecules or whatever - interconnected in such a way that they produce their own behaviour over time." (Meadows, 2015).

In order to gain a better understanding of the causes and consequences of systemic risks for the French territory, various scientific modelling initiatives have recently emerged, notably within the modelling group of the *Agence Française de Développement* (AFD) [2], the IRIS initiative [3] and the STEEP [4] research team at INRIA.

However, it is vital to realise that the scope of the models developed is limited both by major uncertainties (socio-political, geopolitical, etc.) and by a lack of understanding of what they can and do mean. They are not capable of predicting the future, nor are they intended to become so, given their methodological and epistemological frameworks.

Their findings are primarily qualitative, at best sometimes semi-quantitative, but they are particularly robust.

In business-as-usual scenarios, crises become commonplace.

These include energy stress, record inflation, a major surge in the cost of fossil fuels, the de-aggregation of part of economic activity, amplified by financial debt defaults and speculation, which in turn amplifies crises in both the productive and financial economies, deflationary spirals, step-by-step collapses, and so on.

To curb these dynamics and reduce their disastrous consequences, as well as to increase our capacity for resilience, cultural, social, economic, industrial, political and geopolitical breakthroughs are all and simultaneously essential. ■

(2) https://www.afd.fr/en/actualites/gemmes-application-understanding-effects-climate-change-economy
(3) https://www.carbone4.com/lancement-iris-initiative
(4) https://steep.inria.fr/

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FORESIGHT TOOLS TO ANTICIPATE TOMORROW'S RISKS

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SUMMARY

The insurance world is observing an extension of the limits of crises and the appearance of emerging risks; to qualify these, the notion of accumulation risk (e.g., a bug affecting a group of autonomous vehicles) is central. We are going to have to envisage the scenario of complete destruction and then think about reconstruction.

AN INITIAL MESSAGE ON DAY-TO-DAY ANTICIPATION...

The insurance sector uses the following risk typology:

- Existing risks for which we have data (probability of occurrence, cost of impacts, tables used to price damage),
- Emerging risks that didn't exist before and that we need to monitor even though there is very little data.
For example, how can we qualify the risks generated by an autonomous vehicle driven by an algorithm?
We don't yet know how to put a price on this type of risk.

Foresight offers tools to qualify emerging risks through weak signals, of which there is a whole "zoology":

- **black swans**" (Taleb) with a risk that has a very low occurrence but a very high impact,
- the "**black elephants**" ("*Elephant in the Room*") as signals of climate change,
- **jellyfish**", with a risk that seems a long way off but "*a tentacle can already sting us today*", and so on.
- **Canaries**", an event which, if it occurs, indicates that a crisis is coming (like the canary indicating a firedamp explosion).

For an insurer, what qualifies as an emerging risk is **an "accumulation risk".**

Let's take one example: whereas conventional accidents vary greatly from one person to another and from one place to another, in autonomous driving, on the other hand, the fact that the same algorithm controls the vehicles can mean that, in the event of a bug, a large number of vehicles may have an accident. It is also this risk of accumulation that is feared with climate change: beyond a 5 to 6°C rise in temperature, there will be events that fall outside the scope of insurance, because too many disasters will need to be covered at the same time.

Insurers are therefore concerned to identify the risks of accumulation that could arise from climate change, cyber-attacks or pandemics. And thinking about how to anticipate them.
The notion of accumulation risk is therefore central to the characterisation of future crises for insurers.

SECOND MESSAGE CONCERNING CRISIS EXERCISES AND ANTICIPATION IN TIMES OF CRISIS.

Today, we need to work on multi-crisis scenarios (pandemic with cyber-attack or containment and earthquake), to see all the inconsistencies that emerge from these exercises and to make the necessary adaptations.

THIRD MESSAGE ON THE BEFORE-AND-AFTER DEBATE.

We are talking about the transition from a **VUCA** world *(Volatility, Uncertainty, Complexity and Ambiguity)* to a **BANI** world:

• *Brittle:* ransomware, no longer able to access software, unable to operate,

• *Anxious:* a surge in burn-outs, suicides, mental health issues, including among those managing the crisis,

• *Non-linear:* threshold effects and cliff effect (sudden worsening of consequences),

• *Incomprehensible:* fake news, incomprehensible messages from reference institutions.

FINDINGS AND QUESTIONS.

We are seeing a shift around the following pivots:

- **Pivot on posture in the face of the crisis**

There are the usual postures (prevention, preparation, etc., to avoid overcoming or preparing for the crisis) but, increasingly, we are seeing the need to anticipate the damage caused by the disaster so as to be able to start thinking now about financing reconstruction.

We are moving away from the logic of building a protocol to prevent, prepare and protect, towards a protocol based on a scenario where everything is destroyed, collapses and we think about the aftermath: how do we bounce back? (Where do we find water, food, medical care, how do we communicate when the organisation has collapsed?)

- **Pivot on the public-private boundary of the crisis**

The public and private sectors are no longer separate. Today's crises call for a public-private crisis management ecosystem.

We have moved into a totally open crisis system, with stakeholders who have their own interests and power games.

- **Pivot on the timing of the crisis and all the legal consequences it may have**

The state of emergency, the state of exception, what powers are left to the administration, to judges, to parliament, to intermediary institutions, to States. This raises the problem of the temporality of these legal implications, which are specific to each country.

When do we enter and leave a crisis? And if the crisis is not just a 24-hour crisis, we have to manage long-term crises (e.g., Fukushima and the consequences over several decades). ■

INTERACTIONS BETWEEN SECTORS:
THE NEED FOR CONSISTENCY AND FORWARD-LOOKING MODELLING

Maxime EFOUI-HESS
Project manager

Baptiste ANDRIEU
Doctoral student
Association "The Shift Project"

Presentation of one of the Shift Project projects developed in partnership with the ISTEER laboratory in Grenoble: a tool for integrating energy-climate issues into a systemic vision of the economy.

SUMMARY

Presentation of two initiatives that integrate the energy-climate issue into a systemic vision of the economy. The first initiative is based on a model linking the various economic sectors (France, Europe) with a view to helping institutions. The second initiative is an evolution of the World3 model, covering the entire world, fuelled by the constraint of increasing scarcity of raw materials up to critical stages, and looking ahead to 2050. It is a geopolitical strategy tool, making it possible to identify the risks and vulnerabilities for France in the global context, based on projected policies.

TWO INITIATIVES ARE PRESENTED

1. A fairly simple model that allows us to understand the transformations taking place in society through a physical modelling of things, using a systems approach.

2. The ISTEER model, which takes a more holistic and complex view, resulting in a risk management tool. This tool is still in the development phase and will produce its first results at the end of the year.

Initiative 1

Concerning the first initiative, which also explains the Shift's general approach/method: defining the economy in concrete terms (the economy is not driven by euros but by concrete objects, which are called the "physical determinants" of the economy).

More specifically, the aim is to describe how the different sectors interact with each other: modelling of the different economic chains from upstream sectors to downstream uses + general overview to understand how the transformations in each sector are compatible with each other in order to project the production of these different activities into a possible future, because today, programmatic projections can envision up to 30 times the production capacity of France and Europe, which is not possible.

What's the point: to have a concrete economy and to be able to apply our constraints to it. In other words, to make hypotheses about inputs and what they can produce (quantification of all inputs and quantification of externalities) and to be able to quantify possible futures.

The aim of the Shift Project is to help institutions prepare for crises and constraints.

Initiative 2

Concerning the second initiative ("panoramic" model project): this model can be used to simulate:

- Sudden and chronic hazards,
- Multi-hazard and multi-crisis scenarios.

The model is based on a question: what will our dependence on raw materials be in 2050? There are two parameters to answer this question:

- Consumption of raw materials and their sub-parameters: breakdown of GDP, services and their respective consumption of raw materials, value chain, age of fleet, etc.

• The regions producing these raw materials and in what quantities: creation of a geological/material model DEMAND / MATER, which will give the quantities of resources accessible according to different parameters (available energy, constraints on energy supply, social acceptability, demand for materials in all regions of the world, etc.).

The model has been calibrated on past data since 1900 and is projected to 2050. It takes into account as many of the economy's characteristic infrastructures as possible (energy, buildings, transport, industry), all of which are dynamic and subject to obsolescence.

The data comes from around fifteen regions and one category, 'all countries in the world'. They also include flows between these regions, using a "footprint".

This tool is designed for forecasting and risk analysis based on different development scenarios for the regions modelled, and on geopolitical conditions.

THE INTEREST OF THIS WORK IS THREEFOLD

• Producing tools to inform the debate: the model makes points of vulnerability visible. By starting with the physical elements of the economy, we are able to see what flows we need, because the economic variable is not always representative of the physical context.

• Taking a global view of risks: placing France's vulnerabilities in a global context.

• Integrate these tools into crisis anticipation and management planning methodologies: integrate the scenarios/strategic trajectories devised by the institutions and feed them into the model that will develop the context of physical constraints. From there, it is possible to describe the physical context in which we find ourselves and the vulnerabilities we will have to deal with in order to respond to possible crises.

LINK WITH WORLD 3 ON THE LIMITS TO GROWTH: WHAT ABOUT DEMOGRAPHICS?

Use of the same model with a little more complexity (this World 3 model is 50 years old). The Shift model also includes an innovative geological component.

The aim will be to work with decision-makers to further develop this tool with specifications that make it useful for decision-making.

The model is also based on historical data from several of the world's major regions over several centuries. This allows extrapolations to be made.

Where the model encounters difficulties is in risk analysis and the identification of consequences and vulnerabilities. ■

STRENGTHEN DIALOGUE BETWEEN RESEARCHERS AND PRACTITIONERS AT EUROPEAN LEVEL

Philippe QUEVAUVILLER
European Commission
DG HOME

SUMMARY

European research suffers from a lack of cross-sectoral coordination, as well as a lack of relays between Member States and users. National initiatives to facilitate the dissemination of results would be welcome.

Programming (European and national) research in the field of crisis management (linked to natural and man-made disasters, whether accidental or intentional) and implementing the results of this research requires a structured dialogue between a multitude of stakeholders and disciplines:

- legislators,
- first responders,
- scientists,
- industry/SMEs,
- civil society, including elected representatives.

A LACK OF CROSS-SECTOR COORDINATION

There is a lack of cross-sectoral coordination at all levels (international, national, regional/local) and the transmission of scientific advances made under the European research framework programme (Horizon Europe), particularly in the field of disaster management and reduction, is hampered by a lack of effective relays within the Member States vis-à-vis users/practitioners.

HOW CAN WE STRENGTHEN DIALOGUE?

With a view to enhanced dialogue at European level via CERIS (Community of European Research and Innovation for Security), is it possible to envisage that national initiatives could provide such a relay and work in partnership with the services of the European Commission in the fields of civil protection, security and research? ■

3 OPERATIONAL CRISIS MANAGEMENT

OPERATIONAL CRISIS MANAGEMENT

• CRISIS MANAGEMENT AT EDF

Isabelle LEBOUCHER
Head of Crisis Management and Business Continuity (EDF)

• CRISIS MANAGEMENT AT RATP

Corinne LEBELHOMME-GUTIERREZ
Project Manager (RATP group, Paris Metro)

• CRISIS MANAGEMENT AT AIR FRANCE

Jean-Yves CHAUMET
Operations Control Manager (Air France)

• CRISIS MANAGEMENT AT SUEZ

Emmanuel LENAIN
Major Projects Safety Director (SUEZ Eau France)

CRISIS MANAGEMENT OF ELECTRICAL SYSTEMS: A EURO-AMERICAN COMPARATIVE APPROACH

Angélique PALLE
Researcher in the Armament and Defence Economics Department at IRSEM

Presentation of crisis management of electricity systems with a comparative European and American approach, based on field surveys of electricity network operators in Europe and the USA.

SUMMARY

Europe has an integrated electricity system, supported by major operators interconnected on a continental scale, which favours an energy transition strategy and top-down management of the network; cyber is separated from other threats.
In the USA, the network is much more fragmented and less managed. The federal government is seeking to encourage coordination and dialogue between the many stakeholders involved. There is an approach to the threat where the cyber and physical levels are intertwined.

The electricity transmission infrastructure was designated as an OIV (*Opérateur d'Importance Vitale*) in 2008 and again in 2012, with around fifty Points of Vital Importance identified.

The electricity system is an increasingly systemic and critical activity for several reasons:

- Electrification of uses underway with the energy and digital transitions,
- The specificity of the European region, with the integration of European markets and networks, means that we are increasingly connected to our neighbours. The sector's current objective is to achieve 15% interconnection. This has a double systemic effect: an incident in one sector can affect other sectors, and an anomaly in the sector can have repercussions in all European countries.

To get an idea of the systemic nature of the electricity sector, the
"The Energy Institute's *Black Out Simulator*[1]) simulates the effects of a blackout in a European region on all activities.

USA/EUROPE DIFFERENCE ON THE CRITICALITY SCALE

This obligation to interconnect with energy transition imperatives is a specific feature of the European electricity system compared with the American system, which is much more fragmented and decrepit.

This technical difference between the US and EU systems has an impact on the way crisis management is approached.

Although the EU is following the USA's lead in terms of critical infrastructure protection (2005: *Green Paper on critical infrastructure programming*, *etc.*), research shows that there are differences in vision regarding the approach to infrastructure protection depending on the type of threat (physical or cyber):

- First of all, it should be noted that the electricity transmission system is on the list of the EU's 13 critical infrastructure areas.

(1) Tool available online: https://www.blackout-simulator.com/

• The USA has a very different programmatic approach from the EU, which focuses on the ground, whereas the EU is above all top-down, with threat analysis as its first priority.

• Europe separates the management of the physical and cyber levels, whereas the USA manages the two threats together, in an integrated way: we are seeing the construction of a direct link between these two threats.

• In the USA, there is also a direct link between the federal government and the bodies responsible for protecting the network.

In 2006, the DHS proposed a national infrastructure protection plan and set up a coordination council to act as a link between the federal government and the electricity sector; in 2013, the federal level was brought to the fore and the industrial stakeholders embarked on a joint infrastructure protection programme with targets for securing the network.

The emphasis is on sharing information between the various stakeholders (political, technical, security) at different levels, including with Canada and Mexico.

The federal government has an important role as an information integrator with an overall view of the network and the stakeholders involved; this is less the case in Europe, no doubt because of the smaller number of network operators who have an integrated view of the system. In Europe, the protection of the electricity system is much more organized by industry, with a distinction between the cyber threat and the physical threat.

• There are also exercises (such as GRIDEX) involving all the stakeholders in the system, as well as Canada and Mexico. GRIDEX exercises take place every 2 years in the USA and combine cyber and physical attacks.

In terms of exercises, ANSOE (or ENSOE Setec) organized a European exercise at the end of 2018, while the USA began its exercises in 2011. ■

IN SEARCH OF AN INTELLIGENT ANALYTICAL CRISIS MANAGEMENT ARCHITECTURE THROUGH A FRANCO-GERMAN APPROACH

Dr Stefan Wolfgang PICKL
Professor, Bundeswehr University, Munich

"The only thing we can count on is uncertainty! However, every year the response to crises and emergencies improves, business continuity plans are strengthened and disaster recovery capacity increases. Every year, new concepts are developed in disaster planning, prevention and mitigation. It's not all bad news.

(Hiles, 2011)

SUMMARY

The issue of strategic decision support is a shared concern that has given rise to several joint initiatives by the SANCTUM project team and its counterpart at the Bundeswehr University (COMTESSA research group) for several years now.

THE SEARCH FOR INNOVATIVE ARCHITECTURE

In crisis management, clear and early anticipation and communication are essential. It is therefore important to have data and parameters describing the system in crisis that can be transmitted as quickly as possible.

These elements, which form part of an intelligent architecture, are traditionally grouped into three phases:

1. Prevention
2. Impact reduction
3. Healing and repair

Figure 1 illustrates how this initial analysis is used to structure the resilience of the organization.

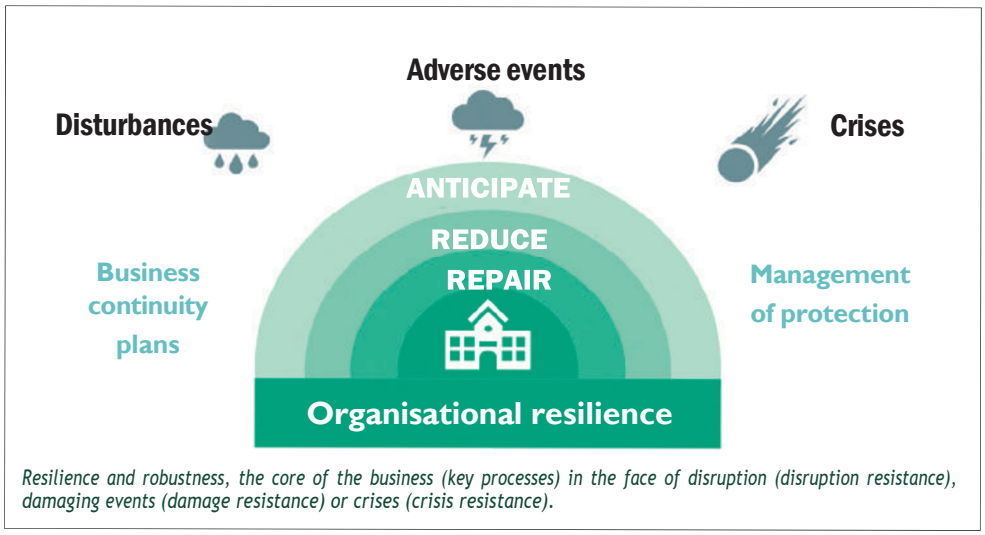


Figure 1 - *Business continuity system (ifaa 2020).*

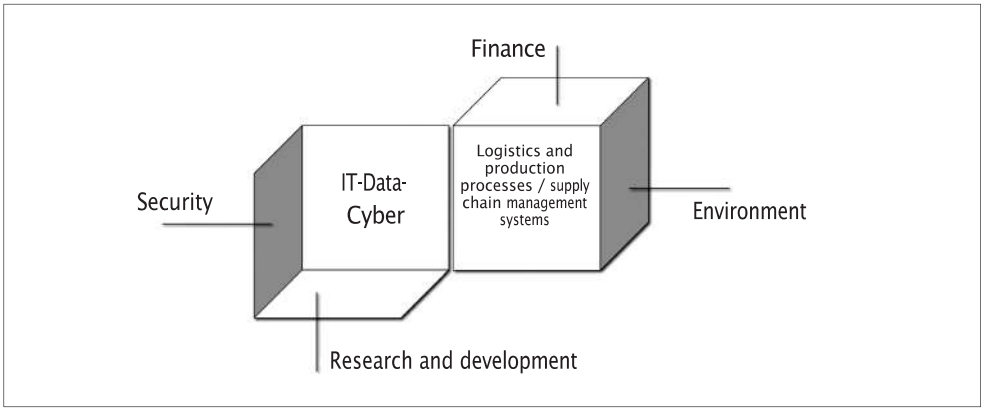


Figure 2 - *Vulnerability assessment decision cube.*

The aim of our innovative architecture project is to achieve holistic risk management by *linking* the operational aspects mentioned above to the fundamental principles that can guide strategic decisions within the framework of an intelligent architecture:

- How can the quantitative and qualitative aspects of risk management be combined in an "intelligent" way, not only at national level, but also at supranational level, taking advantage of advances in digital technology and "big data"?
- How can aspects of complex risk management be applied in this context to identify risk situations in critical infrastructure in good time?
- How can risk management and resilience analysis be combined?
- What are the operational consequences for the stakeholders on the ground? What specific skills, qualifications and resources are required?

The basic architecture we are looking for includes:

- a comprehensive decision-support platform,
- a complex and intelligent optimisation framework.

This is the fundamental core of the platform developed by the COMTESSA Competence Centre at the University of Bundeswehr through the SARA project, whose main key functionalities are described in the following paragraphs.

SARA: INTELLIGENT ANALYTICAL RESILIENCE ARCHITECTURE

SARA is the result of critical thinking (Pickl, 2019) that aims to move beyond the traditional risk analysis framework on which most current decision-making processes are based to take *an integrated and holistic view*. It is proposed that this integration be achieved using a 'decision-making cube' **(Figure 2)**, with each of the six sides representing one of the following six sectors of activity:

- Safety and security
- Economy / Finance
- Logistics and production processes/supply chain management systems
- Environment
- Research and development
- IT-Data-Cyber

These six sectors are considered essential, both within a company and for a public structure, for the complex consideration of risks. This is typically the case for the protection of critical infrastructure.

Qualitative aspect — Sector-based approach

Each side of the cube therefore represents a particular sector ("sectoral approach") which can be analysed using different risk management methods. The decision-maker can act independently on each sector, turning them in his or her direction, grasping and analysing them.

Ideally, it would be possible to assign a weighting ('value') to each face after the event, as is the case in a dice game. The principle adopted by the COMTESSA team corresponds precisely to the prioritisation of issues suggested by the SANCTUM project, which forms the basis of its anticipation process.

The SARA architecture then consists of building an integrated map to help the target decision emerge.

The aim of the next stage is to provide quantitative and forward-looking information on the overall weighting assigned to the sides of the "decision-making cube".

Quantitative aspect — Zone model

Each of the cube's 6 faces is assigned a geometric sector of a disc known as the "decision disc'. This geometric sector is therefore in bijection with an essential sector of activity.

Each sector is in turn divided into concentric rings.

- The inner crown reflects the risk assessment.
- The external crown anticipates the impact of the measures taken.
- The average crown is a kind of potentiometer that reflects, or sets, the intensity of the measures to be taken.

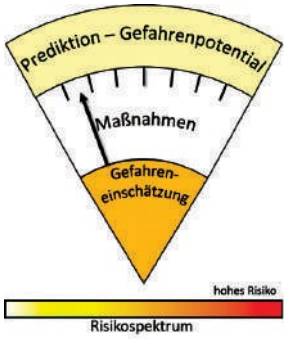


Figure 3 - *From cube to decision disc. Forecasts - Measures - Awareness - Risk spectrum.*

In addition, each of the inner and outer rings is assigned a colour reflecting — based on a given risk spectrum — the intensity of exposure to the event or of its impact. This is to give a visual aspect to the overall graph. This colour has a numerical equivalent.

Prospective aspect — process view ("Lagebild")

At this stage, before a decision is taken, the major challenge lies in the fact that each stakeholder involved in the crisis and its management naturally develops an individual sectoral approach.

The innovation of the SARA architecture is that it aims to break down this "every man for himself" logic, thanks to its integrated (or systemic) operation, which enables the effects of the measures taken for each sector on the other sectors to be measured and visualised.

For example, excessive demands in terms of logistics can lead to environmental damage or a reduction in safety measures...

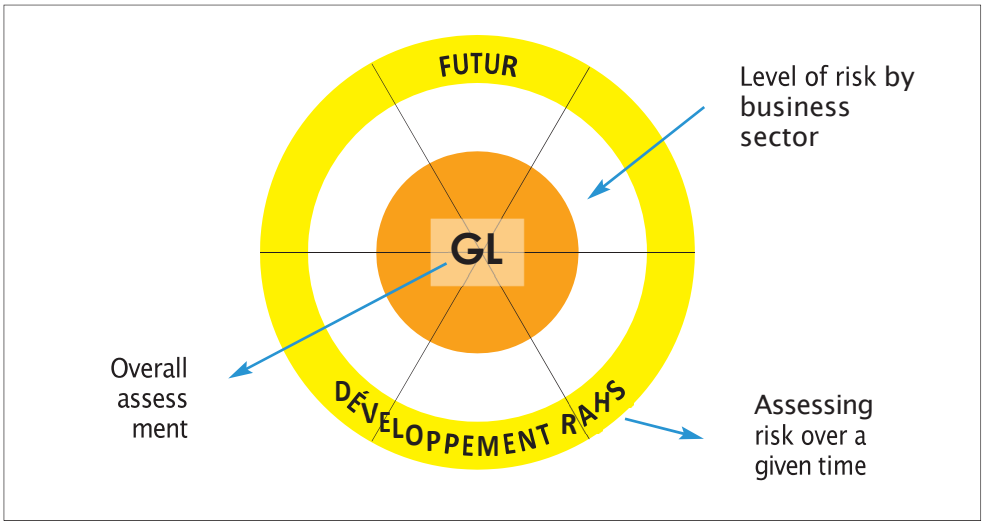


Figure 4 - *Overview of the "decision disk". Assessment of risk levels by sector. RAHS (Risk Architecture Horizon Sensing) project.*

Combining the six sectors to make up the decision disk provides this overview, which would of course be dynamic on a digital medium.

Summary

The architecture envisaged from SARA in all the work carried out by COMTESSA in parallel with that of SANCTUM aims to combine quantitative, qualitative and anticipatory analyses.

This approach is closely linked to the thinking of Wolfgang Bonß (Bonß 1997) and offers the following advantages:

- Integrated approach to different areas of risk
- Systematic aggregation of data for exhaustive digital processing
- Optimisation potential
- Learning behaviour - Intelligent detection
- Integration of quantitative and quantitative aspects

We are aware that SARA is not yet able to meet the ambitions of decision-makers, but its holistic approach, developed on a common basis and promoted by the COMTESSA and SANCTUM centres of competence, is well placed to meet the current and future challenges of increasingly demanding crisis management. ■

TESTIMONY FROM THE DEPARTMENTAL OPERATIONS CENTRE (COD)

Thomas JELIC
Head of Road Safety and Crisis Engineering Unit

Aude Departmental Flood Coordinator

SUMMARY

In the departmental crisis centre (COD), there is a need for real-time mapping of the situation based on all accessible data; AI could help meet this need.

FOCUS ON THE COD SITUATION ROOM

A constant and growing need for mapping in COD.

In the Aude department, the prevalence of very rapid-onset flooding is not at all consistent with the possibility of mapping.

The QGIS and Synapse tools don't currently allow you to work with fast kinetics. You can make queries, but that's as far as they go.

In this context of extremely rapid events, AI could provide mapping elements while the urgent tasks of crisis management (telephone calls, questions, decisions, etc.) are being dealt with.

Unfortunately, in COD, you spend a lot of time managing the phone and the handrail, which leaves little time for mapping.

Mapping is used more for anticipation, using forecasts from Météo France to try to determine the consequences and measures to protect the population (QGIS and Synapse).

These are classic GIS tools with weather, road and rail traffic data.

Updating data is important for mapping: can AI help to aggregate more recent data, while always ensuring that the data is reliable?

IA COULD ACTUALLY HELP:

- by carrying out repetitive tasks. All the data available in real time could be cross-referenced with data available before the crisis — maps, ZIPs [potential flood zones], etc. — and help to quantify, for example, the resources needed to evacuate the population.
- If we look at the heterogeneity of crises, we have a starting point and, with AI, we can cross-reference it with local issues.
- AI could help to use data from social networks. This data is important for keeping an eye on what's going on outside the crisis room, making the data more reliable.

While AI can help with decision-making (it will suggest scenarios), the human being remains at the centre of the decision. ■

VIGIERISC: THINKING OUTSIDE THE CRISIS MANAGEMENT BOX...

Ludovic PINGANAUD
ATRISC

SUMMARY

The notion of crisis has become an omnipresent part of everyday social, political — and above all media — life, posing a new problem of meaning for its managers. The author, formerly colonel of firefighters, takes stock of the "traditional" methods of crisis management to embrace the promise of agile engineering.

A crisis is a breakdown in the stability of a system, leading to a breakdown in its decision-making process. Managing a crisis means first of all making sense of the situation, anticipating how it might evolve or change, and then being able to coordinate the most appropriate response to regain control of the situation.

The traditional organisation, with a three-stage response (preparation, operational management and return to normal) is reassuring and seems to meet needs... But is it as effective operationally as it is theoretically?

"IF CERTAINTY IS REASSURING, DOUBT IS MORE NOBLE.

This quotation from Salama MOUSSA alerts us to the risk faced by managers who believe themselves to be immune from conceptualised organisations.

"We've got everything planned, we've got the plans, we've got a modern crisis room, we've had regular drills, so we're ready...". In crisis management, however, doubt must be a permanent feature. It forces us to assess the decisions we have taken and to change course when they are no longer in phase with developments in the situation.

And yet, when it comes to preparation, there is no shortage of critical comments:
The exercises are interesting, but they are not realistic enough..."; "Those who do the exercises are not realistic enough..."; "Those who do the exercises are not realistic enough...".

who take part in exercises are not the same people who take part in crisis situations. In fact, this creates a lot of chaos because the real stakeholders don't know the procedures and, in a crisis situation, impose their own organisation, which turns out to be unknown to everyone"; "With the holidays, the people who were supposed to be in the crisis unit weren't there, which disorganised the planned response...".

The same applies to crisis management: *"We didn't use the plans because we didn't have time to consult them"; "None of the scenarios in the plan corresponded to the situation we encountered"; "We didn't know enough about the procedures because we had never used them in a real situation"; "The organisation was put in place several years ago but it is no longer adapted and many people have changed jobs since then..."*.

By separating crisis management from the normal functioning of the organisation, it is difficult for those involved to remain operational and effective. Indeed, even if the organisation put in place has been carefully thought through and has proved its effectiveness, it remains difficult to maintain the expected level of performance, for several reasons.

The existence of a structured system is in itself reassuring, and it is not unusual to hear *"There's little risk of anything happening because nothing has ever happened"* or *"We'll be able to adapt when the time comes, with a bit of common sense we can deal with any situation..."*.

Unfortunately, this kind of talk can reflect either denial or a lack of foresight. Or even a form of incompetence. With serious consequences.

The importance of the post-crisis phase is often underestimated. Although RETEX is often carried out, the lessons learned are often not rigorously followed up, and only those who actively participated in the event remember what worked and what mistakes should not be made.

But these experiences should lead us to change the way we think about crisis management.

STRENGTHENING ORGANISATIONAL RELIABILITY

A crisis system should therefore not be an exceptional system, but one that complements the existing organisation and enables it to step up a gear when it detects an abnormal situation. Making an organisation reliable means maintaining its level of performance when it becomes vulnerable. Its vulnerability must therefore be analysed on an ongoing basis by monitoring various pre-identified signals and parameters.

The aim of the current development of VIGIERISC is precisely to enable decision-makers to acquire an overall view of the 'state of health' of their organisation. It also gives the various stakeholders in the organisation a less restrictive view of their business by enabling them to visualise the interactions that take place between them.

with other businesses or events that could have an impact on them. Taking account of these signals (weak or strong, also known as early warning signals) can of course be based on innovative technologies or even artificial intelligence. However, it would be dangerous to prematurely dispense with a human, collective and collaborative interpretation.

Based on the principles of HRO *(High Reliability Organizing)* and FOH *(Organizational and Human Factors)*, the principle is to retain a predominantly human dimension in the thinking process, so as to anticipate areas of vulnerability as objectively as possible.

This involves keeping a constant watch on all the precursor signals, cross-referencing them with the information that emerges from the background noise, to ultimately identify which of the organisation's functions are likely to be impacted to a greater or lesser extent, or on a lasting basis.

An impacted function can also, through a domino effect, impact another function. By consolidating all these signals, it is then possible to quantify the organisation's overall level of vulnerability and to mobilise the human and material resources needed to intervene at an early stage.

The aim today is to bring a new dynamic to crisis management by combining the benefits of new technologies with real expertise in crisis management. In this context, the crisis system does not exist in isolation.

Salama MOUSSA
(1997-1958)
Egyptian intellectual reformer.

no longer as such, but as a means of measuring the overall reliability of the organisation, capable of reacting almost instantaneously when a vulnerability is detected.

Of course, the organisation needs to adapt to this new way of working, and staff need to be fully involved in the process. The aim is not to overhaul existing organisations, but to incorporate into the decision-making process the multiple interactions that must exist between the different units that make up a crisis centre, and to clearly differentiate the specific role of the different decision-making levels (strategic, tactical and operational).

Moving from crisis management to reliability is a real paradigm shift.

The principle of reliability is to ensure that all those involved are capable of reacting effectively at all times. Physically tired, or under particular stress, are they still capable of guaranteeing the required level of performance and developing the skills needed to manage the situation?

Contrary to popular belief, the skills required for crisis management are primarily non-technical. To develop these skills, regular training is essential. If you make the effort to apply good practice on a daily basis, there's a good chance you'll be able to apply the same behaviour in exceptional, complex situations, even under stress.

CONCLUSION

We could plagiarise Clausewitz by saying that crisis management is simply the continuation of the management of a usual situation by other means, after that situation has deteriorated. Tools such as VIGIERISC are part of these "other means" and can help us to adapt as effectively as possible by continuously processing early warning signals as exhaustively as possible.

But this analysis, carried out initially by digital means, must remain coupled with a human analysis, which is the only way to discern the criticality of the situation and take the appropriate measures early enough. ■

CRISIS MANAGEMENT AT EDF

Isabelle LEBOUCHER
Head of Crisis Management and Business Continuity at EDF

SUMMARY

EDF presents an approach in which continuity is sought between crisis and non-crisis situations; a "rapid thinking force" is called upon to anticipate crises, but also for strategic non-crisis related issues.

SPECIAL FEATURES OF THE EDF CRISIS CENTRE

The crisis centre was renovated in 2018. It has the following special features:

- Emphasis on ergonomics (space to isolate oneself, convivial catering area, simplified access to the crisis room for faster response, etc.).
- Use of crisis management IT tools outside the crisis itself (exercises, ordinary times, etc.).
- The importance of communications (the reports show *that "there are never enough communications staff"*); the communications room in the centre is identical to the non-crisis communications centre.
- Development of hybrid formats, and installation of 3 fallback crisis centres on other sites, in the event of access problems.
- Developing anticipation — missions of the *Force de Réflexion Rapide* (FRR)

THE FRR IS A UNIT IN ITS OWN RIGHT, WHICH IS MOBILISED:

- During crisis management, at the request of the Director; it then acts as an anticipation unit and produces an oral report as the situation unfolds.
- On request, and independently of crisis management, to deal with strategic issues; written and oral reports are then organised.

This example illustrates the increasingly important role of anticipation in crisis management, which leads to several complementary considerations:

- Including scriptwriters in the situation room?
- Probable or worst-case scenarios?
- Analysis to prepare for the end of the crisis?
- Link to planning? ■

CRISIS MANAGEMENT AT RATP

Corinne LEBELHOMME-GUTIERREZ
Project Manager,
RATP Group
(Paris Métro)

SUMMARY

The factors behind crises are tending to increase in number: media hype, systemic shocks and the consequences of climate change, and for every company the cyber threat. The RATP is prepared along 3 lines: building resilience (→ BCP), training (→ exercises), varying scenarios, in particular through foresight.

WHAT CRISES CAN WE EXPECT?

Firstly, the widespread media use of the term 'crisis'. A change at the head of a digital platform, the economic difficulties of festivals, the sporting and managerial failures of a football team... Any difficulty is a 'crisis'. The term has entered the public language as a symptom of the acceleration of media time, at the risk of trivialising it.

But let's be prepared for a real increase in the number of crisis situations, those that call into question our methods and processes, threatening the very survival of our companies.

We have collectively gone through a chain of systemic shocks with the Covid pandemic and then the war in Ukraine and their cascading impacts. Today, the energy crisis is causing tremors on a European scale to which we must all adapt.

Tomorrow, climate change will generate a new terrain of vulnerabilities, transformations and therefore crises. These crises will be both more unpredictable and more complex. The Labo-Crise presentations demonstrated this brilliantly.

Tomorrow's world will also be noisier, with a proliferation of aggressive and uninhibited stakeholders.

So companies like RATP should expect to face a cyber crisis. For major operators, the question is no longer whether a major attack on their information systems could happen, but "when". Cyber attackers are professionalised and organised like a service market.

In some cases, using sophisticated means, they will be able to combine computer tools with other offensive means and, playing on several registers, will be able to strike severely and destabilise organisations.

HOW TO PREPARE?

• **Strengthening resilience.**
If you can't avoid a crisis, you have to avoid a catastrophe. The challenge is to know how to absorb a shock and then recover. This requires a robust internal organisation for crisis management, with good knowledge of external stakeholders, and the drafting and regular monitoring of cross-functional business continuity plans for the most important activities. For example, the RATP Group has a comprehensive BCP covering all of its critical business processes.

• **Training.**
Large companies rely on professionals who can help anticipate crises and organise and plan how to deal with them. It is just as vital to get people acculturated, and to raise the awareness of experts in all fields, so as to save precious time when the time comes. The RATP Group is implementing an ambitious training programme, with 5 to 6 exercises every year, in coordination with its partners.

• **Vary the scenarios.**
Respond to an endogenous crisis with the aim of maintaining a nominal service. Preparing for a lengthy rebuild after a cyber-attack. Thinking about the next systemic shock.

To remain agile, it is important to vary the hypotheses and thinking frameworks. It is also essential to be able to exchange ideas with external partners and to draw on the work of others. ■

CRISIS MANAGEMENT AT AIR FRANCE

Jean-Yves CHAUMET
Operations Control Manager
Air France

SUMMARY

At Air France, crises have many origins and can be classified into three main categories: irregularity management, operating crises and major events. The crisis unit, activated in less than an hour, relies on dedicated rooms and specially trained and supervised staff.

At Air France, "we are constantly at risk" of a crisis, with many possible causes:

- Geopolitics (Ukrainian crisis, etc.).
- Meteorological (cyclones, etc.).
- Customer service (Covid).
- Internal cause (aircraft failure, ill pilot).

Exposure to risk is particularly high because of:

- A strong link with France (flag-bearer), and assimilation during geopolitical crises.
- A history of fragility (past crashes).
- High levels of media exposure and pressure.
- Air law.

CRISIS TYPOLOGY

In essence, a crisis is a situation where there is a significant deviation from forecasts. 3 categories have been established at AirFrance:

1. Managing irregularities

For example:
Flight delays, cancellations and diversions → management by the Operations Control Centre (OCC), active 24 hours a day, 17 professions, around 150 people, with a "shift manager".

2. Operating crisis

For example:
Long delays requiring personalised information for passengers
→ management by the CCO and the Commercial Coordination and Communication Unit (C4).

3. Major event

(i.e., damage to human life, property (aircraft, maintenance site, IT site) or reputation).

Example:
Loss of an IT application, accident, terrorism, health crisis
→ management by the crisis unit.

Example of the Covid crisis: the first cell lasted 4 months, and managed the drafting of the health protocol, the reduction of flights, and the repatriation of 400,000 French people in cooperation with the Ministry of Foreign Affairs.

OPERATION OF THE CRISIS UNIT

The crisis unit was activated in less than an hour.

ARCHITECTURE THE CRISIS ROOM

- Decision-making room.
- COMEX room.
- Anticipation room.
- Communication and other rooms.

MANAGING HUMAN FACTORS DURING A CRISIS

- Selection of on-call members based on stress management and interpersonal skills/"human factor" (as for pilots).
- Specific upstream training.
- Feedback and group follow-up with a psychiatrist. ■

CRISIS MANAGEMENT AT SUEZ

Emmanuel LENAIN
Major Projects
Security Director,
SUEZ Eau France

Preparing for tomorrow's crises means taking account of changes in our environment in real time and drawing on past experience to capitalise on and anticipate future developments.

SUMMARY

Suez works very early on to anticipate crises, right from the design stage of future facilities. In response, as well as consolidating its core business, Suez is strengthening its relations with the key stakeholders in crisis management (operators, institutions), developing more global methods and tools, and ensuring that its staff and resources are up to date.

At SUEZ, we work far upstream to integrate as many phenomena as possible, trying to work out the systemic consequences of each event and eliminate silo effects. Anticipation involves integrating safety and crisis management into the design of future facilities.
On the strength of our experience in crisis management as a strategic operator, we continue to train and monitor to ensure that we are not overtaken by external events. Although we have mastered our core business, it is always more difficult to anticipate external events.

WE ANTICIPATE TWO MAJOR FAMILIES OF NEW RISKS

• **The risks associated with climate change:** faster and more violent floods, heat waves coupled with severe droughts, storms, etc.

• **Technological risks:** Cyber, power and telecommunications cuts.

For these reasons, it is important to consolidate core business expertise and develop partnerships or special relationships with key stakeholders in the crisis: The French High Committee for National Resilience, the *Gendarmerie Nationale*, the Police, the Prefectures, the Defence Zones, EDF, etc. We have also developed partnerships with key stakeholders in security, such as ARDANTI and its digital twin, which enables us to simulate and validate vulnerabilities in our strategic facilities.

Aware of the systemic risks of future crises, with more violent, stronger, longer and more sudden climatic events, it is important to adapt our methods of anticipation. France is already an organised country, with a number of major plans that are often well implemented, but we need to go further.

THERE ARE TWO KEY AREAS OF FOCUS

• **Anticipating longer crises**: several weeks.

• **Anticipating greater and more systemic crises**, that require us to no longer work in isolated silos, but to evaluate and anticipate the collateral effects of an event, whether natural, human or technological.
This leads us to work with more global methods of analysis, to take up the basic tools of crisis management, such as multi-layer mapping, and to train in crisis management tools.

Two important points:

• **Resources:** dealing with long crises requires investment, and organisational constraints mean that it is not possible to deal with them alone.

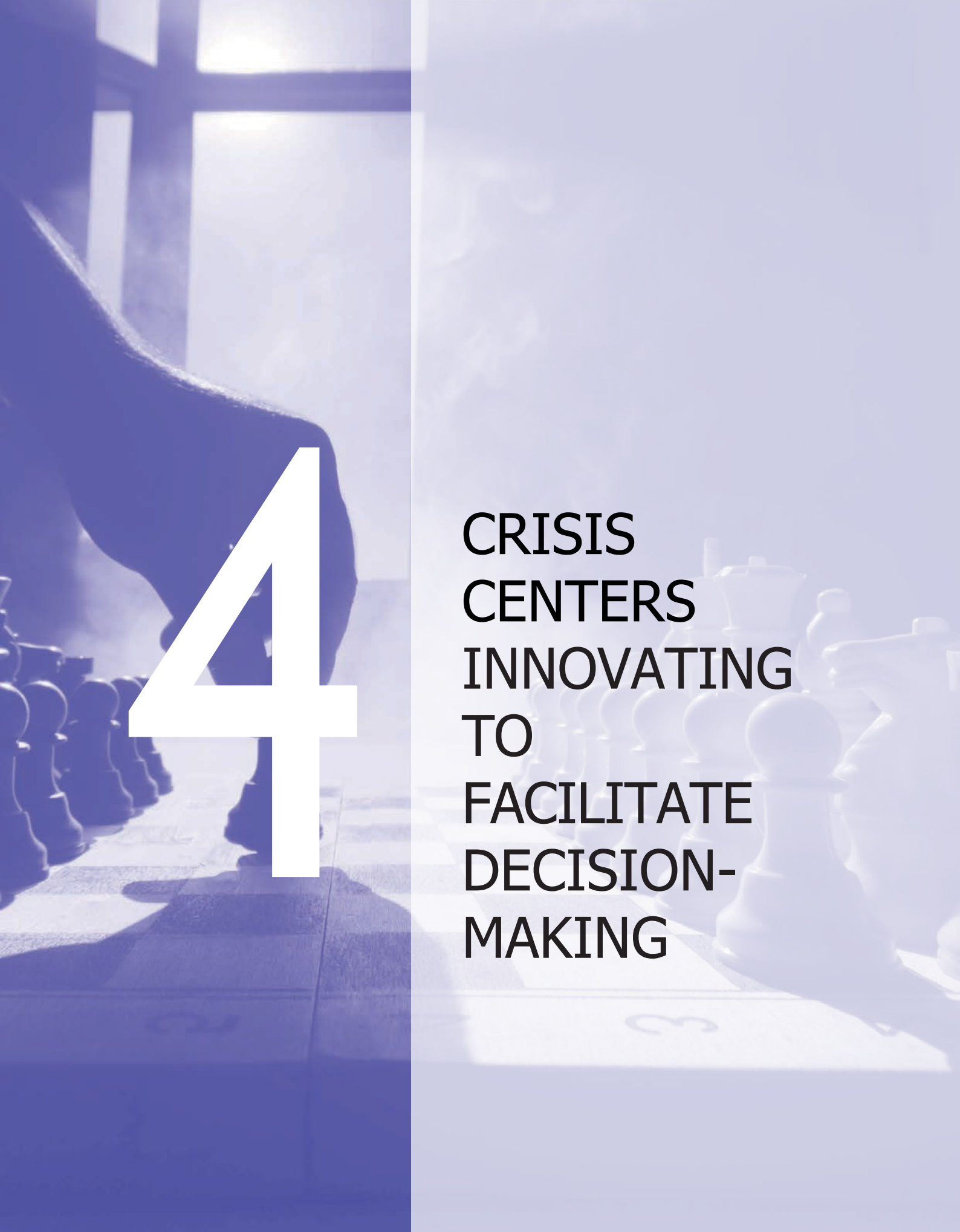
• **People**: training, support and commitment are essential for successful event management.

It is therefore important to build on these pillars:
• Anticipation — Preparation
• Training — Investment
• Training — Cooperation ■

ANTICIPATING TOMORROW'S CRISIS SITUATIONS

AND ADAPTING THE MEANS OF RESPONDING TO THEM

Participants in the Labo-Crise seminar, 28th of September 2022 at the Maison de l'Industrie, Paris.



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CRISIS CENTERS INNOVATING TO FACILITATE DECISION-MAKING

CRISIS CENTERS INNOVATING TO FACILITATE DECISION-MAKING

• FROM CRISIS ORGANISATION TO CRISIS MANAGEMENT ROOMS

Christian SOMMADE
General Delegate of the French High Committee for National Resilience

• COMMON DENOMINATOR FOR INNOVATIVE CRISIS ROOMS

Bruno MAESTRACCI
General Controller, "Seine et Marne" Department Fire Brigade (SDIS77)

• TOWARDS A NATIONAL PORTAL FOR INNOVATIVE CRISIS MANAGEMENT

Loïc MOCHEL
Consultant for MTECT SHFDS, Studies and Research Mission

• THE NEED TO ADAPT CRISIS UNITS TO INCORPORATE DIGITAL TECHNOLOGY

Emmanuel DESCOLA
Technical Director, Crisotech

• AI FOR CRISIS MANAGEMENT

Grégoire MARTINON
Reliable AI Scientific Lead, Quantmetry company

Aurore BAEHR
Reliable AI Senior Data Consultant, Quantmetry

• INITIATIVES TO INTEGRATE AI INTO CRISIS ROOMS

Sébastien TRUPTIL
Engineer - Researcher at CEA Tech Occitanie, in partnership with the Occitanie Region, head of the Criz'innov project

• EXPRESSIF®: TRUSTED ARTIFICIAL INTELLIGENCE FOR CRISIS MANAGEMENT

Laurence BOUDET Jean-Philippe POLI
Engineers - Researchers, Université Paris-Saclay, CEA-List

• R-IOSUITE®: A SOFTWARE TO SUPPORT DECISION-MAKING

Audrey FERTIER
Senior Lecturer (IMT Mines d'Albi)

• VIRTUAL REALITY FOR CRISIS MANAGEMENT

Audrey FERTIER, Aurélie CONGES, Alexis EVAIN, Guillaume MARTIN, Thibaut CERABONA, Robin BATARD and Frédérick BENABEN
Security and Crisis Management Axis of the Industrial Engineering Centre (CGI) of IMT MINES ALBI

• RESOCIO PROJECT: TOWARDS AN AUTOMATED ANALYSIS OF SOCIAL MEDIA PLATFORMS FOR IMPROVED OPERATIONAL MANAGEMENT OF NATURAL DISASTERS

Samuel AUCLAIR - BRGM, **Aurélie MONTARNAL** - IMT Mines Albi, **Anouck ADROT** - Dauphine Recherches en Management (DRM) - UMR 7088, **Sylvain CHAVE** - PREDICT-Services, **Cécile GRACIANNE** - BRGM

Christian SOMMADE
General Delegate of the French High Committee for National Resilience

FROM CRISIS ORGANISATION TO CRISIS MANAGEMENT ROOMS

SUMMARY

In this section, we delve into the correlation between the physical layout of a crisis room and its level of collaborative functioning. This principle is illustrated by various examples (France, Europe, USA).
The ergonomics of the crisis room and its equipment with crisis management tools must follow a functional logic: favouring rapid access, confidentiality, communication, etc.

Typical Federal Emergency Management Agency (FEMA) crisis management organisation chart.

ORGANISATION OF THE CRISIS ROOM

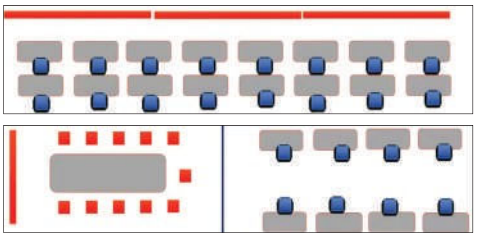
The design and organisation of crisis units and rooms vary from country to country. The NATO approach, which is based on a collaborative philosophy that is less hierarchical than in France, has several advantages. American crisis units are organised by support functions (ESF).

This system can be easily adapted to the specifics of the crisis (possibility of adding cyber modules, social networks, etc.).

What's more, the system is shared by federal, state and regional administrations, as well as major companies. All the stakeholders therefore share a common culture, which makes it easier for them to work together.

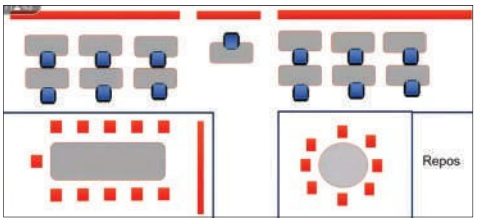
CRISIS ROOM TYPOLOGY

The organisation of the crisis unit is reflected in the crisis room and its equipment, as illustrated by the examples on the opposite page.



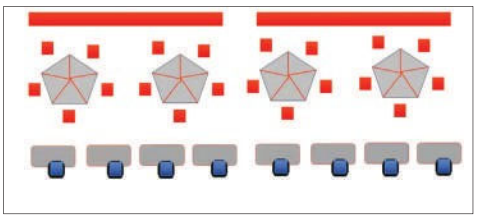
PARIS FIRE BRIGADE

A "call-taking" room, conducive to parallel working, with a traditional meeting room and an organic cell monitoring room, good for operations but less suitable for carrying information.



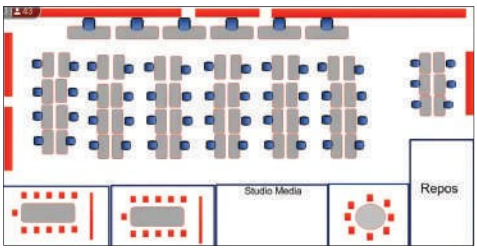
LILLE EUROPEAN METROPOLIS CRISIS ROOM

An Operations Room and a Decision Room. Different functions in close but separate spaces to ensure all the functions of crisis management.



EMERGENCY OPERATION CENTER (EOC) (LOUISIANA, USA)

New-generation multi-room. A room whose workstations are not allocated in advance, offering a highly flexible structure that can be adapted according to the crisis to be managed.



HARRIS COUNTY EMERGENCY OPERATION CENTRE (TEXAS, USA)

(120 posts for 2 million inhabitants; a "little cathedral", huge and very silent, which cost $20-25 million) or FEMA's National Response Coordination Center (federal level, where the President of the United States intervenes, 300 places, full equipment).

Same model: several workstations that can be allocated to different departments, with a supervision and rooms for summaries and decisions.

FUNCTION AND ERGONOMICS OF THE CRISIS ROOM

A crisis room must guarantee:

- Good coordination.
- Reactivity and rapid decision-making.
- Compliance with procedures.
- Sharing information.
- Confidentiality.
- Workstations providing access to specific resources (software, archives, etc.).

To achieve this, the architecture must be ergonomic:

- Size adapted to needs: at least 10 m² per user.
- Designed to minimise the mental burden on members:
  - Appropriate lighting, preferably natural (beware of walls of images which can be tiring).
  - Sound insulation.
  - Ventilation and temperature.
  - Adapted workstation (distance from screen, sit-stand desk).
  - Rest room.
  - Adapted to changes in equipment (as IS are changed every 4-5 years).

There is no one-size-fits-all crisis room, what matters most is that it is tailored to the operational needs of the crisis response team.

- Decision-making cells do not require any particular architecture, since they only need the data they need to make decisions.

They can even be semi-virtual or even virtual.

- Tools and organizations that are only put in place in the event of a crisis are often less well mastered.

It is preferable for them to be tried out in normal times, when there is no crisis. At ANSSI, for example, an operational monitoring unit meets on a weekly basis, to create habits and facilitate the transition to crisis management mode.

- The CIC still needs to be thought through (is it a strategic or operational tool, or does it need to be professionalised?) ■

COMMON DENOMINATORS FOR INNOVATIVE CRISIS ROOMS

Bruno MAESTRACCI
General Controller,
"Seine et Marne"
Department Fire
Brigade (SDIS 77)

SUMMARY

Crisis centres work in a network. It is not desirable to create a centre for crisis centres. It is better, in a democracy and in complex situations, to preserve the balance of power and seek to coordinate existing crisis centres and encourage dialogue between them.

The issue addressed here has more to do with crisis management intelligence than with crisis management.

In fact, the term "management" may lead people to think that this is a simple procedure, whereas the reality is much more complex, for a variety of reasons:

- Multiple, cross-functional crises.
- Interdependence of crisis management services, which cannot be reduced to operational sectors.
- Each crisis unit is unique.
- Each crisis unit is part of a wider system and is unique in terms of its missions (informational, operational, anticipation, etc.) and its cultural environment (depending on the professions that make it up, and the risks specific to its area).

So there is no "recipe" for crisis management, nor is there a model unit built *ex nihilo*.

That's why the term crisis management intelligence is preferable.

A MAJOR CHALLENGE IS TO "TO 'LINK' CRISES TOGETHER, TO IDENTIFY THE LINKS BETWEEN THEM AND TO INTERACTIONS.

Would a crisis centre of crisis centres be appropriate? Its role would be primarily one of coordination and anticipation, with decision-making powers resting with the units specialising in the areas concerned.

If it had a decision-making function, such a crisis centre would concentrate many powers, which is contrary to the principle of balance in a democracy.

Given the complexity and cross-disciplinary nature of crises, it is important for crisis centres to work together.

HOW CAN WE IMPROVE THE CONNECTIONS BETWEEN CRISIS CENTRES?

While there are still some technical difficulties, the problems are above all linked to human factors: difficulty in transferring information, lack of coordination, reluctance to collaborate, etc.

MORE SPECIFICALLY, A NUMBER OF ISSUES HAVE BEEN IDENTIFIED

A culture that is highly segmented by business line, sector, community, local area, etc. This highly siloed way of working makes it harder for stakeholders to exchange information.

Recommendations

- Integrating different professions in crisis centres. Crisis management in the Netherlands is the most successful example, where soldiers, sailors, police and firefighters work together, initially to manage submerged waters.
- Develop relationships outside crisis periods between the various stakeholders and enable dialogue to learn from the practices of others (in particular crisis centres in different territories).
- More generally, to establish a climate of trust between the stakeholders, based in particular on shared values.

Lack of upstream coordination between crisis centres, particularly between centres at different geographical or hierarchical levels.

Example of the MH370 plane crash. The ASEAN crisis centre in Jakarta was not armed and was therefore unable to coordinate the regional crisis centres. In the end, there was no international coordination in the search for the plane.

As a result, China intervened, sending its ships into the territorial waters of neighbouring countries, against an already tense geopolitical backdrop in the region.

Recommendations

- Be humble about the limits of the crisis centre, about the impossibility of reacting as quickly as desired, about not being able to respond to every request. Take the example of the 2015 terrorist attacks.
- But also to develop a shared vision of crisis management and its limits, a collective sense of crisis management that goes beyond sometimes simplistic definitions.

Example: if the ASEAN crisis unit was not armed, it was because its missions concerned only natural risks. A less rigid stance would have enabled the crisis unit to be activated to coordinate international research. ■

TOWARDS A NATIONAL PORTAL FOR INNOVATIVE CRISIS MANAGEMENT?

Loïc MOCHEL
Consultant for MTECT SHFDS, Studies and Research Mission

SUMMARY

In order to deepen relations between crisis managers and the world of innovation, it would be useful to develop a national crisis management solutions portal, with a space devoted to experimentation, where needs or requests could be expressed and solutions presented.

HOW CAN WE FIND INNOVATIONS THAT RESPOND IN A RELEVANT WAY TO OUR NEED FOR CRISIS MANAGEMENT?

In the age of the Internet, a search engine is of course an indispensable ally. But there are other ways of doing things in professional life, which are littered with opportunities to discover one that could add value to the crisis management process. Seminars(1), interviews, trade fairs(2), conferences and collaborative projects are just some of the opportunities.

IS IT POSSIBLE TO BRING CRISIS MANAGERS AND INNOVATION CLOSER TOGETHER?

At least two existing initiatives are attempting to answer this question.

The first, in France, is supported by the SAFE competitiveness cluster through its catalogue of solutions(3).

The second, in Europe, is the Portfolio of Solutions, set up as part of a European project (DRIVER+5).

The aim of these two initiatives, in different formats, is to enable solution providers to publicise their proposals and specify the need(s) they meet.

A PREREQUISITE FOR SELECTING AN INNOVATION IS IDENTIFYING THE NEED.

Looking for innovation means looking to meet specific needs. Therefore, the crisis manager needs to ask himself some specific questions:

- What problems should be solved?
- What gaps need to be filled?
- Which function should be improved?
- What performance can you achieve?

And he must ask himself these questions, remembering that he is acting within the framework of a particular organisation.

This point broadens the notion of need and raises other important questions. What skills does the organisation have? Will these skills enable it to work effectively with innovation? Is the innovation compatible with security requirements?

When it comes to digital innovations, the issue of data and how it is governed within the organisation is becoming increasingly important.

Finally, what is the ecosystem of tools within which we are seeking to integrate the innovation? Will the innovation be able to communicate effectively with the other tools?

(1) The Labo-Crise is a perfect illustration of this.
(2) One example is the "Innovation Trophies" organised each year as part of the Secours Expo trade show.
(3) The solutions catalogue listed 56 solutions in November 2022. www.safecluster.com/catalogue-de-solution/

Furthermore, introducing an innovation into an organisation means breaking with a pre-existing process, with the inevitable resistance to change that this entails. We therefore need to think about the strategy for implementing this innovation.

ONCE THE NEED AND THE INNOVATION HAVE BEEN IDENTIFIED, THERE IS STILL ONE OBSTACLE TO OVERCOME.

How can the reliability of the selected solution be demonstrated in real-life conditions?

It therefore seems appropriate to set up a system of experimentation, which is useful in several respects: to test an innovation, to compare innovations and, for a solution provider, to have the elements needed to bring his in-novation to maturity.

As an extension of the catalogue of solutions proposed by the SAFE competitiveness cluster, and in the same spirit as the Portfolio Of Solutions, wouldn't it be useful to have a national crisis management solutions portal?

A portal that not only allows solution providers to propose their solutions, but also crisis managers to express their needs, with a space dedicated to experimentation to test how a need meets a solution? ■

THE NEED TO ADAPT CRISIS UNITS TO INCORPORATE DIGITAL TECHNOLOGY

Emmanuel DESCOLA
Technical Director,
Crisotech

SUMMARY

Interviews with stakeholders revealed that that a crisis management tool must first and foremost fulfil basic functions such as mapping, alerting, maintaining records and sharing information. To work on detecting weak signals, and then use AI, you need tools for processing masses of data that are sensitive to anomalies (e.g. social networks). Used initially in a calm context to familiarise ourselves with how they work, we can then switch to a crisis context. But the virtual crisis room also implies a change of organisational paradigm: the need for everyone to be present on the same site is no longer relevant.

With 10 years' experience, Crisotech is a consultancy specialising in crisis management, hot and cold support, tabletop and full-scale crisis exercises, media pressure, and now the development of crisis management tools.

PROTOTYPING WHAT COULD BE A CRISIS MANAGEMENT SUITE

With all the different functions included in a crisis management cell today, the basic question remains. What could be useful in a crisis management cell: prototyping a handrail, a dashboard, etc.?

Secondly, these prototypes should be tested with crisis managers, trying to achieve a mix of public and private stakeholders.

We've heard a lot about AI, but we're still a long way from being able to integrate it in France today. On the other hand, there are a lot of crisis units that are not equipped with basic tools (such as handrails).

Interviews have highlighted the essential functions that this tool could have:

- **The alert** (a dashboard) to have a clear and shared representation of the situation.
- **Cartography**, because today it is central: geographical cartography (GIS) but also network systems.
- **Reflex cards and plans.**
- **A shared handrail.**

But we ruled it out (because it wasn't technically ready):

- Integrating a Retex component into the tool. Structuring data and creating a history is complicated because there is often not enough time to provide feedback after a crisis. And to feed an AI, you need a huge number of crises.

In France, cells need to be adapted to incorporate digital technology: the current 4 functions may no longer be appropriate. New functions need to be created so that digital tools can be added. The detection of weak signals is relatively accessible today, particularly from open sources. We can also do semantic detection by monitoring social networks and creating alerts. All this is accessible:

- This is an investment that companies and public authorities are not ready to make. A crisis is perceived as a one-off event and the tools are used on an ad hoc basis. The challenge is therefore to design tools that can be used in times of crisis as well as in times of peace to detect incidents and weak signals, and which can then be used as a crisis management tool.
- Crisis managers don't know how to use the tools at the time of the crisis, so we need to use tools that they're used to using, such as WhatsApp, Waze and so on.

This issue needs to be resolved before we even think about integrating AI. Once these tools have been democratised, there will be AI, with structured data and secure green databases, of course. ■

AI FOR CRISIS MANAGEMENT

Grégoire MARTINON
Reliable AI Scientific Lead, company Quantmetry

Aurore BAEHR
Reliable AI Senior Data Consultant, Quantmetry company

SUMMARY

AI is already present in many fields (music, voice recognition, medicine) and is potentially useful for processing information in crisis management. To provide a framework for its growing use and prevent the associated risks (in terms of control, liability, use of data, etc.), the European Union is preparing a regulation, the AI Act. A number of material conditions still need to be met before AI can be implemented in an organisation: trained staff, archived data and software.

WHERE IS AI FOUND?

Spotify (music application)
Detailed music suggestions and recommendations based on the history of tracks already listened to.

Google Home
Voice recognition to control actions (weather, traffic, etc.).

Diagnostic aid for breast cancer
Analysis of images and historical data to predict with proven confidence.

POTENTIAL USE CASES FOR IA

- Analysis of information flows (Facebook, twitter, social networks): identification of weak signals and occurrences.
- Covid case counts by geographical area.
- Visual reconnaissance of at-risk areas using satellite imagery.

WHAT IS IA?

A brief history of AI: 2 dates to remember

- **1956**: birth of the term "Artificial Intelligence" at the Dartmouth Workshop in the USA and first definition of AI and its experimental field.
- **2012:** ImageNet competition: a Google researcher proposed a *deep learning* algorithm(1) for the first time. He won the competition hands down. Since then, AI work and performance have grown exponentially.

"An AI system is software that uses techniques from the broad categories below to generate output that influences the environment in which it operates:

Expert systems
One of the first IT technologies (set of business rules).

Machine Learning
For example, you can use the mail sorting system to classify undesirable mail.

Statistics
Used for weather models, etc. AI is the science of automating intellectual tasks: classifying, predicting, estimating, etc.

WHY DO WE DO IA?

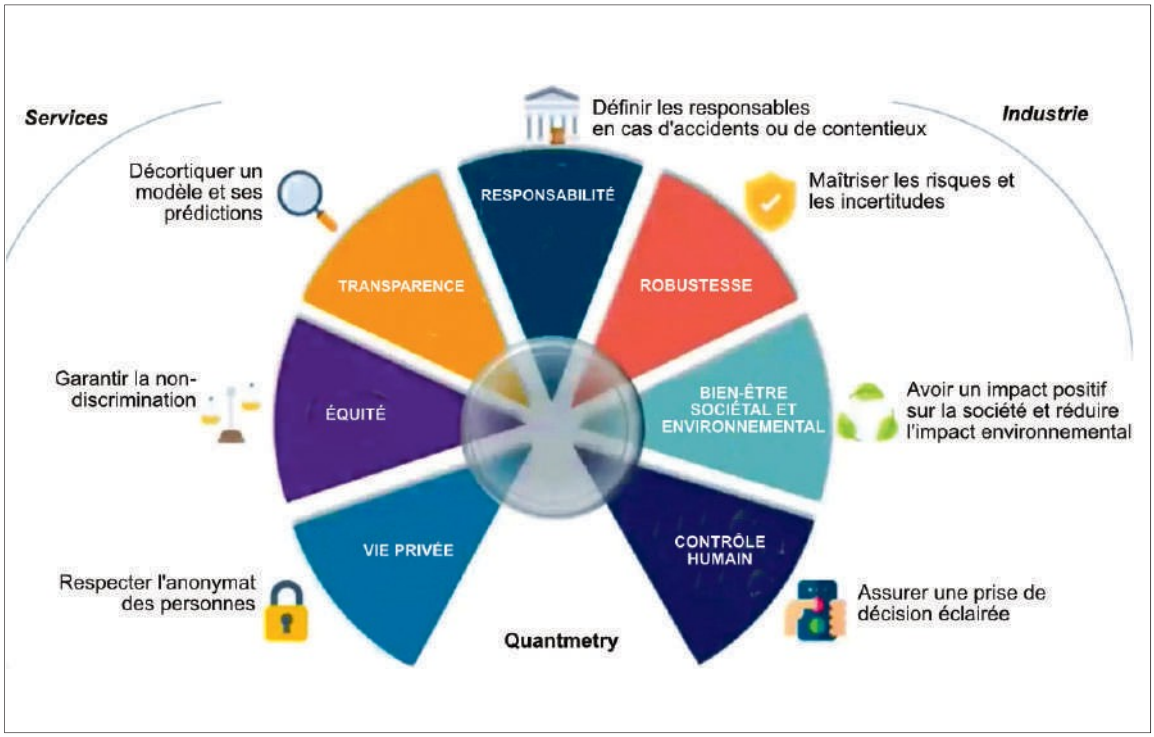
- **Benefits**

AI is an "autopilot" for processes. A process can be automated in whole or in part to minimise human variability (differences in process implementation due to human factors: hunger, mood, etc.) and to scale up and coordinate a large number of centralised operators.

- **Disadvantages**

The larger the scale and the more centralised the system, the more an error can be amplified and have consequences (amplification of bias and errors on a large scale), loss of responsibility in the event of an accident (who took the decision that led to the accident?).

(1) *Deep* Learning is one of the main *Machine Learning* technologies. With *Deep Learning*, we are talking about algorithms capable of mimicking the actions of the human brain using artificial neural networks. The networks are made up of dozens or even hundreds of "layers" of neurons, each receiving and interpreting information from the previous layer.



CURRENT EUROPEAN REGULATIONS CLARIFY ALL THE ISSUES WITH THE AI ACT.

The European Union is currently preparing legislation similar to the GDPR (General Data Protection Regulation) on data: the AI Act (an initiative that aims to frame artificial intelligence in a way that makes it trustworthy, human-centred, ethical, sustainable and inclusive), which will focus on the artificial intelligences that consume this data. 1st proposal for a regulation in April 2021.

Once the regulation has been promulgated, stakeholders will have 2 years to comply with it (same procedure as for the GDPR).

THE SEVEN ESSENTIAL REQUIREMENTS OF THE AI ACT

These requirements will apply to high-risk uses; for other uses, the regulations recommend the implementation of good practice.

The EU, but also other stakeholders, are working on trusted AI: the OECD (risk assessment grid), UNESCO (charter on ethical AI), certification under way at the AFNOR, labels under way on algorithms and AI-enabled projects, also in the voluntary sector.

PREREQUISITES AND LIMITATIONS OF AI

To create value with an AI project, you need data governance. In other words, all the resources the project team needs to access the data, ensure that it is usable (complete and up-to-date data), certified, secure and ethical.

The company's organisation needs to integrate new skills around the
We have also created a "data science" centre to host the AI project:

- A data scientist team working on the numerical modelling aspect.
- An IT team (from the historical team) that will enable AI to be integrated into the company.
- Business teams should not be left out of the AI project, because they are the data experts who understand the meaning of the data and the purpose of the project.

AI is not just about technology (the data scientist part) but also about organisation and business skills.

THE MATERIAL CONDITIONS FOR DOING AI

- To have data that is representative, certified, governed, documented, traceable and on which we can build real trust.
- Have a storage and deployment infrastructure (on mobiles, tablets, software). And a production team to do the deployment work.
- Having software that is adapted to the skills of users: easy to master, with a large community and adapted to the production expected by users.

PITFALLS TO AVOID WITH AI

- Historical bias in databases.
- Representativeness bias: when we have little data on a subject because it is poorly represented or covered.
- Cause and effect bias: a correlation is not a causal relationship.

CONCLUSION

According to the EU definition, AI is everywhere. Very simple and very complex algorithms can be found in everyday activities.

The challenges concern data, company organisation, skills and ethics. ■

INITIATIVE TO INTEGRATE AI INTO CRISIS ROOMS

Sébastien TRUPTIL
Research Engineer at CEA Tech Occitanie, in partnership with Occitanie Region, Criz'innov project leader

Sébastien Truptil is the project manager for the Criz'Innov project. It is in this capacity that he speaks in this article. Criz'Innov involves several research laboratories: the CEA, CEREMA, IMT Mines Albi, IMT Mines Alès and IRIT.

SUMMARY

AI is not yet used in crisis management for two reasons: on the one hand, the multiplicity of crisis situations, which means that many specialised tools are needed, and on the other, the uniqueness of each situation, which makes it difficult to learn.
However, human expertise needs to be capitalised on now, using simulation or expert system solutions.
We can take things one step at a time, starting with the creation of a French standard unifying the processing of location data (as there is an American standard).
One technical response is the Criz'innov project, which aims to bring together a number of existing solutions by a single system (interoperability).

In a world where digital applications are part of our daily lives, crisis management is one of the last bastions that has not yet taken the plunge into the use of digital technology, despite the blatant environment of using Artificial Intelligence (AI) applications.

This observation is the result of two specific features of crisis management that require us to approach the contribution of digital technology in a different way.

1. The first specificity…

…is the heterogeneity of the characteristics of risk areas makes it impossible to create an application that can manage all crisis situations.

The nature and speed of crisis situations require different responses. Forest fires are not dealt with in the same way as a civil or financial crisis. Even two crises of the same nature do not have the same characteristics depending on the geographical area, for example flooding from the Aude (rapid flooding) and flooding from the Loire (slow flooding).

As a result, digital crisis management will have to be based on a constellation of applications that interact with each other as required. This approach should be based on a micro-service architecture that takes account of interoperability issues.

It will enable each application to be used independently of the others, according to the needs of crisis managers.

In other words, each crisis management team will need to be able to select on the fly the applications that are relevant to the crisis in hand. This selection will be made by building a portfolio of applications in the same way as the Play Store® or Apple Store® for our mobile phones.

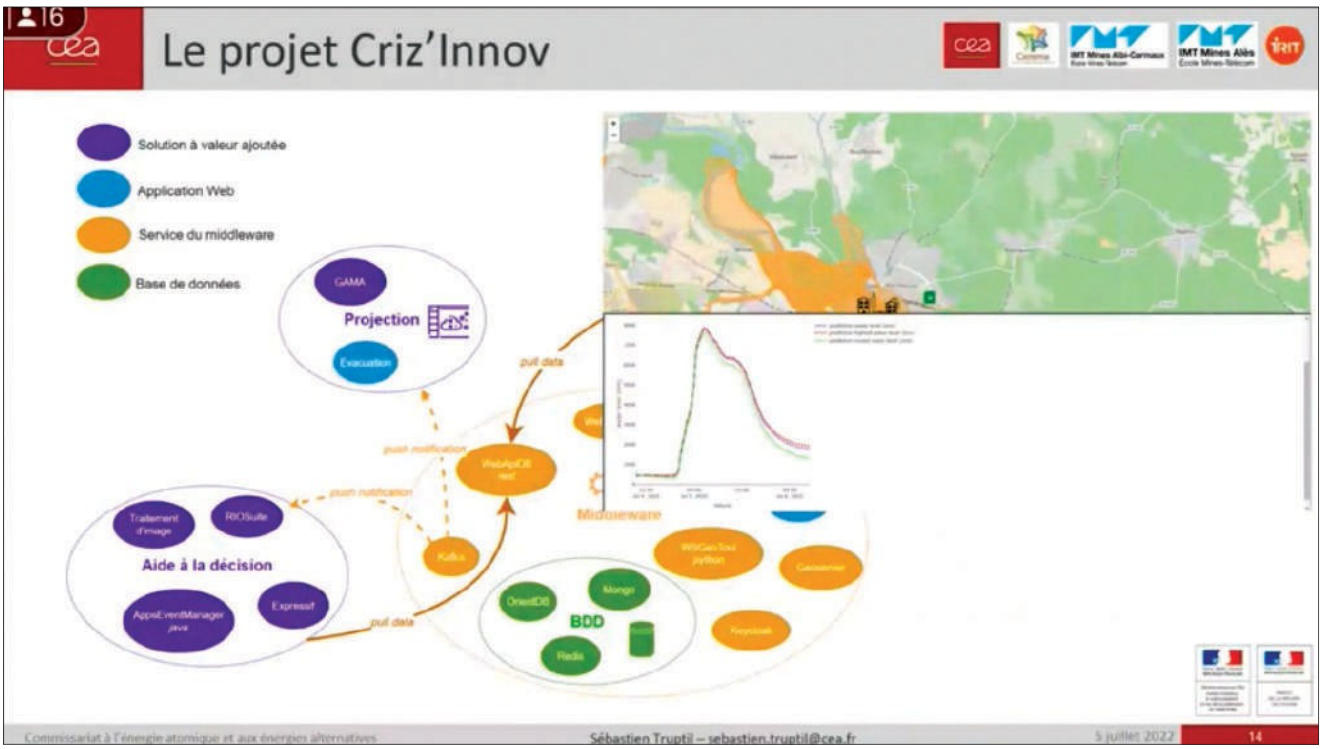
2. The second specificity…

…is the uniqueness of each crisis situation. This uniqueness makes it difficult to create Artificial Intelligence solutions based on self-learning (called *Machine Learning / Deep Learning*).

In fact, the lack of digitisation of crisis management, and consequently of available data, coupled with the number of past cases, slows down the creation of machine learning algorithms consisting of predicting a result based on a calculation of similarity with past cases.

Nevertheless, crisis management is full of human expertise that needs to be capitalised on through digital applications. This capitalisation can give rise to simulation or expert system solutions. By expert system, we mean the ability to explain human thinking in terms of the crisis management context. Advances in fuzzy logic hold great promise for crisis management.

In conclusion, there is a great deal of work to be done to provide effective digital solutions for crisis management.



However, it is important to make the right digital architecture decisions today, so that digital applications can be built and used iteratively.

In other words, let's advocate the method of small steps, while ensuring that each new step does not call into question the previous one. The first fundamental step in this approach should be to unify the information on the 'situation perception' level of the '*Situational Awareness*' concept.

This unification can only be achieved by creating a standard that respects French specificities, following the example of the EDXL (*Emergency Data eXchange Language*) standard in the United States.

THE CRIZ'INNOV APPROACH

Findings

Problem of technological maturity: research is at a low stage of maturity, whereas crisis management needs extremely reliable technologies in which people have confidence. Criz'Innov aims to support and help develop good research ideas and facilitate the transfer of these research results to the crisis room.

Among these results are innovations involving AI, in particular concerning prediction based on an analysis of input data: results on the current situation or indicators that help the manager to make decisions.

To build these predictors, we can use *Machine Learning* (which is based on a large quantity of data, such as images), but in the end we have little relevant data for a crisis whose characteristics we don't know.

In the crisis room, a great deal of human expertise is used, and it is this expertise that we need to capitalise on and learn to re-use to help the crisis manager (this is the path of "expert systems").

There may also be a hybrid solution with *Machine Learning* and an expert system.

When it comes to AI for crisis management, there are several possible solutions.

A multitude of solutions will help decision-makers to solve their crisis management problems.

And these solutions will need to communicate with other existing solutions/software (e.g. Vigicrues, Bison Futé, ORSEC portal, etc.) or other solutions developed by partners.

From there:

- Alternatively, managers are presented with a multitude of screens showing the results produced by the solutions, and it is up to the manager to identify and analyse these raw results at first glance.
- Or, we propose to create links between these results. The solutions will exchange data point by point to relieve the manager of the work involved.

The problem with this architecture is that every time a new solution is desired to be integrating, it requires re-establishing connections with all the others. And all these connections don't make it easy to capitalise on the data and update it to make it easier to perceive the situation.

The idea behind Criz'Innov is *Middle Ware*, the interoperability of solutions, the aim of which is to recover all the data from the solutions and unify them (parallel with an English translator) to be able to capitalise on all the data produced by the solutions, as well as what is entered by the manager.

This unified data can then be processed by *Machine Learning* algorithms.

Another advantage is that capitalising on the data produces a visual image of the situation that can be made available to people. ■

EXPRESSIF®: TRUSTED ARTIFICIAL INTELLIGENCE FOR CRISIS MANAGEMENT

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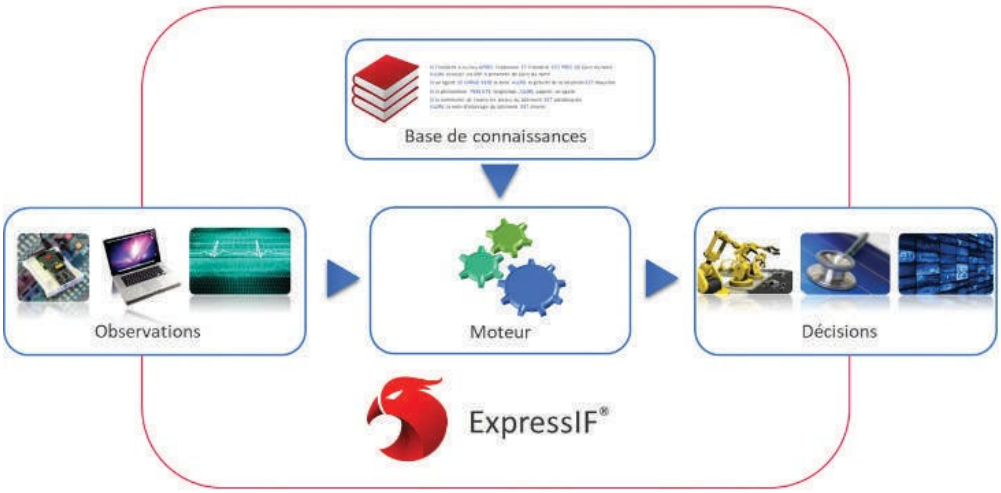
Jean-Philippe POLI
Research Engineers, Université Paris-Saclay, CEA, List

SUMMARY

ExpressIF® is a software technology for situation analysis and decision support; methodological knowledge is modelled before the crisis and the tool is fed during the crisis with situation data (particularly maps).
It has been used in the European ResponDrone project (flooding, fire) and in the Criz'Innov project.



When a civil crisis occurs, it is vital for the commander of the operations and the decision-makers involved to understand the situation in progress, to identify its scope and the issues involved, and to anticipate the various potential developments.

Domino effects must be taken into account.

All this helps to identify the appropriate level of command and to define the response strategy to be adopted for the crisis, to reduce its impact and contain its potential consequences.

Obviously, time is a decisive factor in fast-moving crises. In this context, new technologies can provide interesting functionalities, such as situation analysis and decision support.

ExpressIF® is a software technology that automates human reasoning while keeping humans in the loop.

This is an Explicable Artificial Intelligence (XAI) developed since 2010 at CEA List, a CEA Tech institute. This symbolic AI can be used to model knowledge based on interviews with experts, analysis of procedures or learning from data. This knowledge can be prepared during the crisis preparation phase.

More information
https://expressif.cea.fr

When a crisis occurs, the feedback engine can deduce recommendations, alerts or decisions from facts provided by human operators or identified automatically, from the analysis of time signals and/or geospatial data.

ExpressIF® can connect to a geographic information system and listen to a stream of information to extract what it needs.

As part of the European ResponDrone project, we simulated the flow of fluids and the spread of fire using topography and meteorological data to identify the cartographic issues most exposed to the risks of flooding and fire respectively.

ExpressIF®'s strengths include the ability to query temporal and spatial data to evaluate properties or relationships that are naturally vague or imprecise (such as 'to have occurred before' or 'to be close to'), and the ability to edit knowledge bases using a graphical interface.

As part of the Criz'Innov project, ExpressIF® is being used to improve the assessment of the impact of flooding on establishments open to the public, such as schools and campsites, depending on the time of day and the time of year.

Finally, we seek to automatically justify the results obtained in order to provide an explainable AI in which we can have confidence. ■

R-IOSUITE®: A SOFTWARE TO SUPPORT DECISION-MAKING

Audrey FERTIER
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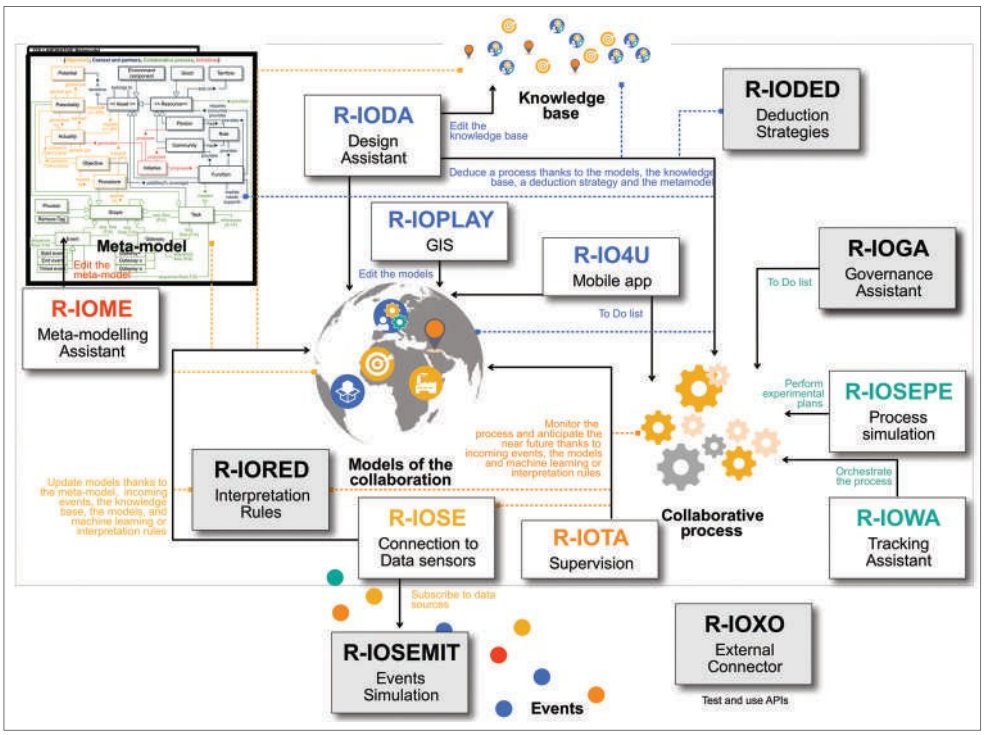
IMT
MINES Albi

SUMMARY

The R-IOSUITE ® tool is an open source research prototype dedicated to crisis management.



The aim of this software is to offer crisis managers the possibility of supervising their territory by maximising the information available in the shortest possible time and putting this information into perspective on a virtual reconstruction of the events in progress.

To do this, R-IOSUITE® interprets data from a wide variety of sources: open-data, available sensors, networks, etc. information systems. The data is interpreted using complex event analysis and artificial learning to update the virtual reconstruction of current events in real time and anticipate their possible developments.

It can also be used to deduce, orchestrate and supervise a response scheme adapted to events and their possible changes. ■

VIRTUAL REALITY FOR CRISIS MANAGEMENT

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Aurélie CONGES

Alexis EVAIN

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Robin BATARD

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SUMMARY

AI can be used to build a virtual crisis unit, enabling information to be shared between remote centres, in a user-friendly format: visual metaphors (pictorial representation of the situation) and augmented cartography; it selects significant data from numerous sources (including social networks), their updating and can produce anticipatory scenarios. The Criz'innov, R-IOSUITE®® offers tools along these lines at departmental level.

The crisis units are made up of representatives of the various parties involved in responding to the crisis. Their aim is to steer the response at political, strategic and tactical levels. They are largely responsible for the conduct of operations during the crisis response.

During the response, the use of data, coming from sensors, social media, open data or even the media, will enable organisations to be informed more quickly. As recommended by the SEQUANA exercise and the Sendaï action framework, managers could use this data to monitor the current crisis via an "augmented" map shared between them (*Common Operational Picture*) and updated automatically.

But the sheer volume and diversity of data to be processed creates a risk of information overload, exacerbated by the inevitable stress of a crisis situation: not only do we need to provide information, but we also need to improve decision-makers' situational *awareness*.

Shared operational situation tools exist. In the literature, the most common[1] [2] apply respectively to the management of flooding in the Middle Loire and operational support for soldiers in crisis or combat situations.

The use of virtual reality facilitates and demultiplies the possibilities of interaction with existing tools (AI for example), while giving access to visual metaphors that make it easier to understand huge quantities of information. Depending on the information needs of its users, virtual reality can represent reality (3D models of real sites) or free itself from reality (visual metaphors). There are many examples of its use.

On the one hand, 3D models can accurately represent the crisis scenario to facilitate the organisation of exercises[3]. **Figure 1** shows, on the left, a photo of the interior of Albi cathedral and, on the right, a photo of the 3D model of the cathedral produced as part of the EGCERSIS joint laboratory.

On the other hand, 3D models can represent the shared **operational situation** in a crisis unit[4], while limiting the risks of information overload. The use of a virtual crisis unit also enables stakeholders to collaborate across physical distances, from one department to another.

(1) A. Fertier, *"Automatic interpretation of heterogeneous data for modelling collaborative situations: Application to crisis management"*, Toulouse, France, 2018.
(2) M. Chmielewski, K. Sapiejewski, and M. Sobolewski, *"Application of Augmented Reality, Mobile Devices, and Sensors for a Combat Entity Quantitative Assessment Supporting Decisions and Situational Awareness Development,"* Appl. Sci. vol. 9, no. 21, Art. no. 21, Jan. 2019, doi: 10.3390/app9214577.
(3) A. Evain et al, *"A Framework for virtual training in a crisis context and a focus on the animation component: the game-master workshop"*, p. 10.
(4) A. Congès, *"Design and evaluation of virtual environments dedicated to crisis management"*, University of Toulouse, IMT Mines Albi, 2022.

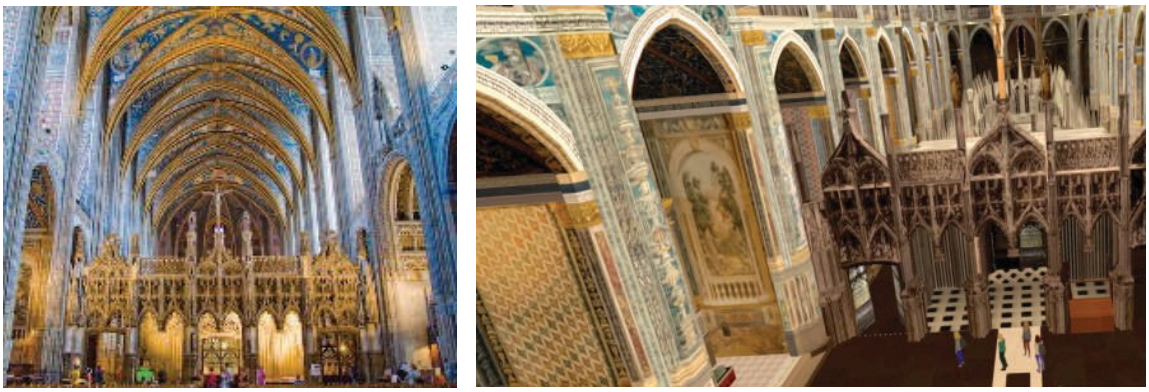

Figure 1 - *Virtual reality to copy reality. Here, Albi Cathedral.*

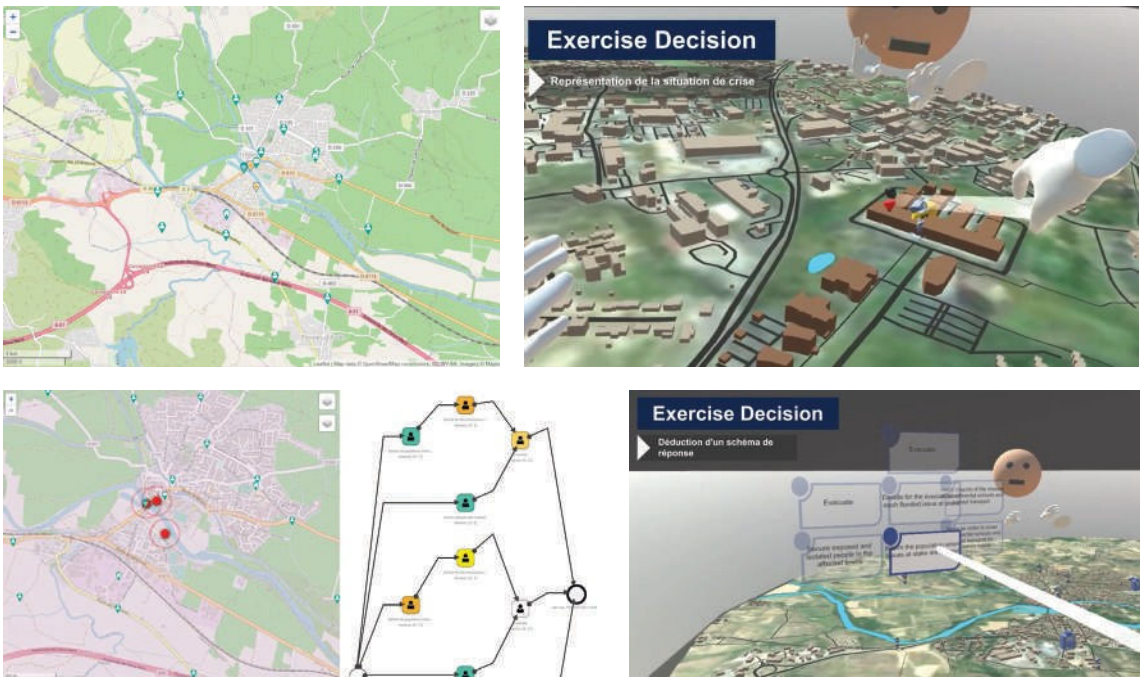

Figure 2 - *Virtualisation of a departmental crisis unit and a decision-making tool under development (R-IOSUITE).*

Figure 2 shows a departmental crisis unit and a decision support tool, R-IOSUITE® (5), virtualised to help crisis managers respond to a flood. The top line shows the shared operational situation. Below, a proposed response to the current crisis. (Work carried out as part of the Criz'innov project.)

(5) N. Salatgé, S. Rebière-Pouyade, J. Lesbegueries, and A. Fertier, *"R-IOSuite V2021.08.01 [Computer software]"*. IMT Mines Albi, http://r-iosuite.com/, CGI, 2021. [On line]. Available at: http://r-iosuite.com/

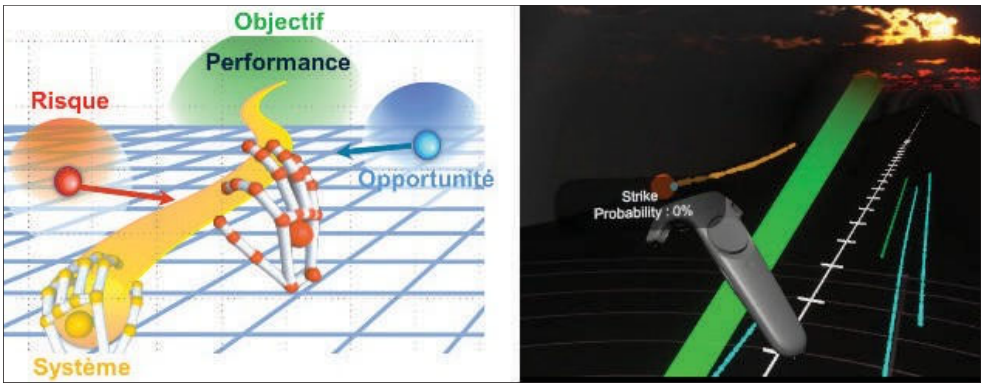

Figure 3 - *Sensory metaphors to represent a goal, risks, opportunities and the current performance of the supervised system.*

Finally, sensory metaphors can be used to represent abstract information. **Figure 3** illustrates their use in a decision support environment. This tool, called POD (*Physics of Decision*)[6], visualises the anticipated effects of risks or decisions in the form of a trajectory. This tool was designed as part of the joint SCAN and SIREN laboratories.

DEVELOPMENT PROSPECTS

There are many ways in which virtual reality can be used for crisis management.

From a technological point of view, if virtual reality follows the same trend as information technology, computers and smartphones, virtual reality headsets will soon weigh as much as a pair of spectacles, at a reasonable price, with the software we need for our daily lives.

From an institutional and industrial point of view, virtual reality and, more generally, immersive technologies open up a cross-disciplinary avenue of development for the use of decision support tools, artificial intelligence tools, shared operational situation tools and crisis cell anticipation tools.

The aim is to use relevant sensory metaphors to facilitate the understanding of complex and dynamic situations. ■

FINANCING

Supported by **the IMT Mines Albi CGI,** this work on the use of virtual reality to assist decision-making in crisis situations has been funded by the joint laboratories:

- **EGCERSIS** (ERDF funding from the Occitanie region and *Immersive Factory* and *Report One*)
- **SCAN** (with *Scalian*)
- **SIREN** (With *Georgia Tech*)
- **The DECAPOD project** (with SHFDS)
- **The Criz'innov project** (financed by the Prefecture of the Occitanie Region and coordinated by the CEA)

(6) F. Benaben et al, *"Instability is the norm! A physics-based theory to navigate among risks and opportunities"*, Enterp. Inf. Syst. 2021, doi: 10.1080/17517575.2021.1878391.

RéSoCIO PROJECT: TOWARDS AN AUTOMATED ANALYSIS OF SOCIAL MEDIA PLATFORMS FOR IMPROVED OPERATIONAL MANAGEMENT OF NATURAL DISASTERS

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SUMMARY

The ReSoCio project is an ANR project involving four partners: BRGM (coordinator), IMT Mines Albi, Predict-Services and the University of Paris-Dauphine, in conjunction with crisis managers. Its aim is to integrate Twitter data into knowledge bases in order to characterise rapid-onset phenomena (flash floods, earthquakes) in real time and provide decision-makers with information. Its unique feature is that it is based on the proven platforms of the first three partners.

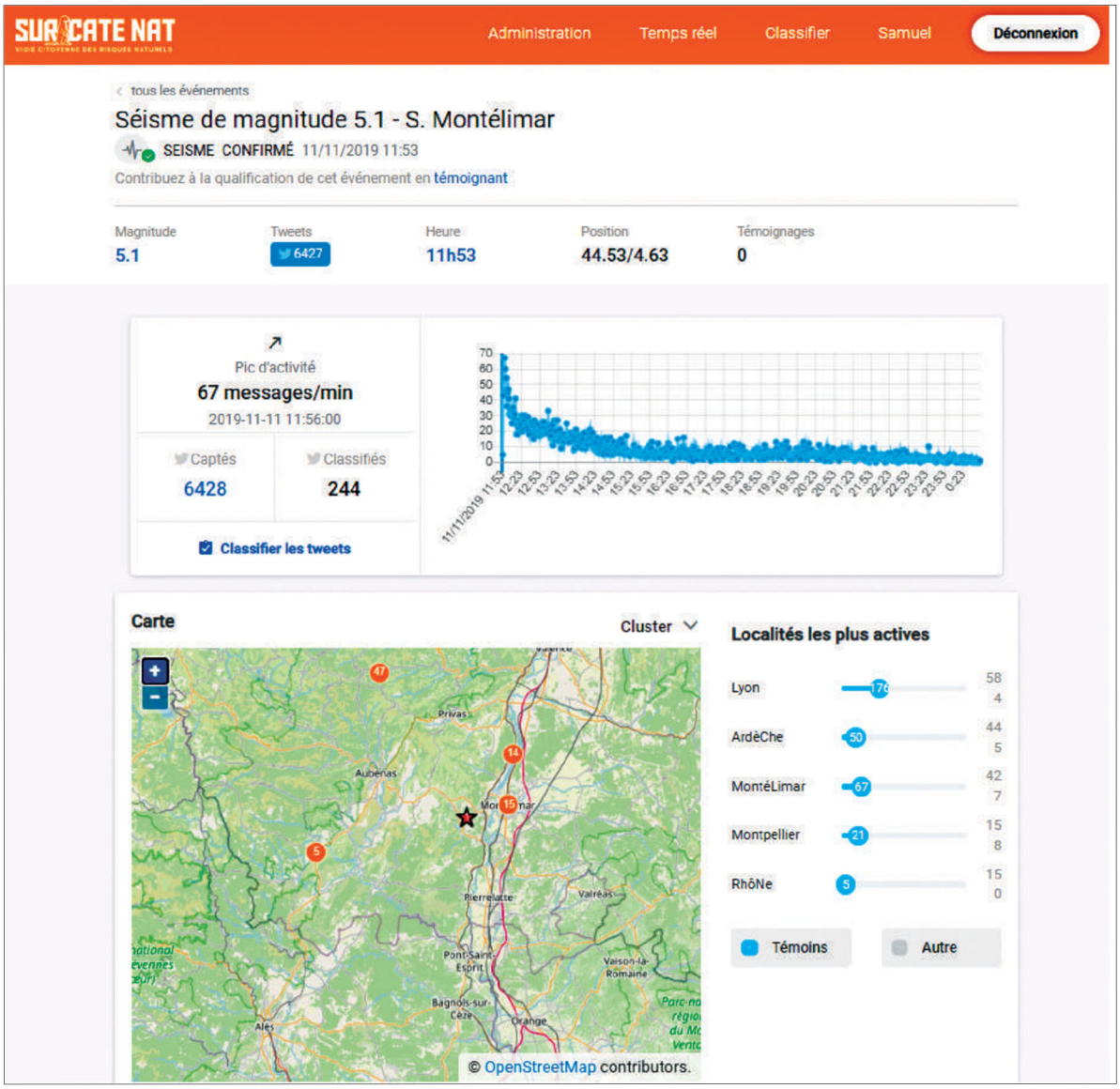
https://resocio.brgm.fr

Co-funded by the French National Research Agency (ANR), the RéSoCIO project aims to propose a tool-based approach to demonstrate the value and feasibility of automated use of Twitter data in the context of a natural disaster crisis, focusing on flash floods and earthquakes.

Particularly suited to fast-onset phenomena that take the authorities by surprise, this line of research is a way of providing crisis managers with consolidated information.

The project has 4 scientific partners: BRGM (project coordinator), IMT-Albi, PREDICT-Services and the University of Paris-Dauphine.

It is backed up by an operational partnership made up of key crisis management structures, with representatives of national (DGSCGC, MTES), zonal (EMZ Sud), departmental (SIDPC Alpes-Maritimes and Var) and municipal (town of Cannes) authorities, as well as emergency services (SDIS Alpes-Maritimes and Var).



Overview of activity recorded on Twitter after the Le Teil earthquake on 11 November 2019, via the SURICATE-Nat platform (© BRGM)

RéSoCIO's general objective is accompanied by the removal of a number of technological hurdles, the first of which concerns the ability to provide information rapidly, which means that tweets must be analysed with other types of exogenous data that are readily available (output from meteorological models, earthquake characteristics, etc.), and that the analysis process must be automated. to enable continuous "on-the-fly" processing.

Another barrier to be overcome is the acceptability of this type of contribution and its potential usability in a real context. This stems from the uncertain nature of the adoption of innovative tools, which can only be reduced by taking the organisational context into account.

© RéSoCIO

User workshop at Entente Valabr

On this basis, RéSoCIO proposes a cross-disciplinary analysis of the way in which Twitter data can be exploited by crisis practitioners, with the main innovative feature being the ongoing identification of algorithmic and organisational mechanisms.

The proposed work involves various stages: capturing, analysing and then merging tweets with other data and knowledge.

In a research landscape with a plethora of non-permanent platforms, the project's main specificity is to rely on 3 existing, robust and complementary platforms to offer innovative and interoperable webservices that can be used directly in third-party tools:

BRGM's SURICATE-Nat platform for collecting and enriching tweets and for detecting events.

ITM-Albi's RIO-Suite platform to characterise the crisis situation,

and the WikiPREDICT tool from PREDICT Services for decision support.

Begun at the start of the project in 2021, the discussions and workshops organised with the members of the user committee have enabled a detailed characterisation of the information needs that RéSoCIO can meet, as well as identifying the associated organisational constraints.

At the same time, work is being carried out to automatically extract references to locations, filter messages according to their relevance, and extract the useful information they contain.

A first version of these algorithms, based on artificial intelligence approaches, is ready to be integrated so that PREDICT-Services can test them within its monitoring and analysis unit from spring 2023. ■

5

INSIGHTS DRAWN FROM LABO-CRISE'S RESEARCH

INSIGHTS DRAWN FROM LABO-CRISE'S RESEARCH

SUMMARY OF THE **"SCENARIOS"** WORKING GROUP

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Marie CARREGA - ONERC

Emmanuel LENAIN - SUEZ

Arnaud GANAYE - Cerema

Mathieu COUSIN - AXA Assurances

• EPILOGUE (OR RETEX OF THE RETEX)
CRISES AS A CONCEPTUAL DRIVER FOR PUBLIC ACTION TRANSFORMATION

Agnès AUDIER - ENS, Mines engineer, Public policy expert

INTRODUCTION: FOSTERING COLLECTIVE INTELLIGENCE IN A CRISIS

Éric BARBAY – MTECT SHFDS

The purpose of this section is to report on an original experiment carried out within Labo-Crise, the aim of which is to better integrate the complexity of events into the crisis centre's output, particularly the situation report.

To do this, we brought together a group of around thirty crisis managers from a variety of backgrounds and asked them to work in a limited time on a hybrid heatwave-drought scenario, with the addition of a cyber-attack.

Our hypothesis is as follows: to deal with complexity, it is in our interest to broaden people's usual way of thinking by encouraging collective intelligence within the group.

Faced with a situation that runs counter to our usual plans, our efforts in the crisis centre tend to be directed towards simplification, calling on sectoral skills and seeking rapid results; to coordinate the stakeholders, we expect the crisis director to provide strong leadership. The result is a silo system in which cross-sectoral coordination, which is the sole responsibility of the crisis manager, is truncated.

The complexity that we are seeking to reduce does not disappear, however: it manifests itself in multiple gaps in the plans.

These are called uncertainty, emergencies and contradictions(1) and they affect the way crisis management works in a way that can be difficult to control. In this context, like water seeping into buildings, it is frightening.

We believe that this fear is partly the result of inadequate organisation. Instead of trying to close the gaps opened up by complexity, we propose to bring together the experts assigned to crisis management in a single, decompartmentalised group, with a collective intelligence. The interdependencies between sectors will be expressed and taken on board by the group with a view to arriving at a systemic and more faithful vision of the situation.

The difficulty lies in reconciling the practice of collective intelligence with the pressure of urgency inherent in the crisis.

That's why it seemed useful to equip the collective intelligence group with a protocol to accelerate its production, implemented under the guidance of a facilitator, a sort of mediator.

In order to evaluate the outcomes within our experiment, three groups were organised, each with a specific discipline: one group working in isolation (traditional organisation, one group based on "pure" collective intelligence (i.e., free to organise

(1) Please refer to Laurent Bibard's article *"Complexity of the world and crisis management"* on page 20.

itself) and another collective intelligence group guided by the above-mentioned protocol.

The exercise then consisted in comparing the work of the three groups according to two criteria: the quality of the group dynamics and the ability of each group to reflect the complexity dimension in their work ("points of view"), in particular the consideration of sectoral interdependencies.

In the end, the intercomparison exercise showed that in order to reconcile the dual constraint of keeping the group's thinking "on the alert" and assimilating the complexity, it seems advisable to organise collective work phases in which the group is provided with a "toolbox".

These can alternate with working in "silos", which becomes richer and more integrated. These can alternate with working in "silos", which becomes richer and more integrated.

The following articles give an account of the aspects of our experiment, particularly regarding:

- how groups function in terms of collective intelligence and how exchanges are regulated,
- the production of visual aids describing the interdependencies, to be adapted to the situation at the time of the crisis.

Enjoy your reading! ■

EXPERIMENTING WITH COLLECTIVE INTELLIGENCE IN THE CRISIS ROOM

Géraldine DUCOS

Hripsimé TOROSSIAN

Patrick RUESTCHMANN

Ludovic PINGANAUD

Samuel AUCLAIR

Cléophée THOMAS

Report on the experiment carried out on 9 May 2022 as part of the LABO- CRISE and presentation of the resulting recommendations.

SUMMARY

In order to gain a better understanding of the systemic nature of crises, the LABO-CRISE has sought to identify the conditions that encourage collective intelligence within a crisis situation analysis unit ("situation"unit). The experiment reported here compares the functioning and feedback of three groups simulating such a cell, each operating based on a specific protocol. The operational recommendations included the need for a trained facilitator and a shared visualisation tool.

STARTING POINT

The observation that cell production
The terms "situation" and "crisis" are incomplete descriptions of systemic crises.

The **"situation reports" (SPs)** produced are most often sectorial summaries juxtaposed in the same document.

They are adapted to high-intensity crises, impacting a limited number of activities traditionally monitored by the ministries, with a linear and limited evolution over time, ultimately leaving the structure of the defence organisation unchanged.

In recent years, we have witnessed a series of slow-onset crises (of medium to low intensity), with multiple, non-linear and intersecting effects (cascade effects).

These are systemic crises, which require us to adapt our assessment grid.

In such crises, cross-sectoral dialogue is necessary to enrich the sectoral SP and present decision-makers with a systemic analysis of the situation in which sectoral interdependencies are taken into account, the underlying issues highlighted and the appropriate responses identified.

To this end, it is worth devising methods for mobilising the collective intelligence of the group of experts, adapted to the emergency context typical of crisis rooms.

EXPERIMENTATION

The aim is to identify the conditions for producing a cross-disciplinary analysis of the situation in a crisis unit. The experiment organised on 9 May 2022, as part of the Labo-Crise, aimed to test three separate collective intelligence protocols, each designed to produce a cross-disciplinary PS based on the same elements of a heatwave drought scenario.

The 40 Labo-Crise participants were divided into 3 groups, each with a specific collective intelligence protocol.

FORMATION OF 3 GROUPS

(AROUND 10 PLAYERS PER GROUP)

- **Group 1 known as "BARRETTE"**

which reconstitutes the organisation of a situation unit with sectoral divisions (in charge of sectoral summaries) and a central coordinating unit (which centralises the summaries for the situation report);

- **Group 2, known as "FREE"**

where the players are free to organise themselves;

- **Group 3: "REINFORCED"**

where the players apply a reinforced collective intelligence protocol.

Within each group, the players are divided into thematic clusters that do not necessarily correspond to their expertise.

TIMING OF THE EXPERIMENT

When	What
1:00 pm	Welcome to the main crisis room and distribution of 3-colour "stickers" for each group. Facilitators wear the color of their group.
1:30 pm	Introduction in the main crisis room and feedback of the Labo-Crise sessions and expectations.
1:55 pm	Launch of the experiment, presentation of the context, the expectations and the team, the scenario (a geo-map, a map of the area, a map of the city, no Mind Map.
2:00 pm	Groups move to their rooms, except for the group that stays in the main crisis room.
2:00 pm	Installation, start of experimentation, the "facilitators" quickly introduce themselves, reminder of the 2 questions for the situ brief.
2:30 pm	The Facilitators remind the meeting that a v.0 status update is expected at 3:00 pm.
	Internal synchronization point for facilitators + DirEx + observers
3:00 pm	Announcement of the Cyber event, addition of the 3rd question to the brief.
	Adaptation of v.0 of the situation report and prodution v.1 by 3:30 p.m.
	Internal synchronization point facilitators + moderator + observers
3:30 pm	The Facilitators invite the groups who are in a position to do so to brief their status report v.1.
3:45 pm	Sequential group briefing (random draw) in the main crisis room.
4:15 pm	Move to the coffee break.
4:30 pm	Debriefing for participants and observers in the main crisis room.
5:00 pm	Remote intervention. pm
5:30 pm	End of the experiment.

It should be noted that these centres do not necessarily correspond to the departmental organisation in place:

- health and civil safety
- economy: agriculture, industry, services
- infrastructure and networks: transport, energy, water, cyber
- international relations and communication
- public order

Groups 2 and 3 are free to re-examine the division into 5 clusters.

Group 2 is free to organise itself as it wishes, or even to change its organisation by experimentation (unlikely given the length of time involved).

Group 1 operates according to the traditional organisation, respecting the 5 divisions mentioned above.

ENTERTAINMENT TEAM

- 1 moderator per group
- 1 principal facilitator
- 1 observer per group who observe without interacting with his group from the beginning to the end of the experiment.

GROUP RESOURCES

Players are given a short briefing on the initial situation; we are in 2025 and we consider that France is in a similar position to today and is facing the same challenges. No other documents will be available during the trial.

It is the knowledge, experience and ability to implement a form of collective intelligence within the proposed framework that are sufficient to carry out this experiment.

Each group has a "facilitator" for the two hours of the experiment.

Observers are present in the background and do not interact with the players, but only with the facilitators and the DirEx.

Groups 2 and 3 also have a framework that encourages collective intelligence.

For group 2, the "free" group, this framework is minimal: the facilitator is instructed to intervene during the SP development work only in the event of an important conflict; the players must self-organise.

For Group 3, the focus was more on regulating and guiding the exchanges. First, the facilitator was asked to ensure that there was a period of silence between two speeches, to encourage listening and reflection; then a co-reader and a graphic designer were appointed, each responsible for collecting the contributions and representing them on a board visible to all.

As an option, LEGO bricks are available for the groups to use to design their own re-presentations; a map can also be drawn up.

A DELIVERABLE THAT REFLECTS THE EFFECTIVENESS OF A COLLECTIVE INTELLIGENCE PROCESS

A 5-minute oral briefing to a High Authority followed by 5 minutes of questions. Venue: main crisis room.
The brief is produced by a spokesperson with optional support from the group members. In view of the duration of the experiment, it is encouraged to minimise the effort involved in producing the presentation material and to opt for a production schedule that is as short as possible.
"It's a 'low-tech' approach that puts the emphasis on substance rather than form. However, the use of geographic mapping to support the brief is recommended but not compulsory.

SITUATION UPDATE (PS)

It describes the group's perception of the situation, with the aim of informing decision-making and anticipation, and is used to answer questions:

- **What are we talking about?**

The challenge is to understand the situation as a whole, across the board: direct and indirect consequences (case-by-case effects), issues, indicators.

- **What answers are available?**

The problem is to identify the measures that are pre-viewed in the plans and can be activated (or other measures).

- **How much is unknown? What remains out of control?**

The aim is not to limit the representation of the situation to known elements, but to broaden the scope of the analysis. In this case, a cyber-attack is introduced after an hour's exercise, and the participants are asked to answer the following question: **How does this cyber-attack jeopardise/destabilise the course of current or future actions?**

THE FOCUS

The deliverable is a status report, not a forward-looking document. The groups do not propose decision-making options but can suggest avenues/themes to be explored and draw attention to grey areas/risks.

SETTING UP THE EXPERIMENT

"Today is Saturday 28 June 2025. Since the winter of 2021, our country has been experiencing major climatic disturbances, leading to a severe heatwave and drought.

Faced with the multisectoral consequences of this crisis, the Prime Minister decided last night to activate a crisis unit (CIC) after receiving clear objectives from the President of the Republic:

- *protect the population,*
- *preserve the economy,*
- *limit social and societal disruption,*
- *develop coherent action with our European partners.*

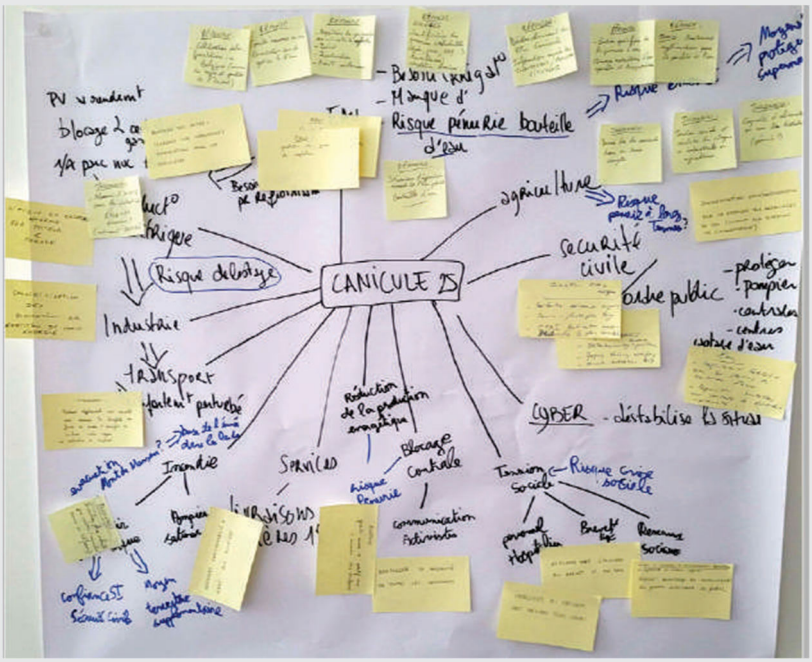
You are assigned to the situation unit, which is part of a department that also includes a decision-making unit, an anticipation unit and a communication unit. You're in a pivotal position, because you're the one who'll be asked the question. "Where do we stand? And you cover every sector: transport, energy, the economy, health, social affairs, security, international relations, etc.

The situation is deteriorating with just a few days to go before the end of the school year (decisions to be taken on school closures in the run-up to the end-of-year exams), and it is highly likely that the French President will address the French people in a few days' time.

You will now join your teams and experience the first 2 hours of your cell situation.

It is you, through your organisation and internal cooperation, who will give rhythm and above all meaning to the first deliverable from the crisis centre: your perception and assessment of the situation." ■

FEEDBACK GROUP 1 (BARRETTE)



1. FEEDBACK FROM PARTICIPANTS

The participants were surprised that the choice of roles had been made by the participants themselves.

They note the different backgrounds of each of them, which did not hinder the fluidity of the discussion despite the different working methods.

The main obstacle to exchanges seems to have been the configuration of the room and the layout of the participants, which was not conducive to sharing skills.

The group had some difficulty in understanding the exact instructions and deciding on the choice of deliverable, so they were unsure of the form throughout the game.

2. RETURN OF THE OBSERVER

The collective work proved to be very sequenced and lacking in exchanges, a direct consequence of the layout adopted in the crisis room, with the experts lined up on one side and the panel on the other. This face-to-face division may have hampered discussions on certain cross-cutting issues. The participants did not try to qualify the crisis or name a subject for debate, despite the cyber-attack, which could have led to an attempt to rethink the nature of the crisis.

The process of analysing the situation and prioritising the issues was quickly abandoned in favour of the question of solutions, in a context of uncertainty about the method to be adopted for the final report.

A range of subjects were discussed, including the treatment of vulnerable populations (EHPAD). The discussions were limited to "etiquette" subjects directly related to the field of expertise of the experts present. ■

FEEDBACK GROUP 2 (FREE)

1. FEEDBACK FROM PARTICIPANTS

The format of complete freedom given to the participants initially generated a climate of questioning and doubt about the objective of the exercise and the expectations in the feedback.

While this time for questioning may have been perceived as a waste of time, it also allowed for an extended round-table discussion, which was of paramount importance in highlighting what each person could contribute to the management of the crisis.

The participants discussed at length the method to be used and the priorities to be set.

A "peacemaker" gave a great deal of energy to the discussions, enabling progress to be made on the various issues.

While the final result was seen as decent and respectful of everyone's knowledge, the "zero leadership" method was seen as largely unproductive for managing a crisis of this magnitude.

2. RETURN OF THE OBSERVER

The absence of instructions and a pre-established framework refocused the organisation of the group on individuals, and the personality of each person played a major role. The distribution of tasks was a key moment in the game, based on individual skills which motivated the formation of sub-groups.

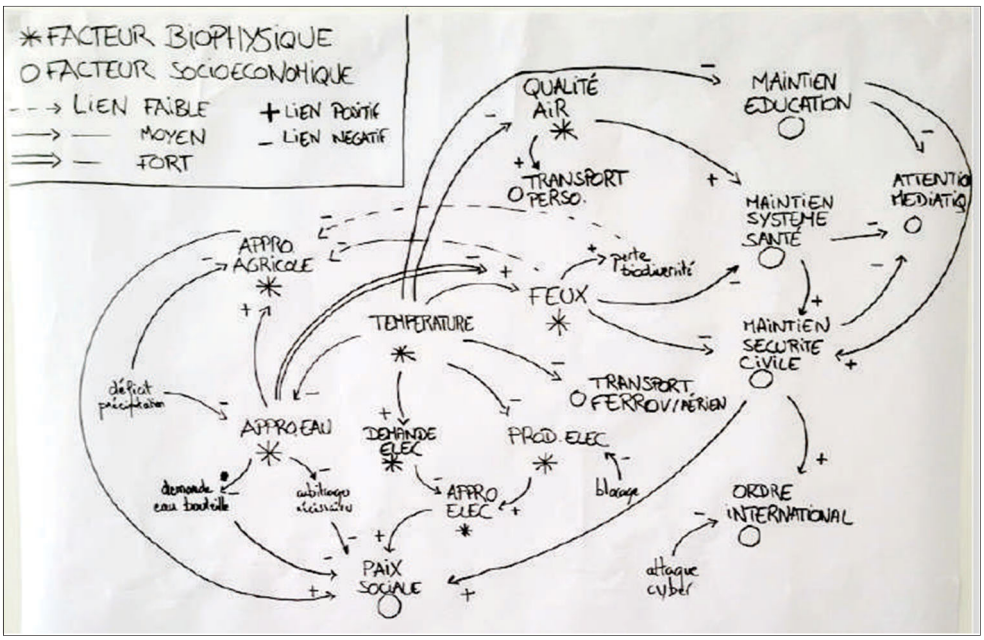
This work in sub-groups gave rise to a rather unusual posture for the bodies and faces: the players were not turned towards each other, but interacted mainly in groups of three, with one of them acting as a link with the rest of the room by wandering from group to group.

In addition, the appropriation of the space led the participants to adopt a more academic attitude.

The size of the room constrained the mobility and materialisation of emerging systems thinking: if a table emerged from the hand of one of the participants who was taking notes, half the room couldn't see it.

The group's behaviour proved to be highly exploratory: the participants engaged in several attempts, mobilising their intelligence on questions of point of situation, hierarchisation, spatialisation over and above questions of interdependence between themes. ■

FEEDBACK GROUP 3 (REINFORCED)



1. FEEDBACK FROM PARTICIPANTS

All the participants took an active part in the game, which led to the emergence of a highly collaborative dynamic.

Only one point of disagreement remained, and the others were quickly overcome.

The question of the facilitator's role in this dispute resolution remains unresolved; it seems likely that the facilitator encouraged the participants to keep their heads down and come to a rapid agreement among themselves before he intervened.

Although initially very precise, the instructions were quickly undermined; in particular, the 5-second pause between each speech was abandoned as too restrictive in view of the time constraint.

Finally, it was clear that the group was naturally structured around the analysis of interdependencies and the design of the plan to be submitted. The systemic methodology used was well suited to the exercise and to a clear understanding of the issues.

2. RETURN OF THE OBSERVER

By working together, we were able to move from an individual vision to an expanded vision of the crisis, creating an interplay that was conducive to identifying solutions.

The facilitation body responded to a mediation model and divided the game into several phases: a framing phase, a reframing phase, a co-production phase and a summing-up phase.

The trust between the players was really created during the co-production time, when the effect of the group was fully revealed in the management of ambiguities and uncertainties.

At the start of the game, the unknowns were dealt with in the form of questions and answers, before being the subject of a direct collective construction, achieved thanks to the confidence of each player in the argument put forward by the other.

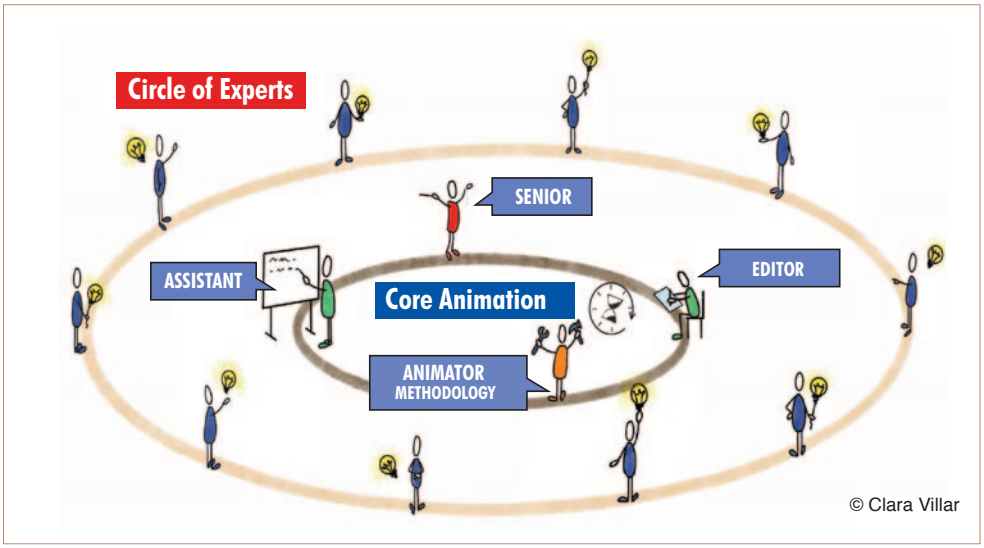
The group dynamic slowed down as soon as the cyber-attack was announced. The participants were out of breath by then, but managed to pick themselves up again for the wrap-up time, spurred on by the prospect of the end of the game, which acted as a performative effect. However, the wear-and-tear phenomenon led some of them to step back and relax their listening, while at the same time others took on more power in the discussion.

This natural shift in the relationships between the authorities in place has produced a myopic effect on certain sectors, whereas the Group's vocation is to open up the view.

During the summary, the argument put forward by the players who had put on the most weight as a result of wear and tear was the one that stood out.

Their legitimacy was respected, and the final result was consistent with the work previously carried out.

Crisis management ended up being de-territorialised: despite strong geographical focus of the discussions, the map of France was not used. ■



Anticipation cell diagram.

1. RECOMMENDATIONS FOR MOBILISING COLLECTIVE INTELLIGENCE IN THE CRISIS ROOM

Organisational prerequisites are necessary for the emergence of collective intelligence in the crisis room. The deployment of collective intelligence is based on trust between the participants and the control of the time available. In an emergency, organisational prerequisites will provide the climate of serenity necessary for the emergence of collective intelligence:

1) Define roles upstream and communicate them clearly to participants

Everyone needs to be able to situate themselves in the group and know the status of the others so that they can approach discussions without interfering questions.

2) Empowering everyone

It is important to instil a sense of involvement in the participants, by encouraging them to look beyond their area of expertise and consider the overall crisis situation and its final consequences, and by giving them the freedom to speak.

3) Putting in place the conditions to regulate trade

This means encouraging everyone to listen and speak up, especially those who are more reserved and/or less responsive than others, who need time to mature their thoughts, while controlling the pace of production.

4) A common reference framework

The aim is for everyone to be able to communicate in a language that everyone understands, based on a shared understanding of the situation that is "in the making".

2. RECOMMENDATIONS FOR IMPROVING THE PRODUCTION OF THE CRISIS UNIT'S SITUATION FUNCTION

We have identified 3 levers for dealing with a complex situation under time pressure:

1) A "facilitator" to facilitate exchanges and guide them towards the expected result

The facilitator is a person experienced in leading a group, who is familiar with the status of the participants and the methods of

crisis management. He knows when to intervene and when to stand back and let the maieutic process take its course. His role can be broken down into two main responsibilities:

• Encourage participants to speak freely and take responsibility for the group's output.

• Structure the exchanges between the participants and enforce the phasing of the intellectual process towards the expected production.

2) A method for analysing the expected result, the cross-functional situation point

Under time pressure, the reflection process needs to be guided by a methodology for effectively qualifying the objects of analysis. Defined upstream, this methodology must include:

• **a pre-analysis of the situation** to qualify the crisis and define its characteristic areas,

• **a shared display of the situation**, the cross-disciplinary representation of which is constructed,

• **A method for prioritising games,** such as risk analysis methods,

• **A method for validating the results,** particularly when there is dissensus among the participants,

• **A method for analysing and exploiting** uncertainties.

3) Tools for greater efficiency

The facilitator and the group need to be able to rely on tools that will enable high-quality collegial work in emergency situations:

• **A battle rhythm:** a tool that sets aside time for exchanges between members of the situation function in order to carry out a cross-functional analysis,

• **Visualisation tools:** maps, mind maps to be fed on paper or in the form of manageable software throughout the crisis, which save time on data capitalised outside the crisis, serve as a support for discussions and illustrate the results in the form of graphs or maps.

• **A transversal SP template:** a pre-formatted A3 document dedicated to the systemic description of the situation and provided to the participants at the outset to guide their thinking directly towards the final result.

3. RECOMMENDATIONS FOR STRUCTURING CRISIS UNIT WORK

• Structure the group with a "delegated director" assisted by a "dedicated facilitator" to ensure that the session runs smoothly, with a "battle rhythm" that defines alternating phases for the sectoral and cross-sectoral summaries.

• A "cross-disciplinary analysis sub-group" can be set up in the middle of the exercise by volunteer participants to ensure cross-disciplinary production.

• Plan for systematic observation of the exercises by experts in the human and social sciences to enrich the feedback with an outside perspective and act as a contrarian. ■

SUMMARY OF THE WORK OF THE "SCENARIOS" WORKING GROUP

This working group is part of the Labo-Crise approach set up by the department of the High Official for Defence and Security of the Ministry of Ecological Transition. It was co-supervised by the SHFDS of the MTECT and the DGGN of the MIOM.

The purpose of this exercise is to assess the effectiveness of a systems approach, based on diagrams representing the causal links in the sequence of events that make up the crisis.

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OBJECTIVE OF THIS WORK

• Highlighting the complexity and sectoral interdependencies of future crises.

• Test and apply the work of Labo-Crise using a practical case study.

• Develop a generic (collective intelligence/systemic) methodology that can be applied to different crises.

WORKING METHOD

The systemic approach has been chosen to overcome the operational limitations of a close analysis by business sector.

The various crisis exercises have shown the limits of this approach: with a sector-by-sector approach, it is very difficult not only to get a global view of the crisis, with certain key sectors or activities being overlooked, but also to correctly grasp the complex, non-linear, chain-reactions.

The systems approach makes it possible to design and define the "crisis system", describe it, understand its components and analyse the possible changes to the whole, taking into account the interactions between its components and key activities.

Two sequences were devised, to which various experts contributed:

1) Illustrating the crises of tomorrow.

2) Identify the resources available to each stakeholder

BUILDING A TEST CASE: THE CRISIS SCENARIO

The crisis scenario played out on 9 May as part of the Labo-Crise approach serves as a basis for this reflection. It is a typical scenario that reflects the new characteristics of crises. As highlighted by the various experts involved in the future Labo-Crise process, the nature of crises has changed. They are increasingly hybrid and long-lasting, with superimposed phases (including paroxysmal phases). They are also ubiquitous, and their domino effects go beyond the remit of a single ministry. This typical scenario deals with the consequences for public order and business continuity. It is described in the following way:

• literary with a *Dossier de Mise en SItuation* (DMSI) type text,

• quantified with data collected on past events as well as data "invented" by the members of the WG on cascade effects, etc.

At this stage, this scenario is not intended to be a precise reflection of reality, but rather to reflect the major dynamics and possible sequences of future crises.

To sum up, the events caused by the drought and the heatwave are as follows:

• an ever-increasing drop in river levels,

• high temperatures, with an increase in the number of departments affected and a rise in peak values,

• forest fires, numerous and diffuse, then the appearance of a mega-fire. ■

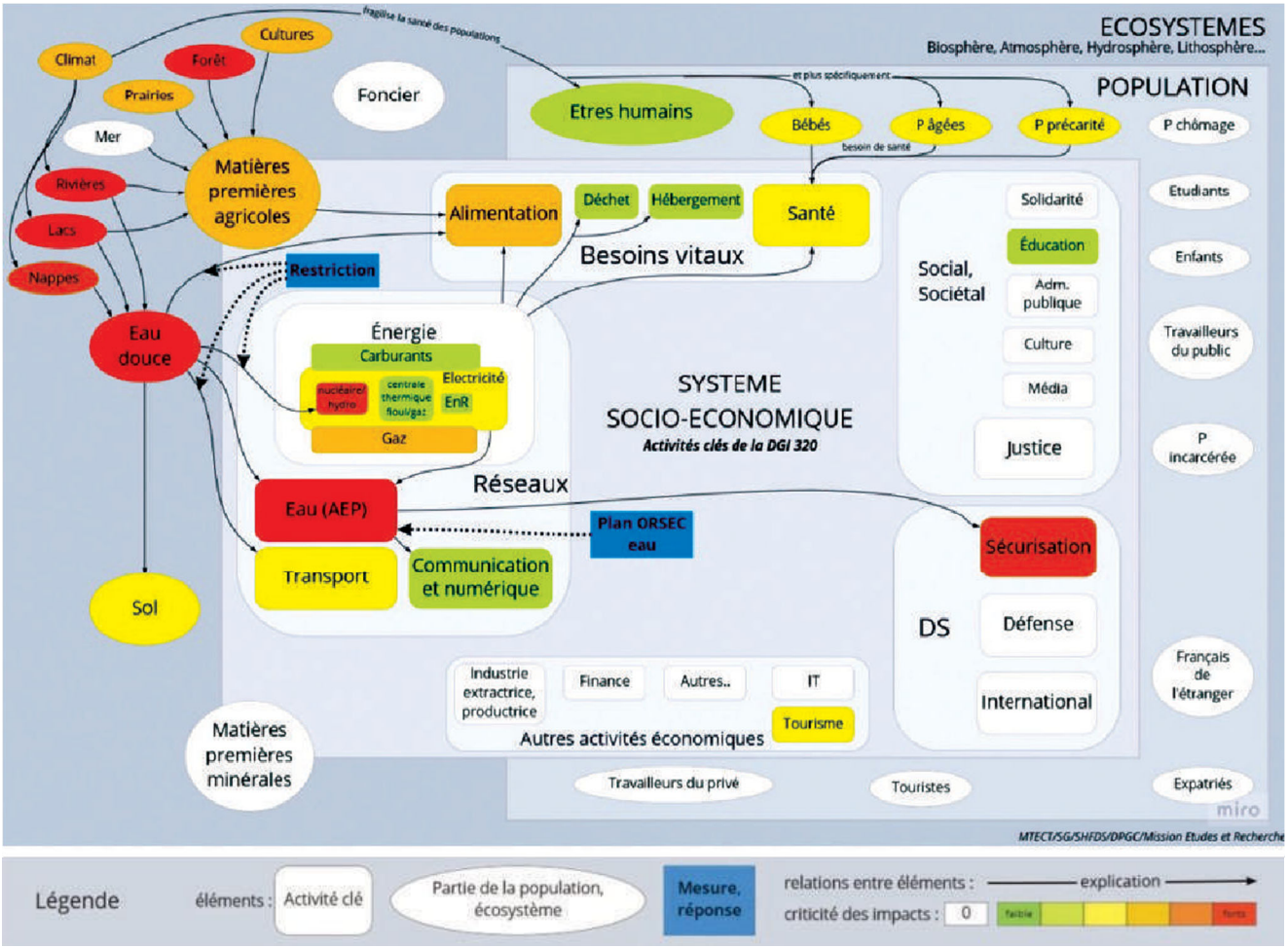


Figure 1: *A generic diagram of the economic system to be adapted to the real situation.*

PHASE 1: IMPACT ANALYSIS

First step: identify the effects of the scenario events on the key activities of Interministerial General Directive 320 on national defence and security planning, and more specifically on the various technical systems that underpin these activities.

An initial overview (**Figure 1**) provides an overall representation, highlighting the components under stress and the functional links that have become vulnerable.

Behind these components we find the major technical infrastructures that provide the flows (materials, data) as well as the services required for key activities. The analysis of the impacts of the scenario has been extended to the major technical systems, via a representation of the functional chain.

For example, for the "water" system, a possible functional representation is shown in **Figure 2**.

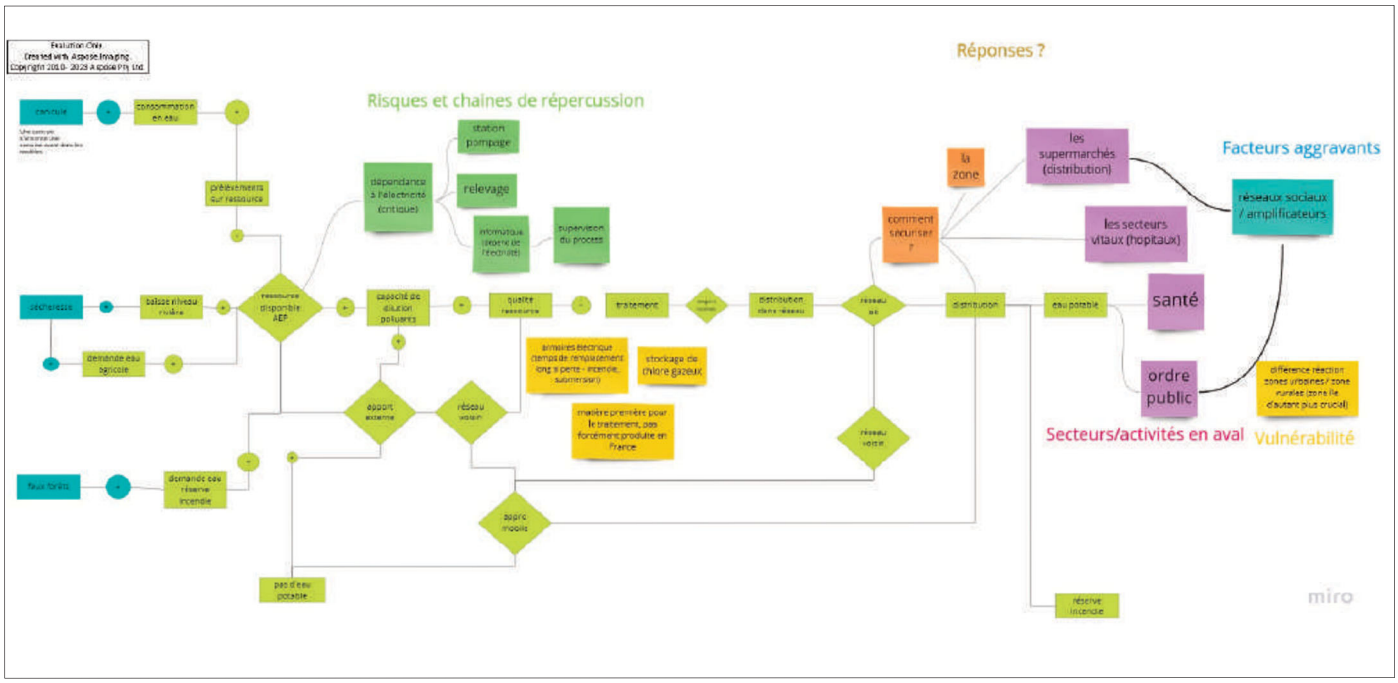


Figure 2. *Functional skeleton of the "water" system, showing elements of vulnerability or dependency.*

While we have not sought to be exhaustive, we have endeavoured to identify the main stages in the process of "producing drinking water", or at the very least to identify those whose failure leads to stress in the process.

Knowing what the usual problems are minimises the effort of surprise, and therefore stress, in a situation of emergency.

This makes it possible to anticipate threshold effects which, if crossed, are likely to amplify the seriousness of the situation (criticality), or even impact other systems (cascade effects).

This initial functional analysis also makes it possible to identify a system's dependencies on one or more other systems. ■

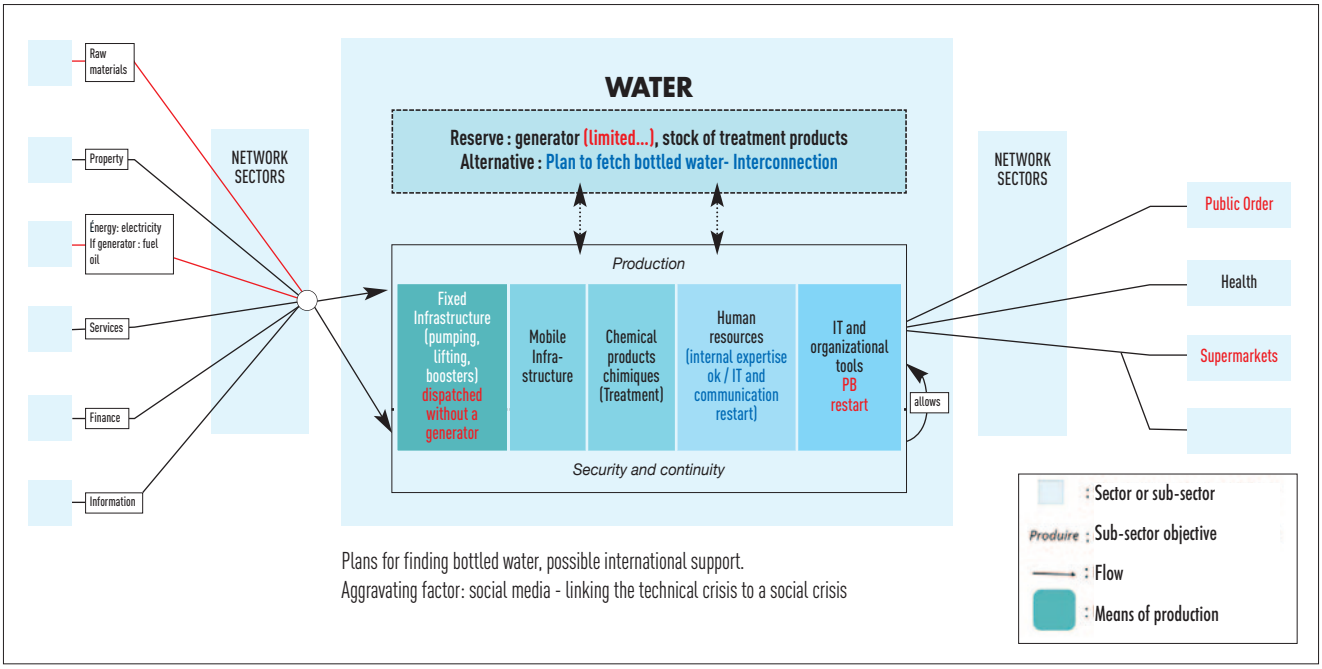


Figure 3: *Conceptual diagram highlighting the interdependencies between the technical system under consideration and its environment.*

PHASE 2: SYSTEMIC INTERDEPENDENCIES

Here, a dual dependency is identified: on electrical energy (both in terms of supply and infrastructure, such as electrical cabinets), and on the products needed for the process (treatment products, which depend on distant production sites — outside France — and logistics flows).

These dependencies should be considered as potential vulnerabilities if it is not possible to maintain the service in the absence of redundant flows or infrastructures.

Cascading failures, or the failure of one of the systems causing one or more others to malfunction or fail, are therefore a factor in the sudden aggravation of the crisis and its spatial perimeter. The conceptual diagram above (**Figure 3**) highlights the interdependencies between the technical system in question and its environment.

In short, a lack of electrical power, or the absence of treatment products, can lead to a serious accident.

This is all the more important as water resources diminish, with a corresponding deterioration in quality. This has a major impact on the ability to supply drinking water to the distribution network.

The vulnerability of the system's internal electrical infrastructure (electrical cabinets) has long-lasting effects. The scarcity of electronic components significantly extends delays in restoring service, bringing entire sites to a standstill.

A water shortage can have repercussions in the social sphere (panic, buying to build up stocks, public unrest, etc.) which will have repercussions on the logistics to be put in place to manage the crisis:

- securing distribution outlets, supplies by lorry, etc.;
- manage priority allocations: health services, etc.;

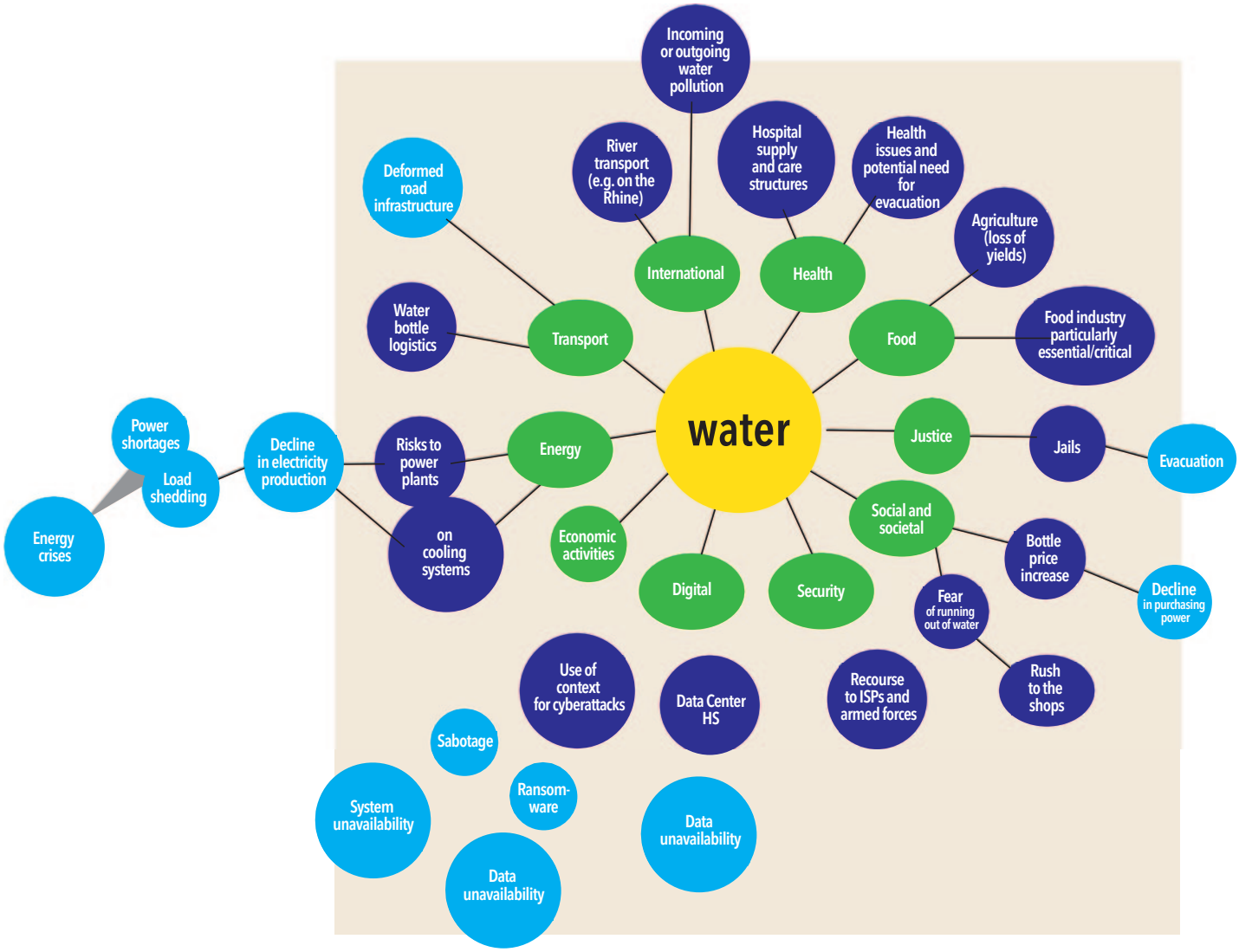


Figure 4. *The dynamic systemic analysis methodology makes it possible to identify induced effects by qualifying them in terms of their kinetics.*

• managing the evacuation of populations, some of which can be particularly sensitive (prisons, hospitals).

In terms of kinetics:

• If the power supply fails, the water production plants will be shut down immediately,

• damage to electrical cabinets (fire, flooding) results in the immediate shutdown of water production sites — replacement takes months,

• Stopping the supply of drinking water very quickly leads to health problems (no waste water disposal), making it necessary to evacuate the population.

All these effects are the propagation of an external impact in the technical system and outside the technical "water" system.

The methodology of dynamic systemic analysis makes it possible to identify induced effects by qualifying them in terms of their kinetics.

Figure 4: the water system is located in the centre, around the key activities, then in the first ring the immediate (short-term) impacts of the failure of the water system on these activities. The second ring reflects the longer-term effects. ■

CONCLUSION: LESSONS FOR CRISIS MANAGEMENT

1. ACQUIRE OPERATIONAL CROSS-FUNCTIONAL KNOWLEDGE UPSTREAM

Understanding the operational functioning of each system that supports key activities

• The major technical systems (based on production, transformation and distribution infrastructures) identified:

- energy,
- transport,
- drinking water supply,
- food
- and currency.

• Major social systems:

- justice,
- the media,
- social networks.

Understanding and mapping the complex interdependencies between systems

• How an initial shock impacts different components of a system, or even several systems.

• Anticipate:

- the extension of the crisis situation to other sectors, and over what timescale;

- extending the spatial scope of the crisis (mapping interdependencies);

- the resources to be mobilised;

- communication with civil society (identification of issues that could cause a stir).

Functional representation (causal chains) of a technical system allows :

- a map of the points of vulnerability of a system, whether the origin of the impact is exogenous or endogenous;
- visualise the cascading effects of pressure or failure at one point in a system on itself or its environment.

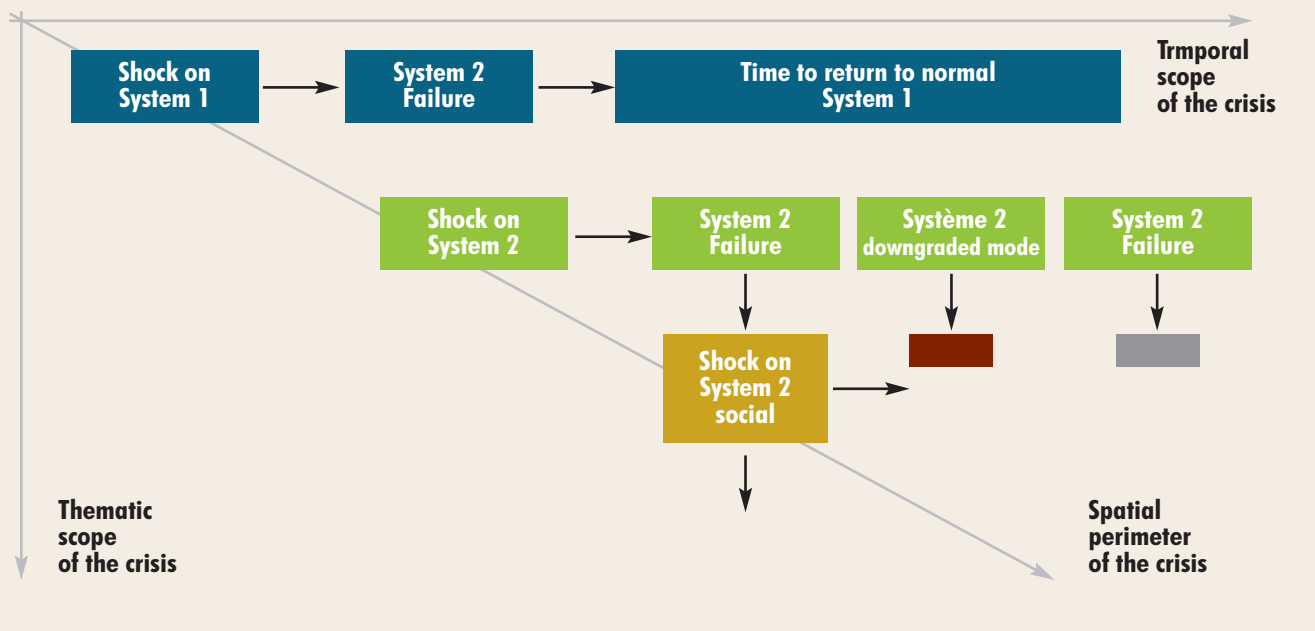
2. PROMOTING A PRINCIPLE OF ACTION: THE PRECAUTIONARY PRINCIPLE

This methodology makes it possible to understand the effect of interdependencies between systems, in normal and degraded situations, and to distinguish between inadequate sizing in normal operation and vulnerabilities that cannot be mitigated without disproportionate investment, which must be taken into account in crisis management.

It seems essential not to let ourselves be surprised by foreseeable and anticipatable chain effects.

The precautionary principle requires the identification and, if possible, the correction of the sizing of infrastructures / installations / flows whose vulnerability is only of internal origin.

Developing a strategy based on resilience makes it possible to incorporate robustness and redundancy as key factors



The hallmark of tomorrow's crises is precisely this hybrid nature, which transcends a single ministerial sector. The crisis becomes a kaleidoscope of situations that challenge the continuity of activity and the resilience of the nation. We can illustrate this with a three-dimensional graph.

3. KNOW HOW TO ACT, BUT ALSO PREPARE, PREPARE, PREPARE

Critical thinking can only develop if there has been pro-active preparation of systems and people.

According to Sun Tzu: in crisis, the most urgent thing is to think.

Knowing what the usual problems are minimises the effort of surprise, and therefore stress.

It's no longer enough to have plans; you need to be able to cope with complexity and discontinuity, and to be able to work in downgraded mode.

Mastery of impact analysis, through repeated training and confrontation with of operational experts, is the mental structure needed to assess the possibilities of crisis management.

For example, the basic level of training required for people called upon to participate in crisis units could be:

- Mastering the impact approach to technical and social systems.
- Mastering the analytical functional representation of each system, then visualising the relational links between sub-systems.
- Mastery of the causal analysis method (diagnosis of interdependencies, analysis of failure kinetics, mapping of vulnerability points, mapping of cascade effects on the system environment). ■

EPILOGUE (OR RETEX OF THE RETEX) CRISES AS A CONCEPTUAL DRIVER FOR PUBLIC ACTION TRANSFORMATION

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SUMMARY

This concluding article provides a mirrored view of our reflections on crisis management. The author does not claim to be an "expert" in dealing with exceptional events, on the contrary, she is a champion of the management of normal times, and endeavours to highlight similarities or possible transpositions in the processes that drive decision-making in these two types of situations.

The growing interest aroused by the Labo-Crise discussions has raised the complex issue of how to integrate a new dimension into public action, itself still marked by the COVID crisis and weary of the challenges of transformation, the list of which is already very long: digitisation, CO2, management, expertise, 'being citizen-centred', the right to make mistakes, simplification, Europe, cooperation, etc.
I would therefore like to make five points which seem to me to argue in favour of a useful transposition of what has been learned from crisis management into the transformation of public action.

I - THINKING ABOUT THE NOTION OF CRISIS TAKES US BACK TO THE FUNDAMENTALS OF PUBLIC ACTION.

In a crisis, the continuity of services essential to the life of the community is at stake. During this period, citizens have to live without certain services; if these are sensitive to the life of the nation (energy, health, etc.), citizens are called upon to contribute to the production of the service (energy sobriety, prophylaxis, etc.). When the crisis arises from what is considered, to a greater or lesser extent, as failings in public action, the State is led to initiate dialogue and sometimes to reform certain institutions. It should be noted that the essential services base can change depending on the situation, the duration of the crisis and its nature.

In all cases, the important thing is that the crisis is prompting all stakeholders — institutions, businesses and civil society — to refocus on collective issues.

II - PREPARING FOR A CRISIS IS GOOD PREPARATION... FOR EVERYDAY LIFE!

Identifying the essential structures, the skeleton of crisis situations, gives us a clearer vision of how the State functions as a system. In particular, I think that understanding interdependencies, focusing on action and the effects it produces, thinking about the interoperability of information systems, or even envisaging possible futures to design the various organisations in response, are ways of working and thinking that would facilitate the transformations that are essential if 'day-to-day' public action is to better embody the expectations of citizens and employees.

III - TAKE ADVANTAGE OF CRISIS MANAGEMENT EXERCISES TO REPOSITION LOCAL AUTHORITY ACTION IN GOOD TIME "NORMAL".

Indeed, this question of the local State, the State The relationship between the two "on the ground", with the issues of governance, technical expertise, relations with local authorities, Paris / local relations, etc. is a subtle one. For my part, I think it's key to take into account the diversity of the

situations, in particular the highly varied traditions of cooperation between the State and local authorities. We also need to take into account the fact that these relationships evolve over time, depending in particular on the political, national and local contexts. In this case, thinking about and even simulating a crisis would be an interesting acid test to check that working processes can withstand extreme situations. In this respect, it is interesting to note that never before have relations between prefectures and Regional Health Agencies (ARS) been so much the subject of comment as during the COVID crisis, including calls for a review of the current situation on issues that have nothing to do with a health crisis.

IV - TO SEE A DEMOCRATIC ISSUE AT STAKE IN THE PREPARATION FOR CRISES AND IN THE PROCESS OF RESOLVING CRISES THEMSELVES.

According to surveys, our fellow citizens, particularly in recent years, have a perfectible confidence in the State's ability to manage the country's major collective challenges: guaranteeing peace and security daily, having a health and education system that functions with quality and fairness, and enabling everyone to make a living from their work. We know, for example, that studies show a deep-seated unease about the solidity of the French healthcare system, as if seeing — or thinking we had seen — the system "on the verge of cracking" in 2020 had left its mark. In Starting from a primary commitment by the State, which must do its utmost to ensure that services are provided, to raise awareness among the public of the role they are called upon to play in ensuring that the system works, even in extreme circumstances.

V - PAY PARTICULAR ATTENTION TO COMMUNICATION IN TIMES OF CRISIS.

Who is talking? With what messages? How to manage media requests? How to monitor and react to social networks? And there are many questions specific to certain crises: how do we inform doctors, pharmacists and patient associations in a health crisis? Here too, planning processes and tools in the event of a crisis could be useful "in peacetime". For example, communicating with GPs in the event of a crisis could mean that, in normal times, weekly reminders could be sent out on the correct prescriptions, points to bear in mind regarding stocks, or other subjects relating to health products.

CONCLUSION

For me, these five complementary angles all point in the same direction: to make it clear that crisis preparedness not only makes it possible to prevent crises and create the conditions for mitigating the effects of future crises, but also for an effective response

in the event of serious danger, but also to accelerate the changes for peacetime, and probably to give even more meaning to the contribution of each actor and each public servant every day. This presupposes that we understand the crisis in all its depths.

The switch to crisis mode is not just a simple accident that is quickly erased, but a reminder of the fundamentals of political life, in the noble sense of the term, which engages institutions, companies and citizens in dialogue capable of strengthening our democracy. Managing crises on a case-by-case basis could lead to authoritarian solutions; on the contrary, when the possibility of crisis underlies public action, it becomes a tool for dialogue and encourages interdisciplinary teamwork. ■

6 AFTERWORD

AFTERWORD

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ANTICIPATING TOMORROW'S CRISIS SITUATIONS AND ADAPTING THE MEANS OF RESPONDING TO THEM

Antoine-Tristan MOCILNIKAR

with

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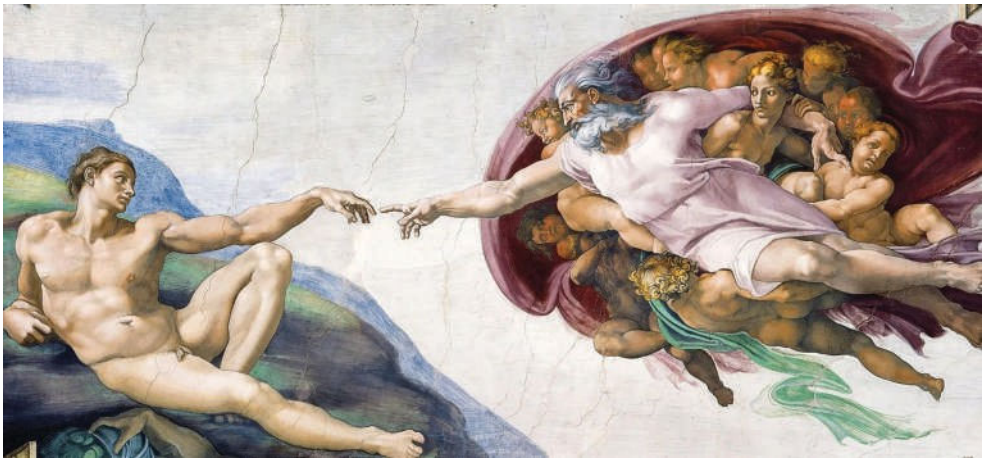


Genesis, the source of all crises, yesterday and tomorrow (Michelangelo, Sistine Chapel).

SUMMARY

This article does not simply conclude the "Proceedings" of Labo-Crise. It sets out to identify the avenues that have led to its work and proposes that it be continued, expanded and diversified in one of the European regions best suited to nurture them and respond to the initial specification: "Anticipating tomorrow's crisis situations and adapting the means to respond to them."

Civilisation gives birth to risk. The world is in a state of flux. Globalisation is accompanied by fragmentation into blocs. Appetites for resources are sharpening. Digitalisation and artificial intelligence (AI) are changing the game. Social media have become positive and negative actors, as well as crisis management tools. The general climate is one of effervescence, both in thinking and in business. You can feel the trends that are affecting all our sectors.

We ourselves can identify different levels of tension. The insurance industry is observing an extension of the limits of crises and the appearance of emerging risks. It looks for weak signals and does not hesitate to use terms like "black swans, black elephants, jellyfish, and canaries." The nature of crises is evolving, they are becoming systemic, hybrid, global... These all-encompassing tensions are increasing and revealing the dynamics of the changes underway. We need to move from the current practice of crisis management — which is sometimes still too compartmentalised — to networked crisis management. We will have to go beyond the current *top-down* approach, by integrating the forces at work and by developing resilience.

Researchers, experts, managers and practitioners met in workshops under the name of LABO-CRISE throughout 2022, culminating in a seminar on the 28th of September 2022. This report has strived to summarise the work of these workshops in order to provide prospective material.

The aim of this work is to encompass a broad field of knowledge, including mathematics, organisational science, history, philosophy, sociology and anthropology, as well as digital technology.

AI is playing an increasingly important role in the debate, both as a structuring element of our

societies, integrated into infrastructures, the bearer of new vulnerabilities (cyberattacks, cyberwarfare, information manipulation) and as the promoter of an intelligence that exceeds human capacities, capable of influencing human decision-making. Section 4 of this report gives examples of the use of AI. For the moment, these are mainly sectoral applications (particularly in the field of natural hazards), but there is a clear desire to put the pieces together towards an integration of models, with still an uncertain role for human intervention.

In this afterword, we attempt a preliminary summary of the avenues of study opened by Labo-Crise, which leads us to immediately raise the ethical issue by defining its boundaries.

The tone of this report is decidedly constructive. The aim is to help the researcher, the person just starting out, the person looking for new inspiration and the person who wants to excel. In all cases, assimilating this work should lead to the deepening of one's practice, with the aim of providing greater well-being to our fellow citizens. This spirit, that drives this document, is what we need to bring to life through the SANCTUM community.

LET'S CONCLUDE WITH THE NOTION OF CRISIS

Our workshops enabled us to confirm, share and establish a common vocabulary and grammar for crisis. Initially, a crisis can be defined as a difficult or dangerous situation that requires immediate action. It can have major repercussions on the lives of the people involved and on society as a whole.

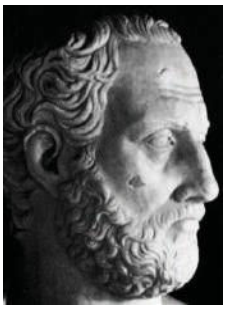
It requires a rapid and coordinated response from authorities, organisations and individuals to minimise losses and damages, restore stability and security and facilitate eventual reconstruction.

Our work has sought to assess the possible obsolescence of this approach. This makes our understanding of what is invariant, and, above all, what must not be forgotten or abandoned, particularly relevant:

- **Preparation and planning:** clear procedures and trained staff are essential.
- **Transparent communication:** both between stakeholders and with the public.
- **Coordination and collaboration:** government officials, NGOs, private companies and the civil society must share information and work together,
- **Adaptability and flexibility:** crises are often unpredictable and can evolve rapidly, so it's important to constantly adjust to changing situations,
- **Feedback and learning:**

The seminar also emphasised the role of anticipation, which is essential to inform decision-making. During a crisis, anticipation is developed in several ways. Firstly, by knowing as much as possible about the situation and how it is likely to evolve. This may involve the use of predictive models and the development of scenarios that need to be regularly updated.

These scenarios should prepare the way out of the crisis, by considering the measures to be taken to achieve a more stable and sustainable situation.



Thucydides
(5th century BC)

Initiating potential of the modern notion of crisis, with the aim of understanding the Peloponnesian War in a systemic way.

WHERE DOES THE CRISIS END? THE LONG CRISIS AND BEYOND

Traditionally, crisis management has been conceived as an action designed to avoid collapse, which is therefore intense but short-term. The current trend is to rethink the crisis as a pre-existing, persistent or recurring disruption, of variable intensity.

For example, in addition to environmental problems and climate change, which can have consequences that can affect several generations, wars and international conflicts can have economic, political and social repercussions that can last for decades or even centuries.

Can they really be described as "crises" or are they rather complex, and multifactorial situations of extended periods? These situations can however certainly be seen as challenges or issues that require urgent, massive and coordinated action. But beyond strict recovery measures, this can include measures to re-establish public order, to help businesses get back on their feet and to help individuals affected by the crisis to re-establish a stable living environment.

This suggests setting up an observatory to monitor the long-term effects of the crisis, including monitoring the mental health of those affected and monitoring the environment to detect any effects on ecosystems.

THE ESSENTIAL CONTRIBUTION OF PHILOSOPHERS, SOCIOLOGISTS AND HISTORIANS

Our practices are based on a long heritage: we are building on the shoulders of giants. We need to be aware of this so that we can make the most of it.

One speaker reminded us of the contribution of SPINOZA, who emphasised the need to understand and manage our emotions in order to make rational and objective decisions, rather than being overwhelmed by panic, fear or anxiety. In crisis management, people skills will continue to be as important as the use of new technologies.

Even before SPINOZA, ARISTOTLE saw politics as a discipline aimed at organising society and solving collective problems. He emphasised the importance of pursuing the middle ground. In times of crisis, this means avoiding over-reaction or extreme measures, and seeking balanced solutions that take account of the various dimensions of a crisis.

Following the techings of his mentor, PLATO, we can also add the importance of questioning assumptions, considering different perspectives and seeking innovative solutions.

Their near-contemporary, THUCYDIDE, taught us that it is necessary to understand the causes — deep and underlying — of a crisis in order to put in place effective response strategies. He demonstrated how Athens and Sparta fell into the trap of power and then failed to anticipate the consequences of their actions and take preventive measures. He is an advocate of historical learning, drawing lessons from past mistakes.

Our contemporaries now emphasise the complexity of current crises.

For sociologist Bruno Latour, crises are often the result of the complex interaction of several stakeholders, such as individuals, organisations, technologies and institutions.

Edgar Morin takes a closer look at the complexity and multidimensionality of crises. This means taking into account all relevant factors, including psychological, social, cultural, economic and political dimensions. He highlights the importance of building resilience and adaptability.

For their part, our military friends introduce us to SUN TZU and Carl VON CLAUSE-WITZ.

What we learn from the Chinese general SUN TZU is the importance of a realistic assessment of the resources and capacities available, and an understanding of the motivations and actions of the other parties involved. Just like Go players!

As far as CLAUSEWITZ is concerned, he constantly reminds us of the importance of the specific political objectives that an action serves to achieve, at different spatiotemporal scales. He also emphasised the need for adaptability and flexibility, stressing that war is a dynamic and uncertain process, requiring constant adaptation to changes on the ground. He admired Napoleon Bonaparte, the great master of rapid decision-making. He made marvellous use of his intuition and experience to make decisions in the absence of complete information. He excelled at adapting to changes on the battlefield and modify his strategy according to the circumstances.

The speech by Niccolò Machiavelli, known as Machiavelli, was complementary. He emphasised the importance of prudent and thoughtful management in all political actions. He warns that solutions that have worked in normal times may not be appropriate in times of crisis.

He argues that in certain situations, the use of force can be justified to maintain order and stability. Finally, he stresses the importance for a leader to maintain his authority and credibility.

Prompt and firm decisions, displaying a certain degree of confidence are therefore necessary to reassure the population and contain disorder.

Sun Tzu
(544-496)

Author of
The Art Of War.

(CONTEMPORARY) FACES OF THE CRISIS

We all agree that crises take different forms in different eras. We are already familiar with certain forms of destabilisation: global economic crisis, widespread social unrest, geopolitical tensions, sovereignty breaches leading to a disruption in energy supplies or in the supply of essential resources and equipment shortages, pandemics, etc.

In addition to conflicts and competition between nations, we are witnessing an increase in threats from non-state parties such as terrorists and criminal organisations, linked to the spread of guided, stealth or long-range weapons, cyber-attacks, hybrid challenges and the issue of disinformation.

The risk of humanitarian crises stems from this global disorder, associated with civil wars, mass migrations, natural disasters and climate change.

In the end, the probability of complete destruction is not zero. Of course, there's no question of advocating for such an outcome; it's the fundamental aim of our work and the theoretical basis of a resilience policy.

This non-exhaustive review of the forms that crises could take prompts us to develop a prospective approach. We can detect factors in our current environment that signal future crises, but also the existence of resources that will strengthen our response.

This is the subject of the following paragraphs.

CLIMATE RISK...

The scenario of a 4-degree rise in average global temperature cannot be ruled out, even if all our policies to limit greenhouse gas emissions are designed to avoid it.

Here are some of the serious situations that could arise:

- Conflicts over access to water could escalate, as could the displacement of populations in search of water resources.
- Increasingly frequent outbreaks of mega-fires, endangering residential areas and vital infrastructure.
- total destruction of certain ecosystems;
- widespread food shortages;
- pandemics;
- massive migrations with diverse causes;
- economic collapses.

In addition, policies to limit global warming may in turn give rise to social challenges, particularly concerning workforce transition for affected industries and services, as well as issues related to households' disposable income, even among the middle classes.

HYBRID THREATS...

Hybrid threats are complex attack strategies that combine different types of threat and approaches. Originally originating in NATO's work, and now incorporated into European and national public policy, they act as undeclared wars implemented by malicious parties — who may be states — to disrupt or compromise targeted systems, infrastructures, or organisations.

Their methods include both conventional and unconventional tactics, including disinformation, psychological warfare, cyber-attacks, influence operations, physical attacks, political subversion, espionage, sabotage and other forms of disruption.

The hybrid nature of these threats makes them difficult to detect, attribute and counter. Mathematically, we are moving from deterministic to non-deterministic models. This is revolutionising the insurance industry.

Here are some of the adaptations we have already identified:

- Integrated approach, involving government agencies, security forces, intelligence services, international organisations,

private companies and the civil society,

- Capacity-building in the fields of cybersecurity, intelligence and economic intelligence,
- Adopting transparent, coherent and proactive communications aimed at the public to thwart misinformation and maintain confidence,
- Organise specific exercises.
- Strengthening international cooperation.

ARTIFICIAL INTELLIGENCE (AI)...

AI offers powerful tools for crisis management and anticipation; we propose an initial breakdown:

- massive processing of heterogeneous data, from social media, sensors of all kinds, the most diverse databases, etc.,
- early detection of potentially serious events,
- modelling and simulation, with a view to drawing up appropriate action plans and identifying the best approaches to minimise damages,
- learning how to deal with many past events,
- rational forecasting of potentially serious situations (e.g., forecasting outbreaks of infectious diseases by analysing public health data and population behaviour).
- assistance with decision-making.

However, the use of artificial intelligence (AI) in crisis management raises important ethical issues and must be guided by clear ethical principles, such as transparency, responsibility, fairness (not favouring or discriminating against certain groups), confidentiality and consent. The community formed around the SANCTUM project is very vigilant on this point.

OTHER AVENUES FOR DEVELOPMENT BASED ON MATHEMATICS...

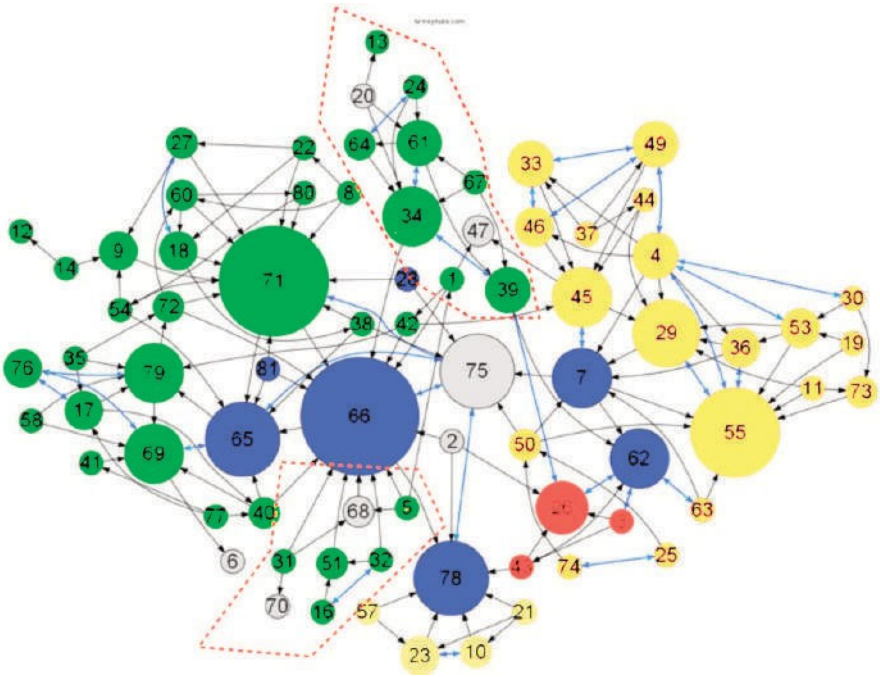
Here we explore the science of uncertainty and models of irreversibility, cumulative risks and graph theory.

Hysteresis has already been discussed, and complexity theory has already been sketched out; other applications could be mentioned, such as unregistered logics or non-linearity.

Let's start by modelling the uncertain or, equivalently, using stochastic processes. This is not intended to provide definitive solutions, but rather to provide an analytical and probabilistic approach to crisis management. These models should be used in conjunction with other crisis management methods and tools, and their effectiveness depends on the quality of the input data and expertise in their appropriate use. In the context of crisis management, the use of models based on Brownian processes may offer some interesting avenues.

Such processes are used to model unpredictable behaviour, in other words to simulate different possible crisis trajectories.

They can be used as a basis for strategic planning and decision-making during crisis management. They can also be used to optimise resource allocation during a crisis.



One of our speakers, Cécile WENDLING, from the AXA Group, addressed the subject of cumulative or aggregate risks, which refers to the possibility that the effects or impacts of several risk factors may add up or combine to create consequences that are more significant than those that would result from cumulative exposure to risks taken in isolation.

In network analysis, graph theory is used to understand and model the relationships and interactions between different elements of a system.

Graphs can help identify nodes of influence within a system, central actors and the connections between them, as well as weak connections and risks of contagion; crisis management decision-makers can better understand where to focus their efforts to maximise the effectiveness of interventions.

Graphs can be used to map the flow of resources, information, or backup within a system, and to optimise the management of these flows to ensure an efficient and balanced distribution of resources during a crisis.

In a very similar way, during the Labo-Crise workshops, we explored heuristic diagrams.

These are visual tools that allow decision-makers to breakdown the posed issue into different causes and to visualise the cause-and-effect relationship between them. In crisis management, these diagrams help decision-makers understand the factors that have contributed to the crisis and to identify the possible consequences. This helps to direct the focus in management and response efforts.

HUMAN AND SOCIAL SCIENCES...

One approach directly inspired by the social sciences is the use of the "Red Team" and "Blue Team" method.

The Blue Team focuses on defence, preparedness and resilience. It is a proactive approach to crisis management, focusing on early detection, strengthening defences and assessing resilience. It uses a variety of means: monitoring tools, anomaly detection techniques and alert systems, examination of security systems and business continuity and recovery plans, training and raising awareness of best practice, etc. The famous Rapid Reaction Forces (RRFs) mentioned in this book are relatively similar.

The red team plays the role of adversary or critic. It adopts an external stance and seeks to identify vulnerabilities, loopholes and potentially negative scenarios. It uses a variety of methods to do this, including risk analysis, social engineering techniques, ethical hacking and simulated attacks. This method encourages critical thinking by challenging assumptions, preconceived ideas and established plans.

The two approaches compete, but they are also complementary. One focuses on prevention and preparation, the other on detecting vulnerabilities.

Symbolically, the coexistence of the *Red Team* and the *Blue Team* draws on the logic of both the game of chess and the game of Go. Using the *Red Team*'s assessments, the *Blue Team* can strengthen defences, prepare action plans and test resilience in the face of realistic scenarios. This collaboration promotes a holistic approach to crisis management, combining critical assessment and capacity building.

It's a veritable *Kriegsspiel*, the famous "war game" developed by the army of the Kingdom of Prussia in the 19th century to teach officers combat tactics, which has since been democratised into the more entertaining versions that have become known as war games.

In game theory, this situation can be considered as a form of cooperative game rather than a competitive or non-cooperative game.

In a cooperative game, the players seek to achieve a common goal and maximise the overall benefit, rather than seeking to maximise their own individual results.

It is this last avenue that we feel needs to be explored as a matter of urgency.

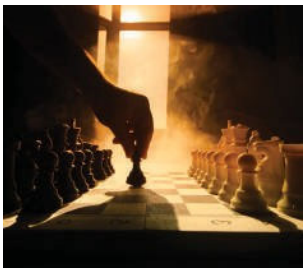
Let's conclude this inventory with two promising avenues: *design fiction* and *storytelling*. They can help explore possible futures and communicate complex ideas in an engaging and inspiring way.

These approaches differ from the "*Red Team/Blue Tea*" duel in that they are much more speculative and semantic.

Design fiction is the creation of speculative prototypes, artefacts or narratives that present hypothetical future scenarios. The designs produced as part of fiction are often inspiring, provocative and sometimes even humorous, but they are always based on a certain understanding of current technological, social, and cultural trends. A simple example is to simulate the presence of a red enemy with known properties in an unlikely geographical location.

In this way, *design fiction* can help to spark conversations and stimulate the imagination around future possibilities. It's considerably less mechanical. It opens up unexpected, uncertain and even unspoken avenues. Another example would be working on crisis management in a universe like René BARJAVEL's novel "Ravage".

Storytelling is a communication method that uses stories to convey complex ideas and concepts. It is a narrative approach that can help to explain absent ideas, capture the audience's attention and evoke emotions. It also uses storytelling to involve certain stakeholders who would otherwise remain outside the narrow and demanding circle of our SANCTUM community.



Chess and go are the best-known strategy games. Chess, with its differently "armed" pieces, models military strategy, while Go, with its undifferentiated pieces, models civil strategy.

Participating countries in the EU-Hybnet project.

OPENING UP TO EUROPE

Labo-Crise, in order to maintain good control in this first stage, which concludes with the publication of this report, expressly limited its exchanges to French-speaking ones. Now that a basis for reflection has been established, the time has come to diversify it and strengthen its substance with contributions from our European counterparts.

The fruits of this openness have already been seen in our Franco-German cooperation with the BBK, and in our participation in joint projects with the Bundeswehr University in Munich, the Free University of Berlin, and the Fraunhofer Institute. On a multilateral level, our participation since 2020 in the H2020 project on hybrid threats, alongside 14 other European institutes, has opened up a more comprehensive approach to new risks and a more sophisticated measurement of their impact and of our respective levels of exposure.

Members of the network participated in an ad hoc basis in EUIR22 *(EU Integrated Resolve 2022)*, which brings together EU Member States and NATO, within the conceptual framework of parallel and coordinated exercises, focused on the overall management of a fast-paced cross-border hybrid crisis with external dimensions.

Members of the network are also involved in the *Horizon Scanning Network* (HSN) initiative, which is steered by the General Secretariat of the Council of the EU (GSC).

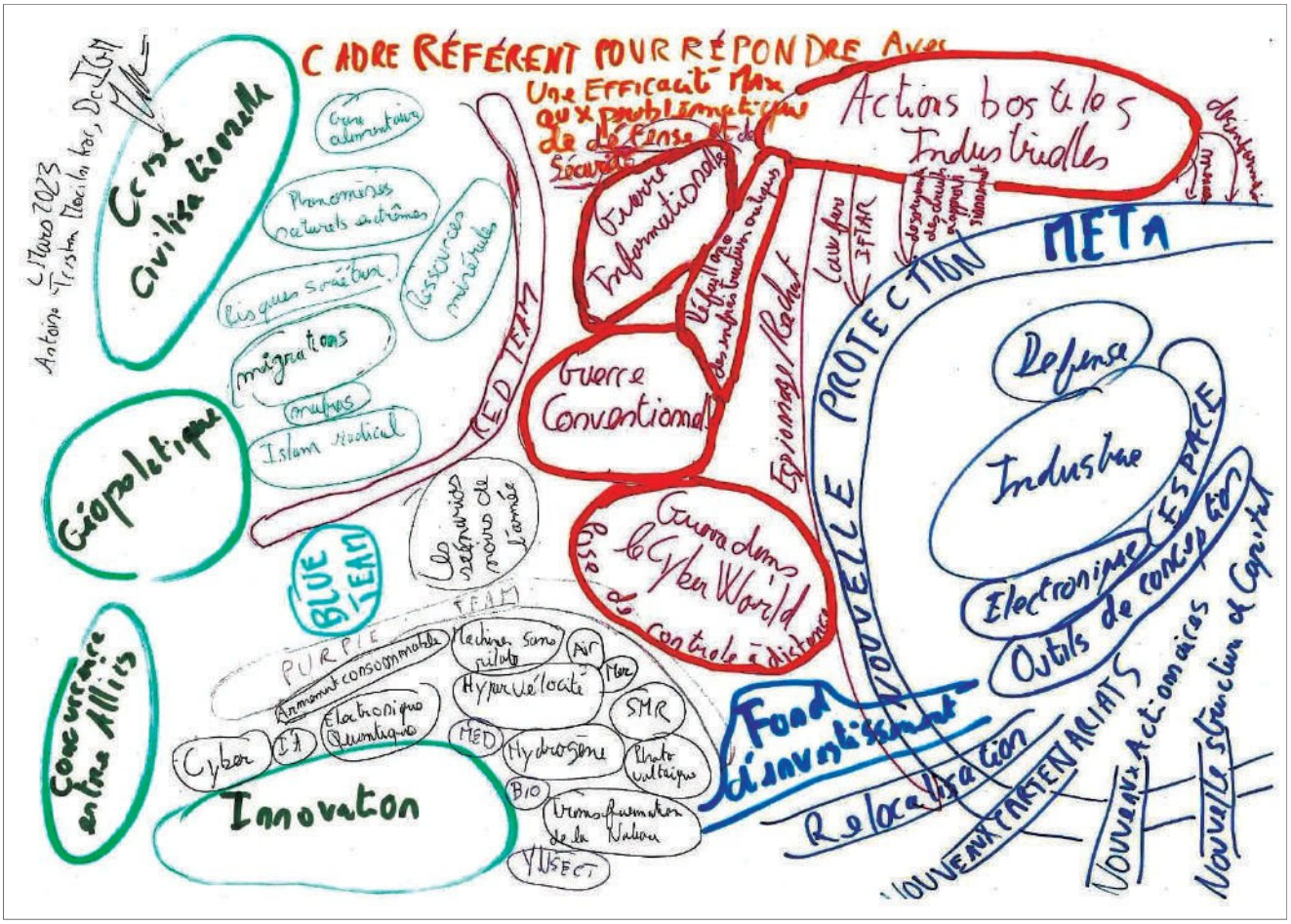
It is made up of experts and risk analysts from the Member States, who participate on a voluntary basis, the Commission services, the European External Action Service (EEAS) and the GSC. It develops possible crisis scenarios.

Finally, much could be done within the framework of the European Community of Research and Innovation for Security (CERIS). Created in 2014, it brings together around 1 500 registered stakeholders (political decision-makers, end-users, academics, industry and civil society).

These different structures could also be a means of nurturing the ideas developed within Labo-Crise as part of the innovation process that has been promoted for several years by the SANCTUM project.

Crises place human beings in a state of heightened vigilance which, when it does not lead to being stunned in the face of danger, stimulates thought. The primary purpose of this document is to provide a forum for the expression of ideas from which response projects can sprout, and to present some of these proposals.

In this afterword, we have tried to bring these elements together, while at the same time proposing to open up the debate to the European level and to promising fields of applied research. It is through this process — bringing together and opening up — that we will be able to adjust to the real scale of current crises. ■



MOCLINIKAR

"Anticipating tomorrow's crisis situations and adapting the means of responding to them"... implies a requirement for exhaustiveness. Its presentation gives the impression of great confusion, which is perhaps only apparent...

And if the answer to the crisis was also poetry...

Cindynicum...

under the sunblind of a gale sudden and foreboding
from your shadows Ô longing flood myth
out of our irises, to the uncertainty sky's duplicitys
turning away from the murmuration of storm
and from your unhappy clouds, curled up high
from which the alchemy of sand stands out
collectively burnt, transmuted into a glass-blower.

Inspiration from Anthony BRUGUIER-JOURDAN
Then working for MTECT SHFDS

INDEX & GLOSSARY

AUTHOR INDEX

GLOSSARY

AFD	French Development Agency
AFPCNT	French Association for Disaster Protection
ANR	National Research Agency
ANSSI	French National Agency for Information Systems Security
ASEAN	Association of Southeast Asian Nations
BANI	Fragile, anxious, non-linear and incomprehensible: a concept proposed by Jamais Cascio, an American anthropologist.
BRGM	Geological and Mining Research Bureau
CEA	French Atomic Energy and Alternative Energies Centre
CEN	Squadron Leader
CEREMA	Centre d'Études et d'Expertises sur les Risques, l'Enronneviment, la Mobilité et l'Aménagement (Centre for Studies and Expertise on Risks, the Environment, Mobility and Town and Country Planning)
CERES	ENS Training Centre for the Environment and the Society
CERIS	*Community for European Research and Innovation for Security*, created and run by the European Commission (Directorate-General for Home Affairs, DG HOME).
CERT-FR	*Computer Emergency Response Team - France*. ANSSI's computer incident response component
CGI	*Industrial Engineering Centre* (Centre de Génie Industriel), one of IMT Mines Albi's three training and research centres
CIC	Interministerial Crisis Centre (Paris)
CNRS	French National Research Centre Scientist
COD	Departmental Operational Crisis Centre
COMEX	Executive Committee
COMTESSA	*Core Competence Center for Operations Research, Management-Tenacity-Excellence, Safety & Security ALLIANCE (Munich)*
CRC	Risk and Crisis Research Centre
CRF or CRf	French Red Cross
CSI	Cybersecurity of Industrial Systems
DDT(M)	Departmental Directorate for Territories (and the Sea)
DGGN	General Directorate of the National Gendarmerie
DHS	United States Department of Homeland Security
DirEx	Abbreviation for Crisis Exercice Management :
DMSI	*Operational Situation file* (Dossier de Mise en Situation)
DREAL	Regional Department for the Environment, Planning and Housing (France)
DRIVER +5	European project
DRM	Paris Dauphine University, Department Research and Management
EDXL	Emergency Data eXchange Language
EGCERSIS	Laboratory for Crisis Management training, IMT Mines Albi
ENS	École Normale Supérieure
ENTSO-E	*European Network For Transmission System Operators (Electricity)*
ENTSO-G	*European Network For Transmission System Operators (Gas)*
EOC	*Emergency Operation Center*
ESSEC	École Supérieure des Sciences Économiques et Commerciales
FSSI	Information Systems Security Officer

GRIDEX	Exercises combining cyber and physical attacks
WG	Working Group
HCFRN	French High Committee for National Resilience
AI	Artificial Intelligence
IGEDD	General Inspectorate for the Environment and Sustainable Development
ITM	Institut Mines-Telecom
INRIA	French National Institute for Research in Digital Science and Technology
INSU	French National Institute for the Sciences of the Universe, part of the CNRS
IPAG	Institut de Préparation à l'Administration Générale (business school)
IRIS	Initiative led by Carbone 4
IRIT	Toulouse Institute for Research in Computer Science
IRSEM	Strategic Research Institute of the "École Militaire", Paris
JRC	Joint Research Centre of the European Commission
LCL	Lieutenant Colonel
MININT	Previous abbreviation for the Ministry of the Interior (before the Overseas Departments and Territories were attached)
MIOM	Ministry of the Interior and Overseas, France
MTE	Ministry of Energy Transition
MTECT	Ministère de la Transition Écologique et des relations with local authorities
OECD	Organisation for Economic Co-operation and Development
OIV	Operator of Vital Importance
ONERC	National Observatory on the Effects of Global Warming
POD	Physics of Decision
QGIS	Free geographic data management software
ResponDrone	European project (flood, fire)
GDPR	General Data Protection Regulation
SAAS	Systemic Approach Support Schemes
SAIV	Security of Activities of Vital Importance
SDIS	Departmental Fire and Rescue Service
SGDSN	General Secretariat for Defence and National Security
SHFDS	Senior Defence and Security Official Service. Each French civil ministry has a SHFDS to carry out the security and defence missions specific to its activities. In this document, this acronym refers to the MTECT SHFDS.
IS	Computer System or Information System
SIDPC	Interministerial Service for Defence and Civil Protection
GIS	Geographic Information System
SURICATE	BRGM platform for primary information on natural disasters, based on Twitter messages
Synapse	Geographical information system of the French Ministry of the Interior
VUCA	*Volatility*, *Uncertainty*, *Complexity and Ambiguity*. Acronym used to designate a method of strategic analysis.

NOTES

Cover illustrations (DR): **1** Kriegspiel, or war game, in the 19th century -**2** Field Marshal Montgomery and General Eisenhower in 1944
3 John von Neumann - **4** Interministerial crisis unit - **5,6,7** Crisis management project © IMT Mines Albi
Seminar photos: © Roman Veiga - Individual photos © Linkedin and DR
June 2023

SANCTUM LABO-CRISE

Thanks to all participants and partners

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MINISTÈRE DE L'ENSEIGNEMENT SUPÉRIEUR ET DE LA RECHERCHE

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der Bundeswehr Universität München

SHFDS

POLICE NATIONALE

Gendarmerie nationale

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Inria

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SANCTUM **LABO-CRISE**

RESEARCH AND EXCHANGE WORKSHOP

ANTICIPATING TOMMOROW'S CRISIS SITUATIONS AND ADAPTING THE MEANS TO RESPOND TO THEM

Proceedings of the September 28, 2022 seminar
and summary of the 2022 workshops

More than just a summary report of the activities carried out by a working group, which admittedly met in the exceptional conditions of the post-Covid-19 pandemic, this document provides a comprehensive overview of the shared approach to crisis management as it is currently practiced.

The contributors to this collective work come from the public sector, are operators and academics. Their common professional background is that they have all worked - each in their own field of activity - to conceptualize crisis management and define an appropriate methodology, with the requirement to be ever more efficient. Because they are all aware that the critical nature of the stakes is never compatible with amateurism.

The pandemic has reinforced this requirement. In addition to crises experienced as incidental events, severely disruptive events requiring intense efforts but of short duration, the scenario of a recurring crisis has emerged, becoming an integral part of daily life.

Health is not the only field concerned. The new threats looming over a world now based on digital technology, the widespread hybridization of threats, the uncertainties regarding climate, and international politics, all give the impression that we have entered a new era in which risks and crises themselves are undergoing transformation.

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