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**Critical Infrastructures and Governance:
New Frontiers, New Visions, New Partnerships**

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“Unconceivable”, “unthinkable”, “total surprise”, “out of the box”: the 21st century opens a new era in the history of risks and crises. Our visions, grammars, models and tools are outclassed to a large degree. Research has a crucial role to play because so much has to be revisited for an in-depth understanding of the challenges. However, two conditions have to be fulfilled: a) some major changes within research culture and practices because the extreme situations have been considered very often as outside the scientific arena; b) a breakthrough in terms of partnership: think-tanks and action teams, which mix different cultures, have to be set up and used on very practical issues. “Learning by doing” will be the key – even if vigilance is required from all partners as concerns their roles and responsibilities. As new emerging crises will not wait, there is no time to waste.

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I – RISKS AND CRISES: A NEW ERA

1. A whole new ball game

1°) A global change

The experience is commonly shared: our managerial models and intellectual models are outclassed by emerging risks and crises.

- Ice Storm, South Québec, January 1998: «*We were prepared for a technical breakdown. We were confronted by a network collapse*» (Hydro Québec expert).
- BSE, UK, 1986-1996: “By the time that BSE was identified as a new disease, as many as 50 000 cattle are likely to have been infected. Given the practice of pooling and recycling cattle remains in animal feed, this sequence of events flowed inevitably from the first case of BSE”²
- BSE, France, 1996: «*An experimental science like biology is incapable of proving that something doesn't exist*» (Dr. Philippe Baralon).
- Anthrax attacks, 2001: «*The anthrax attack on the US Postal was a unique event. This attack should serve as a wake-up call to the possibility of a broad-range of threats*» (Thomas G. Day, Vice-President Engineering, US Postal Service ³).
- Sars crisis, 2003: “a worldwide threat” “*The possibility of undetectable ill people.*” (WHO).
- Heat Wave, France, August 2003, 14 000 people died: “*We did not know anything*” (Minister of Health).
- US power blackout, 14th August 2003: “*This whole event was essentially a 9-second event, maybe 10*” (Michehl R. Gent, president and chief executive of the North American Electric Reliability Council⁴).

Above all, these shocks strike a global context already shaken by constant severe turbulences and serial crises:

«For all of us who work for British Airways, 1997 was a year of challenge, but also of achievement and progress often in the face of adversity. We saw in IRA attack at Gatwick, very strong sterling, financial turmoil in the Far East, strong competition, internal change, a serious industrial dispute and then, just as we thought the worst was over, a fire in Terminal 1.»⁵

² Lord Phillips, J. Bridgeman and M. Ferguson-Smith, The BSE Inquiry, vol 1. Findings and Conclusions, London, Stationary Office, October 2000, § 110.

³ Thomas G. Day, «The Autumn 2001 Anthrax Attack on the United States Postal Service: The Consequence and the Response», *Journal of Contingencies and Crisis Management*, special issue: «Anthrax and Beyond» (P. Lagadec Guest Editor), Volume 11, Number 3, September 2003, p. 110-117 (p. 117).

⁴ *The New York Times*, Saturday, August 16, 2003, p. 1.

⁵ «Rising to the challenges that lie ahead», A New Year message from Bob Ayling, Chief Executive, *British Airways News*, Friday, January 9, 1988, n° 1193, p. 1.

And, *last but not least*, the whole scenery is now under the shadow of the clear-cut diagnosis made in 1997 by a US Presidential commission:

«Our national defence, economic, prosperity, and quality of life have long depended on the essential services that underpin our society. These critical infrastructures – energy, banking and finance, transportation, vital human service, and telecommunications – must be viewed in the Information Age. The rapid proliferation and integration of telecommunication and computer systems have connected infrastructures to one another in a complex network of interdependence. This interlinkage has created a new dimension of vulnerability, which, when combined with an emerging constellation of threats, poses unprecedented national risk.»⁶

2°) Critical infrastructures

Some keys are the following⁷:

- Modern society has come to depend more and more on critical infrastructures as listed above.
- But we depend on more networks than we probably realise: waste disposal and sewer systems may not be classified as critical, but a two-week strike of garbage men will plunge a big city into chaos; and the BSE has shown that garbage could be the key way for global contamination.
- The networks have become more complex, and more vulnerable, as a result of privatisation, economies of scale and globalization. For instance, this was the key cause of Paris Airport Hub severe difficulties on January 4-5, 2003 (each airline having its own contracting parties for de-icing, these sub-companies being unprepared to unconventional situations ; some airlines having nobody or very few people able to take charge in case of chaotic situation).
- Critical networks are increasingly becoming dependent on each other: some glitches in one network may cascade into large-scale breakdowns in other networks.
- Terrorists may not even try to destroy physically some elements of a network infrastructure, but rather seek ways to *use the huge diffusion capacity of our own networks as a weapon*.⁸ The 9/11 terrorists did not seek to destroy an aircraft or an airport. They used the commercial aviation network to attack civil targets outside the system (every aircraft became potentially at risk, obliging the FAA to order shutting down the whole commercial network). In similar vein, the anthrax attacks were (apparently) not directed against the US Postal Service's infrastructures, but attackers took advantage of the trusted capacity to effectively deliver *their* letters.
- In a nutshell, we are witnessing a shift in our vulnerabilities: from “massive destruction to massive disruption”.

⁶ President's Commission on Critical Infrastructure Protection, *Critical Foundations, Protecting America's Infrastructures*, Washington D.C., 1998, p. 13.

⁷ Arjen Boin, Patrick Lagadec, Erwann Michel-Kerjan, and Werner Overdijk: Critical Infrastructures under Threat – Leaning from the Anthrax Scare, *Journal of Contingencies and Crisis Management*, special issue: «Anthrax and Beyond» (P. Lagadec Guest Editor), Volume 11, Number 3, September 2003, p. 99-104 (p. 100-101).

⁸ Erwann Michel-Kerjan, The Wharton School, was the first to introduce this essential clarification. Erwann Michel-Kerjan – “New Challenges in Critical Infrastructures: A US Perspective”, *Journal of Contingencies and Crisis Management*, special issue: «Anthrax and Beyond» (P. Lagadec Guest Editor), Volume 11, Number 3, September 2003, p. 132-141 (p. 133).

The whole scenery is now in the shade of fuzziness and in-depth uncertainty, or even ignorance – and complexity.

- *Fuzziness*: the Anthrax threats in Europe were not terrorist attacks; nevertheless, each and every single alert out of the thousands received had to be taken seriously.
- *Uncertainty*: it took a long time to clarify the origin, the causes of the US-Canadian power blackout last August;
- *Ignorance*: this was the case with BSE, and to a certain extent with Sars;
- *Complexity*: as witnessed with Sars, people in charge are instantly confronted by a maze of combined various dimensions of issues: scientific, technical, organizational, economic, diplomatic, cultural problems; and our systems, at the same time, prove to be themselves extremely complex: headquarters in one region, the incident tracking system in another, the crisis centre in a third – with very different frameworks of decision making in each and every other actor involved.

All this has direct implication on the way we address crises:

- Whereas our traditional worries pertained to technological failures in localised parts of the network, we are now experiencing local disoperation as a result of failures that have occurred halfway across the globe.
- Normal, routine forms of adversity can rapidly develop into compound disasters, as these events ‘ride’ from one network to the other, leaving a trail of destruction behind.
- We were used to mobilize large resources and emergency planning known framework in case of sudden breakdown: briefly speaking, the only problem was the immediate response. But now, more and more, we do not even know the right question to ask ourselves. And when we do, we often realize that our traditional tools are a war behind.

3°) Sustainability: a New Deal

For sure the blows received and the perspective of other severe difficulties – a massive power blackout in European countries, large scale attacks on the information systems, a new Sars or BSE with surprising consequences, chaotic climate episodes, etc. – have profoundly modified our vision of risks and vulnerabilities, sustainability and governance. A dangerous dynamics tends to be reinforced after each event: disarray of people in charge (experts, managers, government) on the one hand, distrust among the public on the other hand, and eventually a growing decoupling between the former and the latter.

The response cannot be purely technical (hardware), nor in terms of “communication” as it has been seen so often in the past few years. There is no time to waste, the multi-dimension of the problem has to be recognised, the in-depth questions have to be addressed, and all actors have to be involved.

Research has a key responsibility in that whole context as it could bring fresh frameworks to better understand and to act more efficiently. Moreover, Research has to find its place through new practices and partnerships.

2. Gaps to Fill

First and foremost, we must avoid the conventional traps:

- The fascination for the “hardware” vision – hardware vulnerabilities, hardware solutions: while it’s helpful as a component to be integrated in any decision making process, there is no such miracle technology filling all the gaps anymore.
- The easy way of “communication”: people in charge prepare to communicate with the media, but nothing else – speaking to the media cannot be the one and ultimate key, especially when the crucial people to reach do not have television or radio anymore.
- The mere use of outdated governance models: back to centralisation, “Command and Control” philosophy already showed its limitations during recent large-scale events with debilitating impact on economic and social continuity of affected countries.

There is no easy way out. We have to take the issue as it is: difficult and complex. At least three crucial line of challenge are to be acknowledged and dealt with.

1°) Intellectual Challenge: Discontinuity

The ‘unconventional’ arena actually presents some regularities:

- *Out-of-scale gravity*: the usual scales suddenly appear outdated.
- *Indeterminate gravity*: the mere impossibility to clarify the potential seriousness of a suspected threat. We already had to face, as in the BSE case, situations when it is even impossible to determine whether you are confronted by a “non-event”, a medium range problem compare to others, by a real disaster, or a new Great Plague type of catastrophe to Mankind;
- *Meaningless probability*: what is the probability of a terrorist attack? Of a class 3 hurricane in New York, of an original heat wave for a whole month over Europe, a polar weather long lasting episode in a so-called temperate zone?
- *Real time*: many people are trained to react swiftly, but how they can respond to dramatic speedy events, at international scale?
- *Hyper-complexity*: systems tend to follow what I would like to describe as “Larsen process dynamics” – complexity and confusion feed more complexity and confusion, and the loop becomes infernal;
- *Ignorance*: no scientific expertise available; impossible to know where, when, who, why ?
- *Out-of-scale costs*: the ultimate frameworks are not overtaken at the margin, but appear radically inadequate, at least potentially.
- *Unknown maps*: potential actors are numerous, immense voids in organisational systems, key conventional actors become marginal, unknown actors become central.
- *Shattering references*: the visions, the frameworks, the measurements that allowed to think and operate do not work anymore, to a large degree.

Each dimension justifies new intellectual approaches and research. More, there is a common point to all of these: discontinuity – which means a fault line, splitting radically different world. Our intellectual tradition poorly incorporates these non linear jumps, mutation, snowballing effects, etc. We are so wonderfully trained to the world of stability, linearity, limited uncertainty at the margin, partitioned theatres of operation, optimization according few well shared and accepted criteria... Those emerging unstable and critical contexts may be far beyond our understanding capacities. Research has an urgent mission to fulfil in that essential respect. And the challenge is not small. As Hegel said : “If you are confronted by unthinkable challenges, you have to invent unthinkable paradigms”. A real program that would be fruitful to really put on the research agenda.

2°) Managerial Challenge: “Out of the box”

Ralph Stacey has clearly stated the point:

“At least 90% of textbooks on strategic management are devoted to that part of the management task which is relatively easy: the running of the organizational machine in as surprise-free a way as possible. On the contrary, the real management task is that of handling the exceptions, coping with and even using unpredictability, clashing counter-cultures; the task has to do with instability, irregularity, difference and disorder.”⁹

A whole world here too has to be explored in that field too.

In terms of prevention:

- Which design for our critical network organisations?
- Which new safety rules, tools, practices, training, audits?
- With whom?
- In which time and space frame?
- Which information to share? With whom? With what security procedures?
- What types of risk cover for catastrophic events when private insurers and reinsurers leave the market?

In terms of crisis management’s aptitude and learning:

- Unconventional simulation methods.
- Unconventional debriefing methods.
- Specific training for top management.
- Across the board preparation.

3°) Psycho/cultural Challenge: deep threats

Emerging risks are not welcomed. It is much comfortable to treat them as “unrealistic”, too rare, beyond our responsibility, etc. This difficulty has to be acknowledged for going further.

Let us read these lines, among many others, clarifying the burden of these impossible times of crisis:

«I think these few minutes were the time of gravest concern for the President. Was the world on the brink of a holocaust? Was it out error? A mistake? Was there something further that should have been done? Or not done? His hand went up to his face and covered his mouth. He opened and closed his fist. His face seemed drawn, his eyes pained, almost gray. We stared at each other across the table. For a few fleeting seconds, it was almost as though no one else was there and he was no longer the President. Inexplicably, I thought of when he was ill and almost died; when he lost his child; when he learned that our oldest brother has been killed; of personal times of strain and hurt. The voices droned on, but I didn’t seem to hear anything. This time, the moment was now –not next week, not tomorrow, «I we can have another meeting and decideI ; not in eight hour, «I we can send another message to Khrushchev and perhaps he will finally understandI. No, none of that was possible. One thousand miles away, in the vast expanse of the Atlantic Ocean the final decisions were going to be made in the next few minutes. (Robert Kennedy).¹⁰

⁹ Strategic Management & Organizational Dynamics, Pitman, London, 1996 (p. XIX-XX).

¹⁰ Robert Kennedy I Thirteen days, A memoir of the Cuban missile Crisis, Norton, 1971, p. 47-49.

The lesson of experience is clear: very few persons see positively any training to manage severe loss of references. Having been chosen, most of the time, for their intellectual ability and academic background to solve specific problems within conventional situations, and to do it better than the others, they can't easily welcome any situation where they will be confronted to opaque, fuzzy, unknown and scaring problems –~~to~~ be addressed with many other stakeholders, nobody having the “real” leadership. Hence the great difficulty to prepare high circles to emerging risks and crises.

And the cultural trap also is crucial. Whenever individuals and organisations are confronted by out of the box problems, unconventional and weak signals, they tend to remind absent, deaf and dumb, and to oppose a kind of avoidance syndrome to the problem. Hence the regular failures: deficient screening systems, late alert and mobilisation, very poor networking, and the impossibility to find collective creative initiative to find a positive way out. Until the fiasco is there and clear, the avoidance syndrome is the common feature. As in the case of BSE, brilliantly analysed by the Phillips Report, with these key lines which explain nearly the whole dynamics: « *In their heart of hearts they felt that it would never happen* ». (Phillips Report ¹¹).

More: a new difficulty, very far from our common knowledge and practice is arising. The whole culture of risk and crisis is embedded in the paradigm of “explosion”. It seems that we are sliding, now, on the opposite dynamics: “implosion”. Destruction of confidence and trust, destruction of links and bridges, absence of criticism which does not mean satisfaction, on the contrary.

On all these subjects we need more research, fundamental and applied. To understand the basics, the grammars, the possible operational responses.

II –~~IN~~NOVATIVE PARTNERSHIPS

1. Research: a strong potential, and much to do

During the Fall of 1999, a European network has been set up by participants in a European-wide crisis conference in the Hague, and in this vein the *European Crisis Management Academy* has been created in April 2000 in Stockholm. Their members meet regularly to share results and questions. The same movement has been launched between the US and the EU, this summer with a EU/US Crisis Management Conference at Minnowbroock Conference Center, thanks to the impulse of Syracuse University and the Leiden group.

Arjen Boin (Leiden University) has clearly expressed the challenges for the Research community itself:

“The obvious challenge for crisis researchers is to bridge the gap between the world of theoretical findings and resource-strapped practitioners. Many academics have, of course, made inroads into the community of crisis managers at all levels of the public

¹¹ Lord Phillips, J. Bridgeman and M. Ferguson-Smith, *The BSE Inquiry*, vol 1. Findings and Conclusions, London, Stationary Office, October 2000, § 1176.

and private domain. However, these remain mostly individual efforts and have not resulted in concerted and recognizable ways of thinking in either government or private organizations. It would seem that crisis researchers would have to build an academic community that can help create effective school of thought, which, in turn, result in training programs.”¹²

As concerns complexity, which will become increasingly crucial with critical infrastructures development, Gene Rochlin (University of California, Berkeley), opens vast avenues:

“In the past, success was equated with equilibrium, and therefore stability, regularity, and predictability. These assumptions, which we drawn from Newtonian physics and Darwinian evolution are now being challenged at the fundamental level by the new “sciences of complexity”, concerned with the dynamical properties of non linear and network feedback systems. One example of new thinking on this subject is a recent book by Russ Marion (The Edge of Organizations, 1999), that does set out to apply newer theories of complexity to organizations. Using Kaufmann’s formulations –[1] particular the notion that systems need to be on the “edge of chaos” to be adaptative –[2]e finds that there are optimal levels and intensities of interaction in complex organizations. Too much, and the system moves towards chaos, too little and it is overly stable and unable to adapt. But he has no idea of what would constitute the proper tools for analysis, let alone for design. Few of us do.”¹³

And Emery Roy, underline some very specific questions, which seem to be seriously overlooked but crucial for critical infrastructures:

“The gap between design and real-time operational requirements is, we believe, one of the most important sources of failure in the provision of reliable critical services. [...] We have identified a class of “reliability professionals” (among control room operators, middle level managers and supervisors and immediate support staff) who have a unique combination of skills, experience and knowledge bases that allow them to transform and at times transcend design limits in the promotion of reliability. We believe these professionals are critical to the successful performance of many complex critical infrastructures and yet their role has been crucially neglected in both research into and design of these systems”.¹⁴

In a nutshell, the keys to go further appear to be:

- To develop international teams and networks, and to launch shared research projects.
- To address the crucial intellectual challenge: discontinuity, complexity, through various research programs.
- To apply efforts, specifically, to Critical Infrastructures and Civil Protection new challenges, and to do that at the international level:
 - Systematic and immediate debriefing, with international teams of all significant breakdown or near miss;
 - Exploration of specific problems such as: real time dynamics, cross boundaries and cross culture dialogues, new organizational and inter-organizational

¹² Arjen Boin “Building Transatlantic Crisis Management Capacity – Lessons from Crisis Research”, Memo prepared for the EU/US Crisis Management Conference, Syracuse University, Minnowbrook, August 6-10, 2003, p. 15.

¹³ Gene I. Rochlin “Mind the Gap”, Memo prepared for the EU/US Crisis Management Conference, Syracuse University, Minnowbrook, August 6-10, 2003, p. 5.

¹⁴ Emery Roe and Paul Schulman: Operational-Technical Issues – Challenges and Lessons, Memo prepared for the EU/US Crisis Management Conference, Syracuse University, Minnowbrook, August 6-10, 2003, p. 1.

design, safety problems linked to globalisation, organizational resistance to learning and ways for breakthrough in that area, etc.

2. Research: a “neutral interface”¹⁵

Experience clearly shows that many actors are anxious to find some new arenas to discuss and share about emerging risks and crises. Companies often feel very uneasy with the perspective to launch open forums, to discuss with competitors, with government; and government feel awkward with the perspective to invent new kinds of forum with industry.

Leading academic institutions could have a key role to play in that respect. There, opening questions is not only possible, but fully legitimate –the norm in fact as they can combine expertise on those issues as well as a neutral role in the development of multi-level partnerships from the public and private sector. There, it is much easier, at least to a certain extent, to work on sensitive subject, and to share some questions, data, frameworks. One difficulty remains to launch initiatives and sustainable forums on which executives can build new thinking frameworks and adequate policy in the long term in partnership with research teams.

The difficulty to overcome could be a too large fault between industry and academic world. Too different languages, concepts, frameworks, experiences, giving way to exaggerated behaviours: academics hiding behind their jargons and jungle of frameworks on one side, and officials seeking refuge in “pragmatic” approaches opening no space for in-depth questioning. But these traps can be overcome through innovative partnerships as recently done in promising initiatives.

3. New partnerships: *now*

The risks are cross sectorial, cross borders. Accordingly, the response has to be cross-sectorial and international in nature. And, given the numerous “black hole” to face as concerns knowledge, paradigms, operational models to construct and implement, research as to be involved in this decisive move.

Some achievements have to be mentioned in this area.

The Crismart ambitious project within the Baltic Region:

“As we launched the CM Baltic/Europe program in close collaboration with Swedish Agency for Civil Emergency Planning, we and our governmental partners agreed upon four closely related goals:

- *To promote the development of crisis studies (as a multi-disciplinary academic subfield) in Sweden.*
- *To promote national and transnational dialog between the scholarly and practitioner communities in Europe.*
- *To encourage scholars and practitioners from other European countries (especially from the new democracies of Northern Europe) to document, analyze, and share knowledge of their crisis experiences.*
- *To promote confidence building and the development of a capacity for*

¹⁵ I borrow the expression from Erwann Michel-Kerjan, The Wharton School.

*political/operational collaboration among the governments of the region.”*¹⁶

Some hallmarks can be sketched at this stage:

- *International think-tanks*: to open questions, before being confronted to the unthinkable; and to prepare new framework of response;
- *Concrete projects*: it is essential to adopt, in complement to the think-tank approach, a “learning by doing” practice; the experimentations have to be precise, specific, and built on the basis of innovative design.
- Think-tanks and people involved in innovative projects have to prepare for direct involvement in case of severe crisis, of large scale projects, training, etc.

As a positive sign on this difficult road, it is useful to refer to the initiative we personally took in 2002 with European postal operators, after the worldwide anthrax crisis in 2001. It appeared that the debriefing launched until then had been “national”, when the challenge was clearly international – it was time to go “out of the box”:

“La Poste’s chairman, Mr Vial, was in New York when he heard the news: According to AFP, two persons had been infected with anthrax in Germany, Europe’s first confirmed cases in the mail-bourn terrorist scare of autumn 2001. He immediately tried to get in touch with his counterpart at Deutsche Post, to no avail. He was also unable to get a hold of the head of Royal Mail. [...] Tension remained high until 8:30 p.m. that evening, when AFP finally announced that its earlier report had proved false. [...] The first lesson was self-evident: The post industry was prepared for specific, local or national crises. It was not for international interconnected crises. [...] Clearly, a new area of risks and potential crises had emerged. As a result both the structure and culture of systems safety and crisis preparedness had to be revisited.

A decision was taken – a conference will be held:

- *to share experiences and lessons from the anthrax crisis;*
- *to share ideas and proposals to improve the collective management of such emerging threats;*
- *to establish a European crisis management capacity enabling crisis managers in public postal operators to network with their counterparts and with other international and European organisations, using a common platform. [...]*

*Representatives from 30 public postal operators came to Paris in late November 2002 to share their experiences, to suggest new avenues for research and to launch a debate on new operational capabilities. Novel crisis situations require high-level involvement which explains why international organisations such as the Universal Postal Union, CERP (Comité Européen de Régulation Postale) as well as USPS (United States Postal Service) were present at the conference. Mr Thomas Day, Vice-President of USPS, accepted to cross over the Atlantic to give the vivid testimony from the directed affected country.”*¹⁷

More: the whole project was designed, planned and led on the basis of an in-depth

¹⁶ Eric Stern and Bengt Sundelius – Crisis Management Europe – An integrated Regional Research and Training Program, prepared for the EU/US Crisis Management Conference, Syracuse University, Minnowbrook, August 6-10, 2003, p. 20.

¹⁷ Martin Hagenbourger, Patrick Lagadec and Marc Pouw: Postal Security, Anthrax and beyond – Europe’s Posts and the Critical Network Challenge: Lessons from the Anthrax Case to Meet Future Challenges, *Journal of Contingencies and Crisis Management*, special issue: «Anthrax and Beyond» (P. Lagadec Guest Editor), Volume 11, Number 3, September 2003, p. 105-107 (p. 105; 107).

collaboration between academics specialized in the field (Ecole Polytechnique, Leiden University, The Wharton School). This partnership led to the publication of a special issue of the *Journal of Contingencies and Crisis Management*, “Anthrax and Beyond: New Challenges, New Responsibilities” –Here again in close collaboration between academics and top-level executives from postal networks.

To conclude in opening the debate for the conference in Stockholm, I would mention that I tried to launch the same initiative concerning the Sars episode, which was not a confined health agencies problem. Airlines, Airports, Municipalities, Health Agencies around the world, should also share their surprises, unconventional positive initiatives at the times and strategic initiatives for the future. Until now, the idea has received much interest, but no decisive organizational support, as required to launch large-scale initiatives on those large-scale issues.

This is probably the key challenge today: finding a critical number of individuals and organizations willing to jump and act in order to transform emerging risks into emerging opportunities.