



Risk Management Division

NON-CONVENTIONAL CRISES AND CRITICAL INFRASTRUCTURE

KATRINA

Report-back Mission

**New Orleans, Gulfport (Mississippi), February 19-25, 2006
Washington, DC, March 13-15 2006**

CRUCIAL FACTS – FURTHER CONSIDERATIONS

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*Pierre Bérroux,
Senior Vice President, Corporate Risk Management*

EDF currently is – and increasingly will be – a key player in new, destabilizing, multi-factor emergencies, of which our activities will not be the root cause (natural catastrophes, pandemics, crises in society, new forms of terrorism, etc.).

Our capacity to combine anticipation and “out-of-the-box” thinking with more traditional operational handling of crises, will be a vital condition for the successful management of such unconventional events. This “joined-up” thinking is at the heart of EDF’s emergency planning.

Since July 2005, the basis of a “rapid-response think tank” has been established. This body aims to provide backup support to strategic management in preparing for or coping with a large-scale crisis situation: the ability to ask “open-ended” questions, the identification of dead ends, key responses and reference frameworks in unpredictable situations, creative initiatives, mapping of intervention teams. This body is, notably, already contributing to contingency planning for a possible influenza pandemic.

With this in mind, it seems essential for the Group to learn from feedback from major catastrophes affecting other players and other countries. Hence the report-back exercise conducted in 1998 following the ice storm which paralyzed Montreal was a critical resource in helping us to cope with the storms that hit our own country at the end of 1999.

In the same spirit, in October 2005, I asked Patrick Lagadec and William Dab to undertake a mission to Toronto, which experienced two major crises in 2003, one linked to the SARS epidemic and the other to the electricity blackout in the North-Eastern United States. By pooling their contacts, and with the vital support of Jean-Pierre Roche, Aéroports de Paris’ Risk Manager, they were able to assemble feedback from the public health and airport authorities, the electricity industries and, particularly, from colleagues at Ontario Power Generation.

The exceptional nature of and serious difficulties arising from hurricane Katrina were worthy of further investigation as soon as circumstances allowed. This became possible in early 2006, and I entrusted this mission to Xavier Guilhou and Patrick Lagadec, supported by Daniel Madet of the Risk Control Department and, once again, with the assistance of Jean-Pierre Roche, Risk Manager at Aéroports de Paris.

With the support of Admiral Oudot de Dainville, Chief of Staff of the French Navy; Prefect Frémont, Prefect of Defense Zone South, and, critically, of His Excellency Jean-David Levitte, French Ambassador to the United States, the team was able to make an initial visit

to New Orleans, where the French Consul, Mr. Pierre Lebovics, contributed all his knowledge of local networks very rapidly to establish a large number of contacts. Work on the project is still ongoing, particularly in Washington, DC, where official inquiries are being held and critical infrastructure companies are still reflecting on the new management architecture for a catastrophe of this magnitude.

The aim of this initial note is, of course, to enrich the thinking of EDF but also to be circulated more widely and, primarily, to all those who assisted the report-back mission. Given the scale of the challenges at hand, it is imperative to work together and share information and experience. EDF is thus open to shared thinking on these issues.

I hope that you will find the following information interesting and would very much welcome your feedback.

*Pierre Bérourx
Senior Vice President, Corporate Risk Management*

Acknowledgements

The report-back mission conducted in Louisiana between February 20 and 25, 2006, at the request of Pierre Bérour, Senior Vice President, Corporate Risk Management at Électricité de France, would not have been possible without the active assistance of a number of key individuals. Our grateful thanks go to the following people for their help, testimony or, simply, their hospitality – at a time when they are still dealing with the legacy of Katrina not only in technical and environmental terms but in terms of individual and collective grief–:

In France, those who personally provided support:

- Admiral Oudot de Dainville, Chief of Staff of the French Navy, and Lieutenant Miremont, Director of the Chief of Staff's office;
- Prefect Christian Frémont, Prefect for the Bouches-du-Rhône, Prefect of the Provence, Alpes, Côte d'Azur region, Prefect of Defense Zone South;
- Mr. Michel Nesterenko, President, *Protection Totale Engineering Group*;
- Mr. Olivier Velin, certified Consultant, IBM France, and Ms. Simone Eiken, Crisis Management Consultant, IBM France.

In the United States:

- His Excellency Mr. Jean-David Levitte, French Ambassador to the United States;
- Lieutenant Harmand, Naval Attaché, French Embassy to the United States;
- Ms. Geneviève Chedeville-Murray, Counselor (Political) - Global Issues, French Embassy to the United States;
- Mr. Pierre Lebovics, French Consul General to New Orleans;
- Ms. Voahangy Wascom, French Consulate, New Orleans;

The number and the quality of the individuals we were able to approach proved critical to the success of a mission which some at initially deemed nearly impossible. Organizing our interviews in Louisiana was a tour de force, particularly since it was undertaken at just three weeks' notice, at a time when Katrina related emergencies still clogged up most agendas and carnival was in full swing – a particularly busy time in New Orleans which Katrina made even more crucial as it offered a time to forget and recover at individual and collective levels.

In the United States, for their personal testimony (in chronological order of the interviews):

Those involved in New Orleans and Mississippi who agreed to meet with us, despite their still-heavy involvement in post-Katrina – and the suffering endured by themselves, their teams, families and communities:

In Louisiana and Mississippi (February 19-26, 2006)

Louis Armstrong Airport

- Roy A. Williams, Director of Aviation
- Richard Blanchard, Airport Fire Chief
- Carolyn Carlton-Lowe, Deputy Director (DD) of Commercial Management
- Charlie Cazayoux, Airport Manager
- Michelle Duffourc, Manager, Public Relations
- Pat Malone, DD, Finance and Administration
- Allyson Ogles, Manager, Land Development
- Mario Rodriguez, DD, Planning and Development
- Maggie Woodruff, Deputy Director of Community & Governmental Affairs

Port of New Orleans

- Paul J. Zimmermann, Director of Operations

Coast Guard, Louisiana District

- Captain Frank Paskewich, Commanding Officer, Captain of the Port
- Capt. R. Mueller, Deputy Sector Commander
- And their team

Mississippi Power

- Kriston D. Barton, Distribution Manager
- James D. Cochran, P.E., Manager, Transmission
- Steve Craig, Manager, Substations
- Charles E. Evans, Jr., P.E., Manager, Division Electric Operations
- Robert Powell, Distribution Project Management
- Melvin Wilson, Manager, Sales & Marketing Services
- Riley Wells, Compliance & Support Manager, Watson Plant

BellSouth

- William A. Oliver, President
- Mike Marino, Jr., Human Resource
- Merlin M. Villar, Jr., Regional Director, External Affairs

American Red Cross, Southeast Louisiana Chapter

- Mrs Kay W. Wilkins, Chief Executive Officer
- Mr Melvin B. Davis, Deputy CEO

FEMA

- Lt. Tony Robinson, Division Director, Response & Recovery
- Joshua Barnes, External Affairs
- Mr. Ted Monette, Deputy Federal Coordinating officer

Whitney National Bank

- Rodney D. Chard, Executive Vice President

Sewerage and Water Board

- Jack R. Huerkamp, P.E., Chief of Operations

Cox Communications

- Elvin Thibodeaux, Manager of Safety and Risk

WDSU Hearst-Argyle Television Inc.

- Mason Granger, President/General Manager
- Chet Guillot, Chief Engineer

Fedex

- Randy King, Managing Director, Domestic Ground Operations

Entergy

- Robert Sloan, Executive Vice-President, General Counsel
- Mark Savoff, Executive Vice-President in charge of operations
- Randall Helmick Vice-President, Customers Service Support

University of New Orleans

- Isabelle Maret, Assistant Professor
- James (Jim) Amdal, Director, Merrit C. Becker Maritime and Intermodal Transportation Center (MITC), College of Urban and Public Affairs
- Jane S. Brooks, Professor, College of Urban and Public Affairs
- Timothy E. Joder, Associate Dean, Business Affairs; Executive Director, Sponsored Research, College of Urban and Public Affairs
- John J. Kiefer, Assistant Professor, Public Administration and Urban Studies
- Shirley Laska, Professor of Sociology ; Director, Center for Hazards Assessment, Response and Technology
- Monica Teet Farris, Assistant Director and Assistant Professor, Center for Hazards Assessment, Response and Technology

In Washington, DC (March 13-15, 2006)¹

Contact with the individuals interviewed was possible thanks to the support of Mr. Samuel Wells of the Woodrow Wilson International Center for Scholars, to whom we extend our heartfelt thanks.

Innovative Emergency Management (IEM)

- J. Krause Wilson, Director, Applied Products (Baton Rouge)
- Melanie Bartis, Crisis and Consequence Management Product Group (Baton Rouge)
- Michael Hirsch, Director, Recovery Program (Arlington)

Particular thanks are due to Krause Wilson and Melanie Bartis, who traveled specially to Washington in order to meet with us.

Department of Homeland Security (DHS)

- James Claverly, Director of the Infrastructure Partnerships Division, US Department of Homeland Security
- Nohemi Zerbi, PE, LPP, International Programs Coordinator, Preparedness Directorate
- And their colleagues

In addition, we were able to meet with a certain number of critical infrastructure operators within the framework of a seminar organized by Harvard University (Kennedy School), with the support of Verizon, on March 14 and 15, at the National Press Club in Washington, DC, addressing the theme: "Protecting our Future: Shaping Public-Private Cooperation to Secure Critical Information Infrastructure." During this seminar, which was much marked by the Katrina experience, contributions were made by Senator Susan Collins, in charge of the Senate report on Katrina (published April 2006), and Congressman Bennie Thompson, a Representative for Mississippi.

¹ Mission carried out by Patrick and Erwan Lagadec

Foreword

It goes without saying that responsibility for this report falls only to its signatories, who take full responsibility for any factual errors, interpretation and analysis within it. The report will be updated to take into account any forthcoming feedback.

Innumerable notes, reports² and books³, thousands of pages on the internet and the media, and dozens of conferences have been or will soon be dedicated to Katrina. We did not aim to return from Louisiana, after just six days, with more than a limited survey or an appreciation of areas that merit further consideration. The magnitude of the subject, its disconcerting complexity, its unusual characteristics, are humbling. Our aim was rather to assemble a number of observations on the most salient or disconcerting characteristics of the catastrophe, and to provide some warnings and suggestions to further our understanding and know-how in dealing with such non-conventional crises. Our meetings in Washington in March only served to confirm this approach, by reminding us to what extent the US players themselves, including at the very highest level, are still puzzled by the complexity of the disaster Katrina has left in its wake.

The investigative frame of reference focused on one specific issue: crucial lessons arising from the event for critical infrastructure operators. In other words, our questions and analyses focused above all on two or three key principles for infrastructure companies to bear in mind, the traps to be wary of, the areas that warrant a fresh look and, where possible, examples of particularly interesting creative initiatives.

It wasn't possible to meet a considerable number of specialized critical infrastructure companies or professionals since this would have meant several weeks in the US, covering Louisiana, the Deep South or even the rest of the United States. While we were able to meet with a significant number of participants, representing a highly diverse range of professionals and perspectives, we are far from having conducted an exhaustive series of interviews. Note, for example, that we were not able to collate the thinking of local associations or elected representatives, who would have had much to contribute.

In addition, during our meetings with twenty or so different players involved, we realized how little time we had for listening and exchange. Ideally we would have needed days at a time to hear about experience of the event, detailed thoughts on relevant issues, and to collate individual perceptions.

The severity of the catastrophe has left deep psychological scars, which were all too apparent during each of our meetings – when they tended to resurface. Our primary duty was one of comprehending respect, and not a coldly intellectual approach to be programmed or scheduled to the minute. Were that the case, a mission of this nature should not be conducted expeditiously, or result in over-hasty conclusions.

Nonetheless, we came away from this experience with the fundamental conviction that,

² In particular, and prior to the publication of the Senate report: “*A Failure of Initiative*”, Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, House of Representatives, February 15, 2006.

The Federal Response to Hurricane Katrina – Lessons Learned, February 2006.

³ We would particularly highlight: Ronald J. Daniels, Donald F Kettl and Howard Kunreuther: *On Risk and Disaster – Lessons from Hurricane Katrina*, University of Pennsylvania Press, Philadelphia, 2006.

despite all the difficulties, it is critical to undertake work of this kind, whatever the limitations. It would be counterproductive to wait for the post-crisis situation to be perfectly under control before undertaking such a feedback report, in the futile hope that the study could then produce an exhaustive and purely “scientific” report of the facts and observations.

It is in this spirit that we conducted previous EDF missions to obtain feedback on the ice storm that hit Quebec in 1998⁴ for example, and, more recently (October 2005), on the SARS episode in Toronto (2003)⁵. It is critically important to undertake investigations into these catastrophic events and to do it without waiting for all the “right” conditions.

There is another, more surprising dimension. If the mission is conducted at the appropriate time – neither too early (risking voyeurism) nor too late (when the teams involved need to move on to other things and have already been swamped with dozens of requests worldwide) –, and if the approach focuses on a respectful hearing of testimony and the individuals conducting the interviews are prepared to offer their suggestions or feel able to share personal experience... then the exercise can reach a new level, and even provide an element of post-traumatic support. We witnessed many times this "shift" during our mission in the Southern States and in Washington. In one case, we even saw a director transform our request into an opportunity for shared discussion with his team – the meeting he organized was probably the first real debriefing session he had had a chance to conduct.

⁴ Review "Ice storm in Quebec - 5 January-15 February 1998", In *La Lettre des Cindyniques*, septembre 2001. (Patrick Lagadec website : www.patricklagadec.net/uk/)

⁵ Patrick Lagadec, William Dab: “Managing Vital Activities in an Unpredictable world – The large network operators and pandemic risks”, “The Toronto Mission: Learning from the Sars crisis and preparing for the flu pandemic, October 10-14 2005”, eDF, Direction du Contrôle des Risques, 10 November 2005 (Patrick Lagadec website : www.patricklagadec.net/uk/).

Introduction

A combination of different factors (climate change, increasing technological complexity, economic interdependence, just-in-time production, asymmetric vulnerabilities, etc.) is giving rise to a new strategic landscape. We are increasingly faced with catastrophes that don't fit our usual terms of reference, response doctrines or traditional operational scripts. More worrying is that while such crises used to be exceptional and marginal phenomena and had no long-term impact on our essential dynamics, they now tend to affect and destabilize the very core of our systems. Increasingly, these "unthinkable" events invoke chaos theory, leaving even the best of our "clock-makers" - who until recently operated in perfectly stable, quantifiable environments⁶ - completely disoriented.

It is urgent to reinvent our preparedness architecture, whether in terms of our understanding, response plans, mechanisms and organizational protocols, and to develop broader visions and specific guidelines, if we wish to regain a balanced and effective operating response underpinned with legitimacy and credibility in this fast emerging universe.

Katrina represents a striking example of this new type of phenomenon, whose analysis should enable us to begin to identify and modify the assumptions that are no longer viable and to construct the appropriate, indeed vital, preparedness framework given the seriousness of what is at stake.

The tone of most French commentary the day after the disaster was striking. "In France, we fortunately have the institutional structure and the national and departmental plans in place that make such a demonstration of powerlessness unthinkable". We have thus attempted, wherever possible, to be wary of analyses like these. Such over-hasty, Pavlovian assessments conceal an all too common refusal to face up to the real issues, and are indeed symptomatic of deep fragility.

On the contrary, we should be tackling head-on the full scale of the challenges posed by Katrina, with an acute awareness that preparedness and response mechanisms must be rethought and rebuilt if we want to be able to cope with this "brave new world" of risks and vulnerabilities: a world that undergoes constant and rapid evolutions, and which we can no longer easily "contain" using pre-configured scripts adapted only to limited, familiar situations arising within a stable context.

This note is an interim report based on the following "points of entry":

- *The surprise factor*: identifying the extraordinary characteristics of the Katrina episode;
- *Focus*: putting the emphasis on the functioning of critical infrastructures (and therefore staying away from the purely political controversy which is currently monopolizing the attention of opinion, if not the investigators themselves in the United States);
- *Response*: discerning the key operational mechanisms that could be deployed in handling other types of extreme disruption;

⁶ Patrick Lagadec: "The borderline of chaos", *Crisis Response*, Vol 2, Issue 3, June 2006, p. 62-63. And in French: "Risques, crises et ruptures aux frontières du chaotique", *Contrôle*, no.168, February 2006, pp. 72-77; "Nouvelles menaces et gouvernance", *Gérer et Comprendre, Annales des Mines* June 2005, no. 80, pp. 8-22. November 4, 2005. Xavier Guilhou and Patrick Lagadec, "Grippe aviaire : une crise de pilotage", *Les Echos, Idées* p. 19. (Patrick Lagadec website : www.patricklagadec.net).

- *Questioning*: identifying the crucial areas on which to focus in order to improve our capacity to think, invent, and heed early warnings in the future.

Public inquiries available elsewhere have already documented the Katrina episode almost exhaustive detail on a purely factual level, as each institution has thought it necessary to publish its own several hundred-page report. Instead, we chose to produce a shorter document focused on the major points of analysis and operational proposals.

Most importantly, this work draws mainly on ‘ground truth’ experience, and on the issues and lessons arising from discussions with frontline players – primarily operators of critical infrastructures and response agencies – in order to better understand the non-conventional challenges represented by Katrina and to extend the analysis beyond the actual hurricane itself. The ultimate challenge is to rebuild our framework for understanding and ground-level intervention in unforeseen situations.

It is along these lines that we wish to continue our exchanges. This document is only a first step. Hopefully, the opinions and remarks arising from the circulation of this brief overview will help to enrich future publications.

I – KATRINA: A NON-CONVENTIONAL PHENOMENON

Hurricane Katrina hit the Gulf of Mexico coast on Monday August 29, 2005. The latest estimates put the number of deaths at 1,300, making this the most destructive hurricane in terms of loss of human life since 1928 (Okeechobee Hurricane, 2,500 deaths), and ranking third in American history of such events (Galveston, 1900, 8,000 deaths).⁷ It was essentially double edged, as it was:

- an extraordinarily large hurricane,
- and mutated into a hybrid catastrophe (natural and technological) following the breaching of the levees and the flooding of New Orleans, which caught nearly everyone by surprise.⁸

1. The hurricane, a familiar event

- The southeast coast of the United States is used to hurricanes (even though Louisiana lies on the fringes of the usual hurricane zone and thus wasn’t front line in terms of awareness and preparedness).
- Weather forecasting and hurricane warning organizations and systems are remarkably effective.
- The civil security methods are also tried and tested, at least in Florida, and populations are used to responding.
- Extremes have already been reached with Category 5 hurricanes like Andrew (1992) and Camille (1969).

⁷ Most of the figures cited are taken from our interviews and from numerous texts, for example: Robert P. Hartwig, Senior Vice President & Chief Economist, Insurance Information Institute, New York, December 7, 2005. <http://www.disasterinformation.org/disaster2/facts/presentation/>

⁸ Even though this risk was remarkably well documented and was the subject of a simulation based on a scenario almost identical to that of 2004. But there is a wide gap between assumptions and their effective organizational integration.

- Warnings on Katrina were given several days ahead: level 5 was reached in the Gulf of Mexico before the hurricane was downgraded to level 4 and close to level 3 upon landfall; the path was predicted very accurately, to within a few tens of kilometers.

2. Katrina: exceeding multiple thresholds

- *Unusual scale*: Katrina was not a Category 5 hurricane – but parameters other than wind speed, which are not well reflected in the Saffir-Simpson scale, need to be taken into consideration: the magnitude of the hurricane, twice the size of Andrew – 400 km compared with 200; the geography of the coast, Louisiana forming a “narrow bottleneck” which contributed to raising the water level; the fact that the hurricane struck just as the tide was high. Depending on the place, the water level reached between 4 and 10 meters, compared to 5 meters for Andrew. Furthermore, Katrina was followed by another hurricane, Rita, on September 24, which compounded the devastation of the first disaster.
- *Off-the-scale span and gravity*: the area impacted is equivalent to the United Kingdom, roughly half of France, with devastated landscapes or even total destruction in the worst affected zones. 250,000 to 300,000 houses⁹ were seriously damaged or destroyed; 110,000 in New Orleans alone – of which 30,000 to 50,000 beyond repair. Tourist resorts built in concrete were swept away.
- *Multi-faceted phenomenon*: the key problem, especially for New Orleans, was not the wind itself, but the persistent flooding following the breaching of the levees (as the majority of the city lies in a basin lower than the level of Lake Pontchartrain and the Mississippi). In New Orleans, close to 110,000 homes, or 50% of the total, were below 1.20 meters of water; certain quarters were under more than 3 meters: the area involved amounted to 7 or 8 times the size of Manhattan Island.
- *Losses and costs*: the overall cost of Katrina has been estimated at US\$200 billion, comprising all types of destruction and dislocation, surpassing any other world catastrophe in terms of economic loss. With regard to insured losses, the cost of Katrina amounts to around US\$40 billion, double the “record” set by hurricane Andrew in 1992, more than six times that of hurricane Hugo (1989), or twice the cost of the September 11, 2001 terrorist attacks. In the three weeks following Katrina, Congress made more than US\$75 billion available, the equivalent of the total spent for September, 11, the four 2004 hurricanes and hurricane Andrew added together.
- *Societal destruction*: 1.5 million people were evacuated from the region¹⁰, cutting the number of available employees by more than 930,000. Other than the lost manpower, the difficulties encountered in reconstruction have been increased by vast amounts of debris¹¹, the destruction of thoroughfares and critical infrastructure, the breakdown of social structures, the public health risk (serious chemical pollution in the water), the increase in materials costs, and the very high cost of transport due to the considerable rise in gasoline prices. Prior to Katrina, Orleans Parish had 15,000 companies trading: only 1,880 had reopened for business on February 8, 2006.

3. Critical infrastructure: massive destruction, domino effect

⁹ This is greater than the damage inflicted in Bosnia Herzegovina or by the Tsunami in Southeast Asia.

¹⁰ 1.5 million people displaced, a figure in line with that of large civil wars.

¹¹ The same unexpected legacy as at the World Trade Center in September 2001.

- *Destruction of offshore oil facilities:* around 75% of offshore oil facilities (3,050 out of 4,000) were situated in the path of Katrina and Rita, the two successive hurricanes: 114 were destroyed (50 by Katrina), 69 damaged, 19 broke their moorings and 3 sank. However, those worst affected were also the oldest and least productive, which in the end limited the impact of the disaster on production. Just after Katrina, 91% of crude oil and 83% of natural gas production was suspended; three weeks later these figures had fallen to 55% and 34% respectively. That said, in periods of severe oil price tension and in an economy of just-in-time production, the smallest disruption can have very serious repercussions.
- *Destruction of vital infrastructures:* 80 to 90% of basic services were destroyed in less than three hours (energy, water and pump stations....) Earlier hurricanes had caused electricity outages affecting around 250,000 people; with Katrina this figure was more than four times greater: 1.1 million, of which 800,000 in Louisiana. With respect to telephone lines, there was a virtually total blackout, with more than 3 million lines cut and damage that could not be repaired in the “short” term (indeed even in the long term due to the persistent flooding); numerous switching centers were inaccessible and often unsalvageable – water being the number one enemy for electrical and electronic installations.
- *Instant knock-on effects:* electricity outages prevented all the other infrastructure networks from functioning; communication breakdowns prevented the normal functioning of disaster response teams; the combined loss of gasoline supply and part of the transport network also created its own share of problems – to add to security issues, etc. The second hurricane, Rita, produced a second shock, forcing restoration teams to suspend their work and withdraw equipment to safety.

4. A backdrop of instability

- *Natural context:* Seven of the ten most costly hurricanes in the history of the United States occurred in the last year alone, between August 2004 and October 2005; five of the 11 most devastating catastrophes in history have hit the United States over the last 4 years: as many major hurricanes (Categories 3, 4 and 5) were logged in the 2000 to 2005 period as during the 1990 decade. Such phenomena would thus appear to be as many steps in a spiral of disasters rather than simply “once-in-a-century” events. In other words, the relativist view which argues cheaply that catastrophes “have always existed” and that modern man has “simply forgotten this fact” doesn’t stand up to analysis, notably that of insurers and reinsurers.
- *Societal context:* our societies are traversed with fault lines that determine highly contrasting social contexts. These in turn can give rise to splintered, extreme, unstable reactions that are difficult to grasp. These fault lines had already been identified in New Orleans. Thus, Henry Quarantelli, founder of the Disaster Research Center, had highlighted, before 2005, that certain places in the United States presented characteristics which did not meet the usual conditions in matters of ground-level control by public institutions. In case of disaster, he added, this would open the way to responses which would not fit the usual disaster sociology paradigms (“officials will not abandon their post, there will be no violence”).
- *Institutional and organizational context:* the shock of terrorism has encouraged a

focus on September 11 style attacks¹²; in this paradigm shift, the standing, resources and teams of FEMA rapidly reached rock bottom, showing that, in just a few years, a body can lose a significant proportion of its effective competence.¹³ As Katrina showed, the price of this "running down" is brutally revealed when tested by stern reality. More generally - and the problem here is not just confined to the United States – due to budget cuts and an increasingly short-term view, our societies have often lost the disaster contingency expertise that they had developed between c. 1990 and 2000. Lastly and most importantly, the primacy given to the “checklist” approach at the expense of strategic thinking, the refusal to address challenges for which there are no “sure” or run-of-the mill solutions (all part of a so-called “operational pragmatism” which barely hides the mediocrity of the vision and the resources deployed) has produced a fundamental lapse in our approach to risk and preparedness for disasters. Outmoded paradigms, a lack of vision, of strategic culture, of preparedness: our response architecture is, all too often “one war too late” in terms of addressing major vulnerabilities. For this reason, it is not enough to criticize the shortfalls of those involved (even if they are obvious, as was the case with Katrina) or merely to recommend organizational adjustments. Fundamental deficiencies require fundamental transformation.

Katrina thus struck as a non-conventional phenomenon that impacted a context itself already marked, prior to the disaster, by a number of fundamental fault lines. Today, such are frequently the characteristics of the new crisis universe.

II – INITIAL STRATEGIC LESSONS

Beyond the commentary – often arrogant or even blind – heard in France in September 2005 on the management of Katrina, beyond even the reports from the American commissions of inquiry which still continue to list the innumerable mistakes and shortfalls of the key disaster response players (which undeniably are often astonishing), the most important point is to identify the major challenges Katrina shed light upon. This requires generic rather than specific thinking. The main issues requiring further consideration are outlined below.

1. Off-scale surprise

1°) Katrina findings

- *Breaching of the levees*: “Everything was ready” to handle the consequences of a hurricane. For example, BellSouth is very experienced in pre-positioning backup telephone systems and support, thereby enabling telephone networks to be rapidly

¹² Despite warnings from specialists. A manager responsible for New York’s unconventional contingency planning confided to us that, in July 2004, what he most feared was not a terrorist attack but a Category 3 hurricane hitting New York (video testimony).

¹³ Again along the same lines, this commentary from Mike Walker, FEMA former Assistant Director, published in the *Washington Times*, September 13, 2005: « Two years ago, in a lecture at the Naval Postgraduate School... I told students that FEMA was not capable of adequately responding to a major hurricane, let alone a catastrophic terrorist attack. My comments were based on an assessment that morale at FEMA was then the worst since the agency was created. The very people the nation depended on to help out during our time of greatest need were being demoralized by an indifferent, inexperienced leadership that neither understood emergency management nor had the skills to ensure the agency had the resources to meet its all-hazards mission ».

restored in impacted areas. Within several hours, four large intervention units were in place and work about to begin. Of course, the question of a possible flood risk – in the event that the water should overtop the levees – had been taken in, and all the equipment was protected; the four support stations had also been set up at sites reputedly safe from the risk of inundation. Yet, astonishingly, the water didn't overtop the levees, it swept them away... and the nature of the challenge was abruptly transformed: everything was waterlogged, starting with the four support base stations: the zones to restore were inaccessible: mud and debris radically transformed the recovery work. All the installations were hit by moisture, telephone equipment's worst enemy.

- *Total communications blackout*: not only was the GSM network not functioning, as experience suggested would be the case, but *no communication channel* was working other than on an occasional, unpredictable basis at best. This included high-technology satellite telephones, which were rapidly blocked by demand saturation in the area. What's more, this wonderful equipment turned out to be usable only outdoors, which is not exactly optimal during hurricanes.
- *Evacuation*: consternation prevailed. 60,000 people were trapped in shelters not designed for the purpose, thousands on the roofs of their houses – or *under* the roofs, prisoners in their attics. The strictly statistical argument that presented as a satisfactory outcome an evacuation of 80% of the inhabitants of New Orleans was not defensible given the tragedy which affected the 20% remaining. How could so many people find themselves trapped, why were they not evacuated (or why couldn't they be evacuated) when city authorities had given the order for this to be done? There were a number of contradictory factors¹⁴.
 - o The first put forward was the incompetence of authorities, who appeared surprised, as did many stakeholders and observers, by the fact that the evacuation didn't follow the usual rules and did not conform to the images of run-of-the-mill Florida evacuations, which went like clockwork and were followed by a rapid, seamless return after the hurricane.
 - o The second was the absence of transport for the underprivileged members of society, and particularly the “desertion” of municipal bus drivers. However, rather than criticizing these employees, we must try to better understand the underlying causes of their defection. Among other factors, school bus drivers, for example, were trained in driving children to school, not for operating within the context of a massive evacuation, an unforeseen scenario, and under considerable stress: the gap between the two roles was too wide.
 - o An unconventional assessment of the context, if close attention is paid to testimony from inhabitants, also reveals that many of them would have chosen to stay even if transport had been available. In effect, their hurricane culture, which produced an ill-founded confidence, was their downfall: “My house has withstood numerous hurricanes with little or no damage. It even survived Camille, a Category 5 whereas I'm told that Katrina is only a level 4. Why leave ? I'm not moving.” Another surprise: we often imagine that Americans, as compared to Europeans, are culturally used to moving freely around the country. It appears that this is not always the case with the least privileged in society who lose their bearings once out of their neighborhood. They don't

¹⁴ Numerous studies are currently underway on this dimension and the conclusions need to be monitored. See particularly : “Understanding Katrina: Perspectives from the Social Sciences”, <http://understandingkatrina.ssrc.org>

have the vocabulary, the financial tools (credit cards), the network of family, friends and professional contacts to offer temporary support or help in integrating within a new context. We rediscover here the “texture” analysis developed by Eric Klinenberg for the Chicago heat wave of 1995¹⁵: social fault lines produce very major surprises.

- o Lastly, it was suggested (without much evidence to back it up) that certain inhabitants stayed because they were afraid of looting or, conversely, because they wanted to do just that once the place was deserted.
- *Urban violence*: consternation – and confusion – reached their height here. For example:
- o Images worthy of Sierra Leone; CNN headlines: “Urban Warfare”; “sound bites” from soldiers hastily recalled from Iraq: “It’s even worse than Baghdad!”. And the unanimous outcry: “This is not America!”
 - o The reports or hyped-up rumors on “countless rapes and killings” inside the Superdome, accompanied by decidedly worrying images. The same with the dead old lady, abandoned in a wheelchair and barely covered –an isolated case, in retrospect, but which was interpreted at the time as symbolic of a wider reality. In fact, it seems that there were but two deaths in the Superdome, one natural and the other a suicide. As for rapes, one case has been reported but has yet to be confirmed.
 - o The real level of violence remains very difficult to evaluate, even six months after the event. There are still major differences of opinion even within the same teams, between those who stress that media reports were outrageously exaggerated or completely groundless, and those who argue that they indeed saw bodies of people who did not appear to have drowned. Interesting also the remarks of a media boss stressing that he had been misled, in watching the major television channels, as to the real gravity of the urban violence – which led to his probably ill-founded decision to delay the return of his teams to the city; while he also admits that “a building was burned every day in the area” where his TV station was based.
 - o In the same way, the usual commentary on behavior presented as delinquent needs to be revisited. On one hand, what the media calls looting is not necessarily that: specialists underline in each case study that a group of human beings who are going to die of hunger would be wrong not to “help themselves” in a shop where goods would rapidly go off in any case. TV crews will present certain images as clear cases of looting while the supermarket manager himself has invited victims to retrieve essential supplies. This type of semantic controversy even took a particularly unfortunate tone in New Orleans where many underprivileged residents made the following bitter remark: “When it’s a Black who is filmed with provisions in his arms, he’s a looter, when he’s White, they’re impressed by his quick-thinking response to the emergency”. However, general “absolution” (the tendency of the “politically correct”) is not appropriate either: the images don’t just show hungry citizens with packs of milk or mineral water in their arms. The theft of electronic goods, not exactly basic necessities, was also obvious. Likewise, when the Coast Guard headquarters or the University of New Orleans were stripped of their IT equipment, it was obvious that this was not spurred by any rational survival reflex.

¹⁵ Eric Klinenberg: *Heat Wave, A Social Autopsy of Disaster in Chicago*, The University of Chicago Press, Chicago and London, 2002.

- *Abandonment by the authorities*: the belief that the authorities are ready to intervene on a large scale in case of a major collective disaster is profoundly rooted in a country as developed as the United States. Yet, in Louisiana, it is combined with very little awareness of who these “authorities” are, or what their capacity and real mission might be, due to the distance between the local government and federal agencies involved (particularly marked in the Deep South). Instinctively, the majority of inhabitants assumed that, in case of disaster, FEMA would “automatically” come to their rescue. This tendency was made worse by the conviction that hurricanes, given their frequency, were a familiar and manageable type of disaster, “domesticated” even. More recently, the Department of Homeland Security had put the security of US national territory at the center of the country’s concerns, with a constant commitment at the highest executive level. These various assumptions, both implicit and explicit, completely collapsed in the hours and days following the arrival of Katrina:
 - Nothing, no assistance, seemed to arrive for the three, even four, first days;
 - Many people finally found themselves in a Superdome considered as a temporary refuge during the passing of the hurricane, but by no means as a long-term housing center: others ended up at the Convention Center, which had not even been identified as a potential refuge;
 - Conditions in the Superdome and the Convention Center quickly deteriorated. They could not be re-supplied given the problem of flooding and urban chaos. Apparently the authorities only “discovered” the problem very late in the day, particularly with regard to the Convention Center. For such a large number of people, the impression of being forgotten was traumatic, astonishing, “unthinkable”;
 - Support personnel inside the Superdome were rapidly stunned by the total loss of radio contact and the absence of any outside help even after 96 hours. Some of them, working for an NGO, tracked down their manager to tell them that the situation was totally beyond them and that they were resigning.

One could cite many other examples. Yet the common ground is the following: the victims and the first response teams realized that they had been suddenly plunged into “an entirely new” battle, and that the authorities were not ready to deal with it. They were violently thrown into a universe worthy of the Balkan war (the word “refugees” was even used until it was deemed too sensitive and politically incorrect, as the United States “is not a Third World country”), with security problems akin to situations of urban guerrilla warfare. Victims had to revisit their most deep-rooted assumptions: “We were told that in case of difficulties the authorities would be there to assist us; we now know that, in case of serious disaster, the first given is that we will be alone, abandoned by the institutions”. The authorities themselves seemed to come to the same conclusion and, as it were, retreated to a new front line which they believed, this time, they could defend in case of disaster: they called on individuals (much more explicitly than in the past) to be ready to be “self-reliant for a 72 hour period” in the event of an emergency.

Beyond the countless specific unexpected events – for example, credit cards that didn’t work, gas stations running dry etc. – one essential surprise stands out: the environment rapidly became unrecognizable. Following Katrina, many inhabitants explained that they no longer recognized their geographical environment and that they got lost in neighborhoods which had previously been familiar. Indeed, the same could be said of the strategic context.

2°) Observations

- *New realities, new angles*: since gravity thresholds are exceeded in every respects, particularly in terms of the domino effect arising from the interdependence of activities - most notably vital infrastructures - and with the fragilization of the foundations on which our activities depend (natural, technical and social environment), every atypical phenomenon must be approached from a new interpretative angle using new methods of treatment.
- *Usual pathology, fiasco guaranteed*: in the present state of emergency response cultures, no country has the capacity to cope with the thresholds that emerging disasters exceed with escalating frequency (quantitatively given their seriousness, qualitatively through their complexity). This would notably require abandoning our codified response doctrines, scripts written in advance, or itemized “checklists”. More often than not, the simple warning that the threat has exceeded a certain level produces an instant paralysis, a “bunkerization” reaction. Everyone – apart from a few remarkable exceptions during the Katrina episode– tends merely to sit in front of CNN, claiming that “this crisis is nothing new”, and waiting for the disaster to return to the agreed script. In an unfortunate vicious circle, the more obvious it is that a threshold has been exceeded, the more the “bunkerization” of those in charge becomes entrenched, pathetic and debilitating. Merely asking specialists to readjust evaluation and early warning mechanisms is not the solution, as the essential problem does not reside in the weakness of the signal, but in its reception by decision-makers who remain petrified.
- *A paradigm behind*: it must be understood that we are dealing here with deep-seated pathologies: it is not enough for commissions of inquiry to criticize the “failures of imagination, initiative, or leadership” in their reports to eliminate our genuine vulnerabilities.¹⁶ We are faced with a fundamental cultural problem involving deep-rooted scientific, intellectual, psychological and institutional thinking. Ritual regrets and condemnations expressed by repetitive inquiry reports are thus insufficient. We must engage in genuine transformative action in addressing:
 - the basis of our scientific thinking: dealing with discontinuity,
 - our organizational principles: developing cultures open to the unexpected,
 - our governance doctrines: extending beyond today’s outmoded social contracts.
- *Rapid-response think-tanks*: one principle to bear in mind: “A level 5 hurricane is not just a hurricane. It is something else and we don’t know what that is”. Hence, the critical need for an immediate mobilization both at operational and strategic levels – with the immediate summoning of a rapid-response think-tank, a resource which makes up for the loss of benchmark frameworks through a powerful commitment of intelligence and creative energy. Four questions need to be asked, as far upstream as possible, and considered throughout:
 - What is the essence of the question?
 - What are the traps?
 - Which new players are involved?
 - Which non-conventional contingency plans need to be set up?
- *And, yet, where is the real surprise?*: though the element of surprise stuns most leaders and demands that the terms of reference be revised, it should not be forgotten that in

¹⁶ « *A Failure of Initiative* », Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, House of Representatives, February 15, 2006.

2004, a large-scale exercise (“Hurricane Pam”) had already been carried out based on a scenario astonishingly close to that of Katrina. The hypothetical death toll ran to more than 60, 000.¹⁷ Three questions emerge:

- o How was it that, despite this exercise, Katrina had such a stun effect?
- o Is it fair to say that the death toll of Katrina, while obviously unacceptable, was still incredibly low – 1,300 deaths, instead of the 60,000 foreseen in the exercise –? Even if they are very reticent on this point, the designer-coordinators of exercise Pam are tempted to argue that this simulation did represent a significant learning curve despite all the shortfalls observed elsewhere.
- o How do we ensure that the lessons learned during exercises become embedded in the culture of those involved, especially when dealing with non-conventional crises?

2. Off-scale complexity

1°) Katrina findings

Traditionally, our reasoning tends to compartmentalize risks and disasters. We characterize events by their nature (natural, technological, social, terrorist, etc.), by type (earthquake, hurricane, landslide, tsunami, etc.). Certainly the argument is regularly made for a non-specific, holistic approach. But our Cartesian mindset constantly comes back to categorization, and the assumption that each stratum, each sub-category calls for an ad-hoc response. But Katrina sent such categories flying, and the protagonists suddenly found themselves unable to read and interpret the situation, let alone make sense of an inundated “radar screen” that combined:

- The direct devastation of the hurricane;
- Generalized flooding making it impossible to reach the affected zones and disrupting operating conditions for all involved: flat bottomed boats became the only possible means of transport, apart from helicopters – never previously utilized on this scale (7,000 people rescued).
- Flooding in a basin which did not allow the pumping foreseen in the plans: all the culverts designed to evacuate flood water to the lake or the river became, instead, the channels for water invasion; the pump stations were out of action.
- Major technological accidents within the zone’s industrial facilities, e.g. the destruction of vast oil reservoirs;
- Considerable pollution, with serious toxicity problems in standing water;
- A colossal debris problem, impeding access; mud blocking the manholes where telephone network specialists needed to work, for example;
- Highly uncertain security conditions, obliging intervention to take place, in certain cases, only under armed guard;
- Generalized breakdown of support services for all interventions: energy, communication, transport, etc.
- Highly complex circumstances in terms of mobility since the region was transformed into a military zone, with checkpoints everywhere following different operational rules according to the military body on duty. It is not necessarily easy to cross such checkpoints when accompanied by armed body guards (even if, in addition, negotiations with the military can be facilitated by hiring members of public-sector

¹⁷ The large networks were not involved in this exercise.

intervention teams such as “Delta Force” during their time off.¹⁸).

This high level of complexity was omnipresent and affected every function. The case of the airport is particularly instructive. The following are just a few of the many relevant points we could mention¹⁹:

- For four days, the airport, which had itself been damaged by the hurricane, had to function on its own: all the support services envisioned by contingency plans (firemen from New Orleans, “mutual aid” coming from other airports in the zone) were themselves also affected.
- With no advance warning, a first helicopter arrived, loaded with victims; the pilot simply explained: “They told us to come here”.
- Then a whole fleet of helicopters which brought in several thousands of people over several days.
- After four days of near total isolation, the airport was suddenly overwhelmed by outside agents, as the US army came in and a city of tents was set up between the two terminals. Inside, airport concourses were transformed respectively into morgue, hospital, dormitory, waiting areas, etc.
- The airport, which processes around 10 million passengers annually (a relatively modest number), rapidly became the leading air platform in the United States. This naturally required a complete revision of ground traffic rules... and the easing of the usual security procedures.
- However, every external operative arrived at the airport with a specific set of operational rules; it rapidly threatened to turn into a bona fide tower of Babel, which would have resulted in delays, conflict and finally chaos.
- The lack of water became a critical issue; luckily there was a well within the airport zone.
- The devil was indeed in the detail: flat tires became a major problem due to ground debris. The search for tires became a veritable treasure hunt, and conveying them to the airport once found turned into something of an exploit.

2°) Observations

- *The “all hazards” planning model is even more critical than is currently being highlighted.* Current discussions, notably in Washington, underline the importance of an “all hazards” approach, no longer separating, for example, natural risk from acts of terrorism. But we need to go farther: within the same disaster, we’re going to have to operate within an impressive number of dimensions. As our culture is one of entrenched specialization, meeting the current realities will require some significant changes. Every major phenomenon, in whatever specific field it may arise, could trigger secondary impacts that will determine a far more complex area of intervention.
- *The “Command Post” model has reached its limits:* our reference basic model provides for strong centralized control and a clear hierarchical chain, especially for serious incidents. Certainly, a central overview, for collating information, coordination and decision-making is indispensable. But other factors are also critical:
 - o the ability to deal with major developments in the theater of operations and adapt accordingly. For example, being able to realize and accept that one is not managing an airport any longer, but the critical survival point for many human

¹⁸ An astonishing situation for the French, as if we were to see a private company, such as a private-sector local television station, contract the services of the French police counter-terrorist unit.

¹⁹ “Hurricane Katrina – August 29, 2005”, Louis Armstrong International Airport. www.flymsy.com

- lives – something which has nothing to do with the airport business.
- o the ability to network multiple cells dealing with intelligence, intervention, resource and decision-making.
- o the ability to handle small but critical bottlenecks such as the proper functioning of airport lavatories. Without water, the system breaks down.

3. Speed in a globalized context

1°) Katrina findings

Among the number of destabilizing events in a catastrophe of this magnitude we should highlight the rapid realization that the theatre of operation is not contained. On every level, the usual or implicitly expected framework has been exceeded:

- *Capacity*: The seriousness of the disaster makes it necessary to think of support structures on a national, continental or international scale. The operatives very rapidly realize that their mutual assistance systems no longer exist because the teams expected to provide support are themselves affected.
- *Specific domino effects*: The shocks experienced in the affected zone have a wider impact. Thus, it became apparent that New York only had two days of fuel stocks and supply would run out if the pipelines in the disaster zone were not rapidly brought back into service, raising issues of priorities.
- *General domino effects*: The “discovery” that the entire New Orleans port area was vital to the national economy.²⁰ That in a just-in-time economy, the loss of the Mississippi waterway would have a major impact – nationally and even internationally – which was not rapidly quantifiable.

2°) Observations

- *Mobilization on a system-wide scale*: as soon as a major catastrophe is declared, and all the more so, the day after the event, it is critical to mobilize intelligence centers at multiple levels, outside the impact zone, to anticipate – and deal with – the multiple effects of a specific shock. One needs to start with the assumption that domino effects are not easily identifiable ahead of time and that there will be numerous surprises.
- *Anticipation*: thinking on support or backup systems within contingency planning must be revised to take on board new phenomena like wider and faster domino effects.
- *Institutional planning*: current models force to those who adopt them to follow a sequence of protocols based on a “Russian doll” doctrine (first mobilizing local teams, then the State, then Federal authorities). This traditional model collapses in this type of context and causes major delays when applied. It needs to be rethought.

4. Texture

1°) Katrina findings

- Everyone, every decision maker, was in a state of shock, first and foremost for personal reasons.
- More than half the individuals in the emergency teams were themselves badly

²⁰ George Friedman: “New Orleans: A Geopolitical Prize, Geopolitical Intelligence Report”, *Strategic Forecasting*, September 1, 2005.

affected: loved ones missing, houses destroyed or inaccessible, etc.

- Each network depended on a small number of nodal points and other networks – which swiftly broke down –, as well as on an incalculable number of partners and links whose functioning had been put out of action. Due to the evacuations, the fabric of employees, customers, suppliers and all support services was destroyed.

2°) Observations

- *An atypical frontier*: intuitively, we imagine that a post-disaster theater of operations combines “necessarily” unscathed managers and affected individuals on the other. But during Katrina, everyone suddenly found himself impacted. This radically changes the conditions of crisis management and post-catastrophe response. Yet even Katrina did not present the most difficult case from this point of view. As it happened, the geography of this frontier remained fairly straightforward, “the inlands” remaining less affected than the coast. Other crises – particularly those involving public health – might leave no such unscathed “sanctuary” to the emergency teams.
- *From a “mechanical” to an “organic” culture*: we have always approached emergency planning issues in terms of mechanics. A breakdown occurs, a team of specialists hastily arrives to deal with the specific problem, which is restricted to a limited area. Whereas, in a confused environment, disrupted by a complex event, the very texture of the socio-technical system itself breaks down. Contrary to a “mechanical breakdown”, an “organic wound” must not be handled according to a strict “top-down” hierarchy: but rather “bottom-up”, starting at local level. Furthermore, repairing a *specific mechanical* problem suffices to restore the entire context that it is affecting: whereas an *organic* wound is necessarily healed (and biological tissue restored) “from the outside to the inside”, which is to say starting from the context and progressing to “ground zero”. In the case of Katrina, this implies that the drying out and reconstruction of New Orleans makes no sense if the sociological and economic problems of those evacuated to Houston or elsewhere (critical even if located *at the margins*) have not first been dealt with.

5. The unthinkable

This is the most destabilizing factor, inducing a feeling of vertigo, a total absence of reference points.

1°) Katrina findings

- The total communications blackout had not been expected; it was experienced as an “unthinkable” event and contributed to stun most leaders.
- Those involved “no longer recognized” their city due to flooding, and its transformation into a military zone (requisition of offices by the military, “checkpoints” everywhere).
- *“Have we lost the Mississippi?”* The most worrying question arising immediately after the disaster was over the state of the port facilities. It was unclear at first whether the channels had been too choked up with wrecked ships of all sorts for the river to continue to function as a lifeline for the Midwest. Even more unsettling: what if the Mississippi had left its bed?
- *“And if we had lost the city?”* Could the city be rehabilitated and in what conditions? Certainly, the will to rebuild is unmistakable. “We are coming back.” But the very fact that this determination is displayed shows that the question whether or not to rebuild

has been asked, and is still being asked for certain neighborhoods. The complexity of the reconstruction, its sensitivity in political or even ethnic terms, also prevents the question from being put in a straightforward way, making it impossible for critical infrastructure operators to plan the effective recovery of their facilities.

2°) Observations

- It is difficult to assess what such unknowns and breakdowns mean in cultural and operational terms. Over and above the simple and occasionally demagogical instinctive responses: "We will rebuild!", a disaster on the scale of Katrina forces those involved to ask themselves "dizzying" questions: do we need to write off a region? Is the will really there to put the resources together to reclaim it? At a time when sea levels are rising, this type of question is likely to be asked in plenty of other places, and soon.
- New Orleans is of course a significant city in human, historic and cultural terms. But we need to ask how the same question would be put if a hub city, one which was critical to the country's economy was at stake. For example: what if Houston and its structures had been hit by Rita? Is inhabitants had been evacuated, and were vulnerable on the freeways when Rita changed direction. Fundamentally, our contingency procedures are designed on intervention in limited zones, operating from those that have been left unscathed. This model would be profoundly challenged if we had to launch a support response for a strategic zone like Los Angeles or Tokyo.

6. Critical infrastructure: A turning point?

1°) Katrina findings

- Critical infrastructure players were immediately confronted with the realization that public bodies struggled to guarantee security, establish overall priorities and respond to their queries. This observation sometimes affected them profoundly and compounded their frustration at the lack of interest from public opinion, the media and the public inquiries as to the immense work they were achieving on all fronts, whether energy, communications, at pumping stations or the water networks.
- Second discovery: critical infrastructure operators often argue that ill-prepared public authorities, whose capacity was soon exceeded and whose culture proved inadequate, sought to respond to the emergency by tapping the resources of critical infrastructure operators, something which they had not always foreseen. Some have concluded that critical infrastructure operators need to integrate this parasitism within their contingency planning (which could imply acquiring certain redundant equipment and displaying it so visibly that public authorities, focusing on commandeering this "decoy", would leave the operators' essential facilities untouched). This state of affairs probably does not encourage full transparency between the public and private sectors... As a result, the leitmotiv of "partnership" between the two sectors has begun to be compromised if not indeed rejected. It sometimes seems as though the priority now is not so much preparing to act in partnership as specifying how the different players can operate without too much respective operational interference (which is hardly a promising basis for constructive interaction)...
- In response, public bodies readily admit that certain private networks were infinitely

better prepared for the disaster (leaving aside the remarkable example of the Coast Guard). But they also justify their behavior by emphasizing that they were in charge of handling systemic problems, of coordinating a diverse range of contrasting initiatives and of making difficult decisions – whereas private-sector operators of critical infrastructures, in comparison, had specific, relatively clear-cut, limited missions. It was thus normal that governmental agencies should tap some of their means to cope with priorities considered to be more important, for example, when the power supply needed to be restored at the refineries or the pipelines on which New York's fuel supply depended. In other words, the private and public sectors, while sharing the same territory, have two different entry points and perspectives, two very different if not contradictory agendas when it comes to viewing it and dealing with it.

2°) Observations

- Our discussions in Washington, and a statement from Senator Susan Collins²¹ (responsible for the forthcoming Senate report on Katrina), revealed an unmistakable realization of the central role played by critical infrastructure operators among stakeholders in the recovery process. Their importance can no longer be dismissed as secondary. Without electricity or telephones, or all kinds of “supply-chains”, the work of frontline disaster response teams is quickly paralyzed. Katrina seems to have led to formulations of unprecedented clarity in this respect.
- Two changes are underway: one within the private sector, involving a strategic reconfiguration of critical infrastructure players, based on a fresh reading of their correlation with the public sector; at the same time, in the public sector, a fundamental transformation, now engaged at federal level, aims to give critical infrastructures a central position. Thus national catastrophic contingency plans are being revised to integrate this new dimension.
- One can even sense, in certain statements, some hesitation with respect to leadership models. Absent a marked effort of public authorities to reclaim their area of competence, it is fair to ask whether some in the public sector would not like to see the responsibility for leadership (beyond formal appearances) passed to infrastructure networks. Not for philosophical reasons such as the sharing of power, but simply for the pragmatic reason of the current status of effective operational competence. Such a shift, such resignation even, would of course be unacceptable. But we need to face the facts: for public leadership to avoid “exploding in full flight” as soon as it is faced with hyper-complex, rapidly-evolving situations, it must become familiar with the sort of “vacillating” environment which is culturally and fundamentally alien to it – but with which it will be confronted during each major future crisis.
- An infrastructure operator used to handling changing realities and context on a day-to-day basis is, as we have seen, more apt to react to new crisis situations than a bureaucracy merely attuned to data archives, the drawing up of plans, territorial jurisdictions, endless talk about “Russian doll” style sequencing of local, regional and federal hierarchies, etc. Nothing has been decided yet, but it seems obvious that any new demonstration by public authorities of their inadequacies during non-conventional crises would lead to further serious shifts.

²¹ Participation in the workshop on “Protecting our Future: Shaping Public-Private Cooperation to Secure Critical Information Infrastructure”, National Press Club, Washington DC. National Press Club, March 15, 2006.

- This fundamental transformation will soon have to confront a pressing problem: the handling of hurricane warnings by public authorities. If orders to evacuate are more thorough and cautious in the future, policy on keeping key personnel from infrastructures networks on-site may need to be reviewed (especially if they are housed in trailers).

III – INITIAL OPERATIONAL LESSONS

1. The personal shock

1°) Katrina findings

- Victims, response teams and leaders were all rapidly plunged into a universe of extreme violence, involving an almost absurd and truly "unthinkable" degree of meltdown. All those who agreed to be interviewed by us, at every level, emphasized how profound the personal shock had been – and remained.
- The physical and psychological environment is confused, terrifying and tragic. It combines the human toll, the lack of information on missing people (or simply their absence), with the destruction of homes or the inability to access them, the breakdown of communication channels and the most basic means of payment (credit cards, for example) against the backdrop of a traumatic evacuation, followed by a chaotic return to an unfamiliar, militarized universe. Some were at first forced to live in their offices, in suffocating heat (as air conditioning had broken down due to the lack of power)...
- Beyond the immediate shock, in which survival instincts take over, the most worrying problem arises from the length of the ordeal, provoking a war of "psychological attrition", which brings about heretofore "dormant" repercussions. The culture of the Deep South is based on constant victory in the face of hurricanes: houses have *always* been rebuilt, communities have *always* been re-established; but, after several months spent in cramped trailers and inhospitable camps, evacuees gradually begin to realize that this time it might be different, that they might indeed this time "lose the war". As during the economic crisis in Argentina, a whole community which believed itself to be "accidentally" homeless has come unconsciously to take on the bitter, depressive psychology and identity of the "purely and simply" homeless.
- In the very short term, this underlying unease about the future is accompanied by the immediate concern about the approach of the next hurricane season²². As of today, there are 94,000 trailers in the area: and this low-grade habitat is incapable of withstanding a simple tropical storm, let alone another hurricane.²³

²² This was written in the Spring of 2006.

²³ A hurricane expert, quoted by the New York Times (March 29, 2006), predicts 17 storms, 9 hurricanes, of which 5 major, over the next year. Whatever the foundations for such forecasts, the latter can only reinforce the unease of those who face potentially multiple evacuations in 2006 – the authorities no longer willing to be accused of lack of resolution in the evacuation orders. (Jeremy Alford, "After Hard Lessons, a New Game Plan for Hurricane Seasons", *The New York Times*, March 29, 2006).

- Certainly, the psychological context is far from being purely negative. A deep-rooted individualistic culture, often reinforced by a feeling of anger against the authorities (whichever they may be), is allowing broken communities and ruined individuals to recover an essentially autonomous means of functioning, a vitality and responsiveness probably unknown in Europe since the London Blitz. In this sense, the leitmotiv “We are coming back!” is much more than just a demagogic slogan.
- The context is thus full of contradictions; and whatever the positives may be, these very contradictions, in creating an absurd, unpredictable and dislocated human context, are making the emergence from the disaster a painful and uncertain experience. In those we interviewed we found at the same time traces of the initial shock and its palpable post-traumatic effects; a dignified restraint, worthy of enormous respect – particularly in the case of two airport managers, who on their own initiative took us to visit the ruins of their houses without ever asking for sympathy - misgivings about the collective route that will, in time, be chosen, full awareness of the long-term obstacles to overcome and the threat which will recur as soon as July, and finally the unshakeable affirmation of their determination to recover, *in spite of it all...*

2°) Observations

- This dimension of personal shock is rarely included in the forecasts and frameworks of our emergency plans.
- And yet, it rapidly creates the most crucial problems in the early stages. At the most chaotic moments, it is human resourcefulness, personal conviction, the vital energy of individuals and groups that prove decisive.
- This observation suggests that we need to modify the spirit of our plans for such periods of severe disruption, on the personal and collective level. Once again, it is not enough simply to test the operational efficiency of logistical and technical organizations or communication channels.
- Lastly, we need to learn to take into account the long-term, dormant, impact of such experiences, which first go unnoticed, but resurface after initial reactions have subsided, after the media have gone home, and the medals have been awarded to heroes. In the main, support responses to these obscure and confused difficulties have yet to be invented.

2. Leadership

1°) Katrina findings

- The case of the airport director is exemplary. With his team, he managed to retain control of the airport, achieving the best possible results given the circumstances. The keys to his success can be summarized as follows:
 - A personal stance combining responsibility with exemplarity. The director remained present on all fronts and fought to remain at the center of operations, despite the emergence of a profoundly altered operational context; he managed to stay in charge and retain his responsibilities in spite of the massive influx of

external personnel, primarily from the military (no fewer than 5,000 people, whereas the airport staff comprised just 50 individuals).

- o A high quality relationship with his employees, at every level of the chain of command, and with his own staff: his attention to and confidence in them and his willingness to delegate responsibility and decision-making to them was truly remarkable.
 - o A business culture systematically embracing a “family” dimension. At the approach of the hurricanes, key employees, if they do not have the time to go and get their families to shelter, can bring them to the airport, a safer environment than individual dwellings. Others are asked to leave in the interest of safety. Solidarity and personal relationships govern all interaction between those involved in airport operations and, in a broader sense, the vast regional mutual aid network.
 - o Much attention was paid to information released to the media, critical when managing large movements of human beings which can rapidly spiral out of control.
 - o A well-thought out, well-managed control architecture. The airport director deployed three units, linking them strategically in order to maintain control of the decision-making process. 1) A medical unit, which imposed a common agenda on multiple players, dictated by humanitarian urgency. 2) A strategy unit, combining the team managing the airport, wherein the director used the “systemic” competence of his team and its control of the “nodal points” of the operation (necessary for the operations of others involved) in order to continue to establish the main orientations. 3) Lastly, a more institutional unit, co-chaired by the airport director and the highest ranking military representative, allowing civilian professionals to reaffirm their presence and prevent the military from marginalizing them. Thus the competence of the director and his team prevented them from being submerged under an influx of external players – even those as weighty as the 82nd Airborne.
- The same leadership and organizational qualities can be found in other companies that successfully responded to the challenge presented by Katrina. For example, Whitney National Bank mobilized its “non-essential” personnel (key individuals being, of course, immediately asked to ensure vital functions) to establish a reception platform in Houston and assist other bank employees with numerous issues: housing, negotiations with insurers, schools for children, etc. Certain companies, in order to show that they were not exclusively focused on “essential” employees and neglecting “the others” (those who were not immediately mobilized), designated the latter as “evacuation teams” and entrusted them with supporting everyone else. The value of this approach was only too well illustrated by the counter examples of companies which, through the lack of such a culture, suffered immediate disarray and paralysis, for example the public-private company managing the New Orleans sewerage system.

2°) Observations

- *Intuition and vital dynamics:* over and above certainties and paradigms, it is important to cultivate the ability of each and everyone to develop and implement “extra-ordinary” dynamics freed from the usual “rational” arrangements. It took only a matter of hours for a disaster like Katrina to wreck even the most sophisticated plans. In such cases, the ability to invent and adapt becomes the key to success – which by no means implies that the rigorous execution of “basic” responses becomes immaterial. We need to place more trust in the reflexes and instinct acquired from professional experience

as distinct than in emergency checklists, whose assumptions are often outdated from the word go (for instance, pre-positioned vehicles for civil and corporate security services found themselves under water in headquarter parking lots). It is important to know how to function when faced with the neutralization, the destruction even, of emergency centers. This can only be achieved provided the subject of non-conventional crises has not been "tabooed" out of upstream planning.

- *Exemplary leadership*: i.e. the qualities demonstrated for instance by Rudy Giuliani in New York on September 11, 2001. The essential pillar is the force of conviction and unassuming charisma of a leader: His or her employees will follow and support their leader, first and foremost thanks to the confidence he or she inspires, the force of personality which informs his or her approach and attitude. This implies, among other things, that teams should never be left without leadership, information, or a sense of direction.
- *Empowerment*: the usual principle of crisis management calls for a strict hierarchy, a rigorous "top-down" rationale. This approach which seems "logical" and is promoted everywhere by traditional training, is instinctively adopted by most decision-makers in crisis situations, with a rigidity that increases as stress levels rise and the extent to which problems at hand are "extra-ordinary". Unfortunately, this approach quickly leads to a dwindling of collective initiative. The "collective fabric" is replaced by a mere skeleton where everyone waits for an order or a counter order, multiplying dysfunctional situations and preventing anyone from applying creativity to remedy them. As soon as the "clockwork schemas" proves inadequate, which rarely takes long, the whole system breaks down, or at least succumbs to paralysis, in an atmosphere of disarray, confusion and mutual mistrust. The exemplary internal dynamics of the New Orleans airport management team, thanks to the leadership of its director, made it possible to escape these usual pitfalls. Such success requires that managers have fundamental qualities: the ability to listen, display confidence, remain modest and, again, to lead by example. Such qualities are not acquired by skimming a contingency plan. The refusal of most decision-makers to involve their teams ahead of events in some genuine "outside the box" thinking condemns them to failure even before any challenge presents itself. Going by the evidence, the airport team did not suffer from this rather widespread syndrome.
- *From mechanics to organics*: the director who can successfully navigate through a crisis is the one who is able to set in motion and inspire an "organic" system of diverse individuals and activities, so that all involved are able, systematically, to look for the most inventive modes of functioning and self-organization. At the airport, for example, firemen had to direct helicopter landings; directors to control flight boarding. An employee manage to discover a tire warehouse several hundred kilometers away in order to prevent the flats caused by debris from paralyzing all activity, etc. Sometimes the solution to major problems turned out to be amazingly trivial: to ensure that the equipment necessary for the unloading of the first commercial vessel to return to New Orleans was brought back into service on time, the port director promised the technicians two cases of beer in return for their efforts. In the midst of a devastated city, he found the beer - selling at an exorbitant price - and brought it to the port, across military checkpoints to boot. Two cases of beer thus allowed for the symbolic commercial reopening of the port of New Orleans, a determining factor in the future of the city.... Our interviews were studded with anecdotes of this type. One important lesson emerges from these testimonies: in a chaotic universe, other than pre-established plans and frameworks organizing the rationale for those involved, two

other factors are as important, if not more critical:

- o 1) “Granularity”, namely the ability of everyone to work “at ground level” to develop a myriad of small initiatives which flesh out the overall architecture and modify it if it proves inadequate;
- o 2) Steering capacity or overall leadership, in other words the ability to inspire a vision, a sense of direction, in order to guide and set on solid ground multiple individual initiatives (thus avoiding a slide into anarchy), and to contain them within the overall intervention architecture in order that they be properly connected to the overall lifeline and do not drift away from it.

It is through a combination of planning, granularity and strong leadership that we can best navigate through a chaotic environment.

- *Rudimentary technical preparation*: it is useful to anticipate the minimum level of logistical equipment that may be needed if the usual support environment is lost. The most rudimentary usually turns out to be the most robust. A catastrophic event often quickly renders complex and sophisticated response mechanisms useless, and forces those involved to fall back upon a small number of “critical points” of great, or even trivial simplicity. As one of those interviewed underlined: “Above all else, I wish I’d had bicycle”. If these fallback points are not provided for (which implies identifying them ahead of time, at the planning stage, when their sheer triviality often renders them “invisible”) management of the crisis is doomed to complete collapse.

3. Major catastrophe contingency planning

1°) Katrina findings

- *The airport: from a commercial role to the ultimate survival “hub” for an entire urban area*. The case is exemplary, as highlighted in the Wall Street Journal’s excellent analysis²⁴:

“The international airport in New Orleans never was intended to be a shelter or a hospital or even an evacuation hub for 30,000 people, but it quickly became all of that after Hurricane Katrina.

That has led Airport Director Roy Williams to suggest changes are needed in airport terminal design and disaster preparations in many cities. New Orleans found it had few safe terminal areas without glass windows, for example, and lacked generators to provide enough emergency power for the thousands of people who filled its concourses. And in Houston, the airport authority, concerned about a similar influx, is urging people evacuating ahead of Hurricane Rita not to come to the airport without a reservation.

“There was no playbook for any of this”, said Mr. Williams.

Mr William told fellow airport directors at the annual convention of Airports Council International-North America in Toronto this week that they may need to rethink the role of their facilities in disasters. Airports may not be looked as just as landing strips anymore – they can quickly become the center of vital services for an entire city

²⁴ Scott McCartney, “Disasters Press Airports into Service”, *The Wall Street Journal*, September 23, 2005.

About 8,000 people a night were sleeping at the airport in the week after the storm, Mr William said, and more than 5,000 troops camped on the property. The airport's emergency preparations never contemplated so many people living in its terminals.

Airport staff, about half of whom had lost their own homes, worked around the clock. A hospital was established in Concourse D; a morgue in another part of the terminal. Concourse B housed injured evacuees. The US Forest Service set up mess tents, just as they do at major forest fires.

The busiest day was Saturday, September 1, when 13,000 people, many of them on stretchers or wheel chairs, were shipped out. All were hand screened for security and their bags hand searched, because the airport still had only limited power.

Ultimately, 30,000 people were evacuated through the New Orleans airport.”

- *The case of Whitney National Bank: an overall IT system configuration which allowed it to cope with high-intensity systemic shocks.* The bank got through the Katrina emergency very effectively, despite the total loss of telephone and internet communication, the collapse of the postal system, the evacuation of its employees, etc. Below we have outlined some of its thinking and organizational changes in the area of IT, a tool clearly critical to its activity:
 - The clarification of key objectives in terms of vulnerability and “recovery”: reducing vulnerability to crisis situations, developing resilience, increasing flexibility in order to be able to respond to major changes in the environment, and to guarantee a faster recovery in case of disaster.
 - A global geographical configuration of the IT network and data processing based on a “triangular” rationale: data bases in Dallas and Atlanta becomes the pillars of security, with a third site, Fort Worth, close to Dallas, guaranteeing the backup of each day’s transactions. A central computer, situated in Chicago, provided additional backup.
 - The adoption of state-of-the-art IT technologies, for example eliminating magnetic tapes for electronic transfers in order to avoid the risks of loss involved in physical data transfers within a context of an emergency evacuation.
- *IBM: an operator mobilized for immediate support response in case of major catastrophe*²⁵

Hurricane Katrina: The right assistance at the right time²⁶

“During Hurricane Katrina, the IBM Crisis Response Team assembled in Baton Rouge, Louisiana, and a second Emergency Operations Center (EOC) was activated in Boulder, Colorado. The team included IBM employees selected for their unique skills as well as subcontractor personnel — all of whom had proven to be self-sufficient in crisis conditions and able to deliver critical services under extreme conditions. The

²⁵ Our thanks here go to Olivier Velin and Simone Eiken (IBM France), Brent Woodworth (IBM, USA) and Patrick Corcoran (IBM, USA), who were kind enough to organize a teleconference with the principal IBM managers worldwide to share IBM’s experience of Katrina and in other parts of the world.

²⁶ The issues addressed here are covered in the note: Olivier Velin, Simone Eiken, Brent Woodworth: “IBM Crisis Response Team – A task force providing assistance in crisis situations”, IBM, February 2006, p. 5.

team also included specialists in military coordination, federal and state emergency management, information technology, communications, engineering, medical services and trauma management.

The results of the Crisis Response Team's efforts could be felt throughout the area that was ravaged by the hurricane. In addition to the direct humanitarian relief services provided by IBM, the team:

- Used database technology to collect and process information needed to locate and reunite missing persons
- Provided hardware to Texas Health and Human Services to quickly register and process evacuees
- Donated equipment and supplies used to process evacuees and support relief workers
- Quickly set up a call center to handle financial donations for relief efforts

It is a reality of global business: disasters of all types will occur, and they will impact the communities where IBM's employees and clients live and work. Yet it is precisely this global reach, together with the collected expertise of IBM employees, which enables IBM to respond like no other in times of crisis.

Part of the success of the team during a crisis is the work that they do before the crisis even strikes. In the case of Hurricane Katrina, The IBM Crisis Response Team (CRT), supported by the IBM Emergency Operations Center (EOC) in Sterling Forest, New York, began monitoring Katrina before it crossed Florida. IBM employees in the region and members of the IBM EOC and CRT were put on alert. EOC representatives — call handlers, project managers, engineers and other IBM experts — began talking to clients about their preparations as the storm churned across the Gulf of Mexico.

2°) Observations

- *Rethinking operational missions.* Major infrastructures have to fulfill entirely new missions when non-conventional crises arise. The case of New Orleans airport is a good example of this in that it managed to totally reconfigure its missions with very little notice when required to do so by the course of events.
- *Upstream integration of the "Recovery" dimension.* Rather than dispensing with reflection on potential shocks, the implementation of safety procedures must integrate this dimension and grow from it. In crisis situations, the upstream combination of both approaches is decisive, since it allows for an accelerated recovery process.
- *Direct involvement in major theaters of operation.* This was the case with IBM, which has made a significant investment alongside other players in disaster management. This goes beyond the idea of contingency planning focused on the threats specific to one company: on the contrary, it means taking the view that the vocation of a large network coincides with its long-term interest (including contingency planning), when it contributes its support to affected populations or to other networks in difficulty, whatever the circumstances. This may herald an entirely new approach to post-catastrophe operations from critical infrastructure operators.

Emerging from crisis: the long term

The lessons from Katrina still need to be analyzed in greater depth. For the moment, at the end of this first stage, we should be wary of showing excessive impatience with the reconstruction process. Certainly, those who so far have done no more than questioned the lack of response from certain parties, recognized the bravery of the Coast Guard, and even underline the extent to which infrastructure operators exercised a role hitherto insufficiently recognized in national contingency planning, will now very likely to criticize the incredibly slow “return to normality” in the affected area – as is already the case among certain quarters in Washington DC.

Here too, as we have already highlighted, we need to take in the scale of the challenge. Recent historic experience has shown that it takes a long time to recover from a crisis involving this level of destruction. For example, it took: remodeling urban landscapes only begun four years after the war came down in Berlin (1989); it took 12 years to get there in Bosnia Herzegovina, despite the considerable resources deployed by the United States and the European Union; and 15 years in Lebanon, despite the considerable means of key Arab and international investors and the support of both American and French engineers.

The problems are nearly always the same:

- The precise assessment of damage to property and the restoration of formal property boundaries (after the destruction of property registers)...
- The problem of the victims, the missing, displaced populations that will or will not be returning...
- The evacuation of rubble and other kinds of debris: it will take anything from 2 to 3 years even with the necessary resources. For example, in Beirut, it took 5 years to clean up the town center and what was evacuated represented only a fraction of the destruction seen in Louisiana and Mississippi...
- The mobilization of financial resources: all sorts of delays arise, e.g. from insurers and local authorities...
- The physical reconstruction of destroyed neighborhoods (a minimum of 3 to 10 years), the huge cost in recovering major equipment (thermal and electricity plants, pumping stations...) compliant with updated technical and regulatory standards...

FEMA has mobilized multiple networks to handle these questions and we may well be surprised by US's efficiency in this area. Therefore it is not necessarily wise to be overly gloomy about the situation. We should avoid being too negative about the situation. Authorities and inhabitants may well make this a showcase for America's dynamism, and surprise everyone on the question of rebuilding New Orleans. The “rebirth” theme and the tone of the 2006 carnival, just six months after the tragedy, is a good illustration of this determination to recover from the gravity of the setback.

We thus need to differentiate between the analysis of: on the one hand, the trauma which is real, significant and undoubtedly enduring at the personal level (the shock can be likened to a nuclear detonation in terms of impact, violence and magnitude); and, on the other hand, the reconstruction process, which is subject to inevitable technical timelines and local cultural constraints.

There are some significant challenges here for critical infrastructure operators. Following

Katrina, they have been calling for the urban planning decisions indispensable to any rebuilding strategy. Yet they are running into a web of problems, including political dissensions (election schedule), cultural reticence (planning is not part of the local genetic makeup as it is in France), and – once again – the difficulties associated with any "extraordinary" situation. It is not simply a matter of deciding upon new roadmaps for the restoration of e.g. water networks. The social balance too has been impacted, and a human fabric, a human culture, cannot be rebuilt solely on the basis of technical schemas.