



Trilateral workshop, FEWS, Shefayim 03/2022

Warnings and Emergency Response to Hazardous Weather Events

Introduction to the Course Via Case Studies

Nir Stav, IMS Executive Director



Disaster Risk Reduction



Where should the
Meteorologists fit in ?



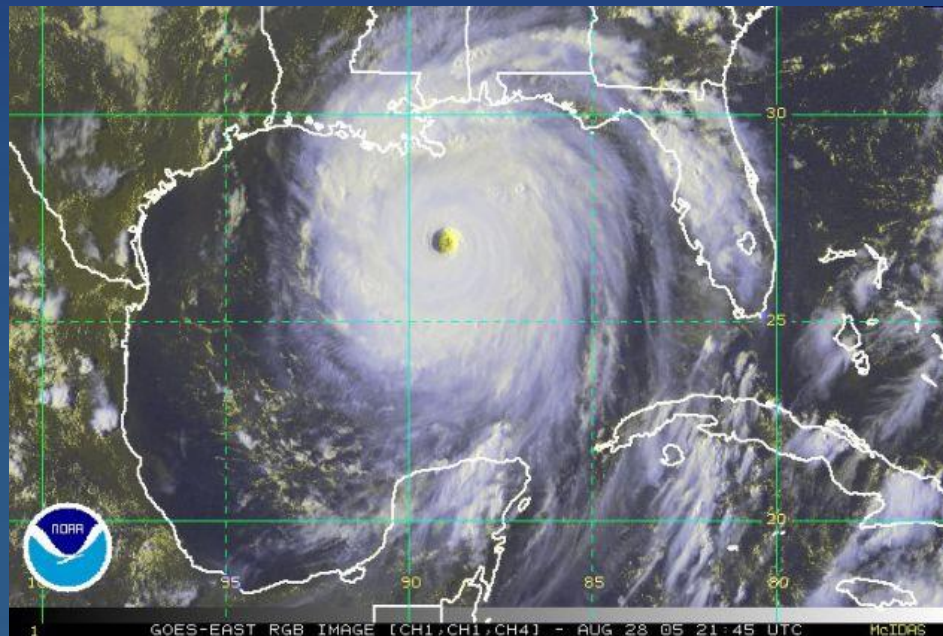
Introduction to the Course Via Case Studies

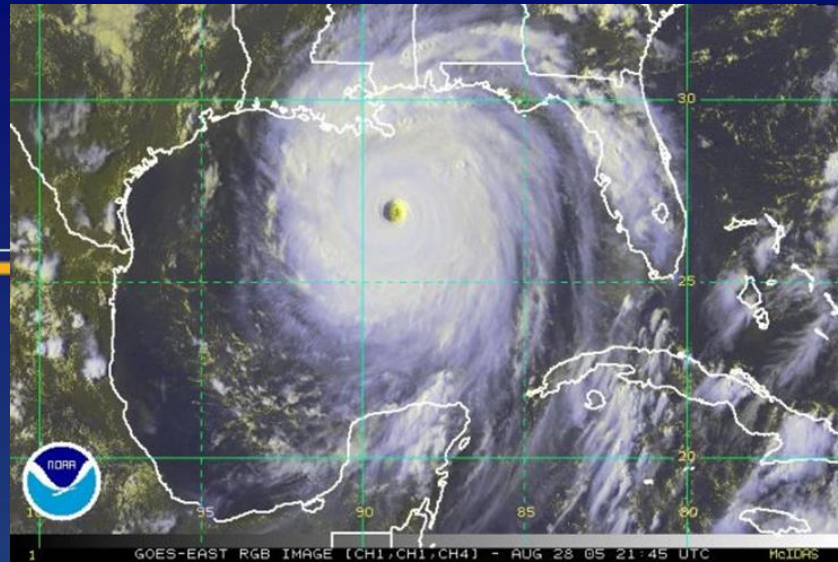
Case Study #1 Hurricane Katrina

Case Study #2 European Heat Wave 2003

Case Study #1

Hurricane Katrina





As of August 2, 2006, 1,118 people were confirmed dead in Louisiana as a result of Hurricane Katrina. Another 135 people are still missing and presumed dead. Thousands of homes were destroyed. Direct damage to residential and non-residential property is estimated at \$21 billion, damage to public infrastructure another \$6.7 billion. Nearly half the region's population has not yet returned after evacuating. Nearly 124 thousand jobs were lost, and the region's economy was crippled.



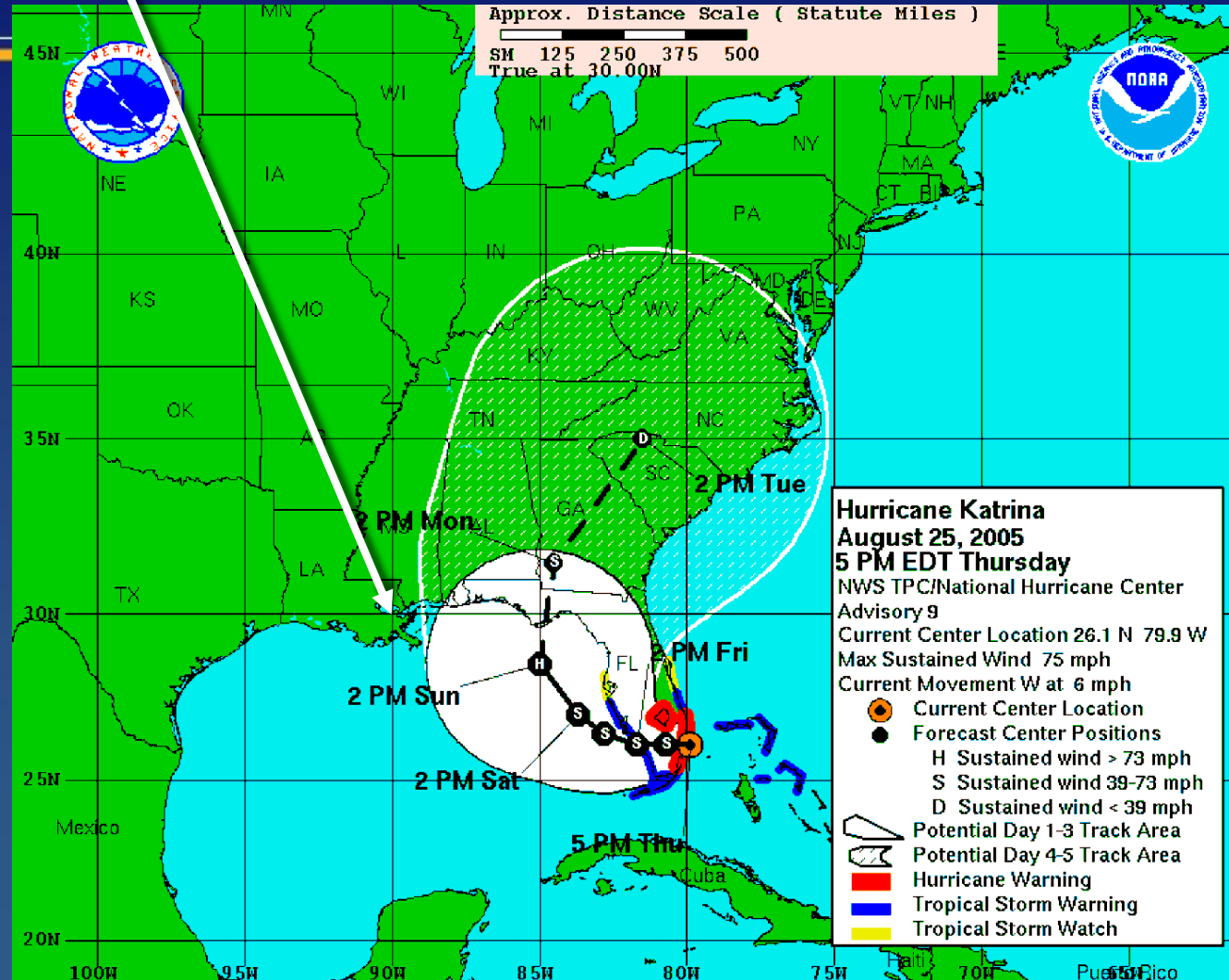
New Orleans

Thursday, August 25

Katrina began as a Tropical Storm over the Bahamas on Wednesday, August 24.

It later became a hurricane and made landfall in Miami as a weak Category 1 on Thursday, August 25.

At that time, the forecast had Katrina moving north along the west coast of Florida toward the Panhandle.





The forecast began to change **Friday night into Saturday** as the forecast models began to show Katrina moving west with a possible landfall either in southeast Louisiana or Mississippi.

On Saturday, August 27, The NHC issued a **Hurricane Watch** for the southeast coast of Louisiana at 10 a.m. on Saturday morning, **48 hours before landfall**. (watches were not usually issued until 36 hours before landfall.)

Saturday, August 27

New Orleans

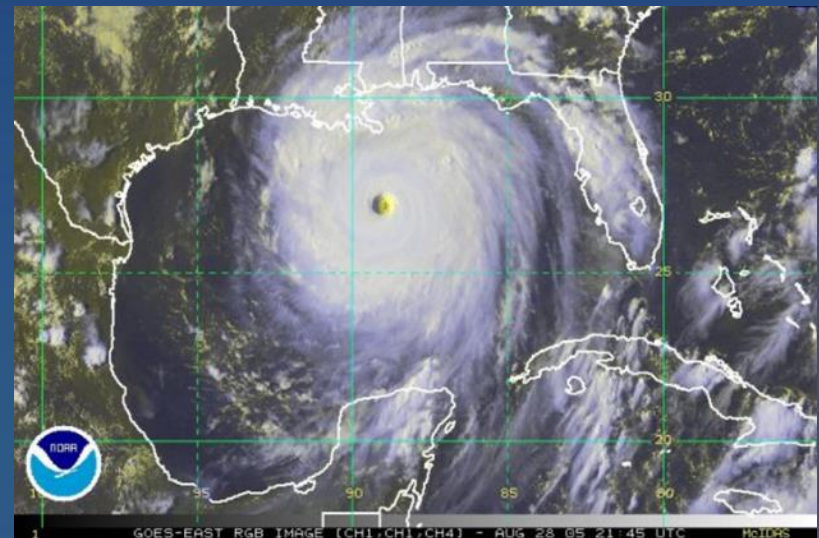


Sunday, August 28

People went to bed on Saturday night with the thought that it might not be so bad. At the time, the storm was only a Category 3 with winds of 115 mph. Upon seeing this, **many people who were told to evacuate decided to stay.**

The first light of Sunday showed a different story. The 7 a.m. headline from the National Hurricane Center read, "KATRINA...NOW A POTENTIALLY CATASTROPHIC CATEGORY FIVE HURRICANE...HEADED FOR THE NORTHERN GULF COAST."

Folks woke up to the news that **Katrina had grown into a Category 5 with winds of 175 mph during the overnight hours.** Media outlets quickly ramped up their coverage of the storm to warn people of the severity of this new situation.



Sunday, August 28



- Voluntary and mandatory **evacuation orders** were issued for large areas of southeast Louisiana as well as coastal Mississippi and Alabama.
- New Orleans mayor Ray Nagin ordered the **mandatory evacuation of the city Of New Orleans**
- **Louisiana Superdome** set up as temporary Refuge of last resort capable of holding 26,000
- Canadian National Railway, Amtrak and Waterford Nuclear Generating Station shut down in preparation
- **1,000,000 obey Evacuation Order** and Leave The City Of New Orleans
- **100,000 Choose to stay** in the City
- **10,000 take shelter at the Louisiana Superdome** 300 National Guard troops stationed in Dome
- **Northern Louisiana region declared a disaster area** by the Federal Government prior to Landfall

Hurricane Katrina Makes Landfall as Category 3 status
on Monday, August 29 at 6:10 AM local time

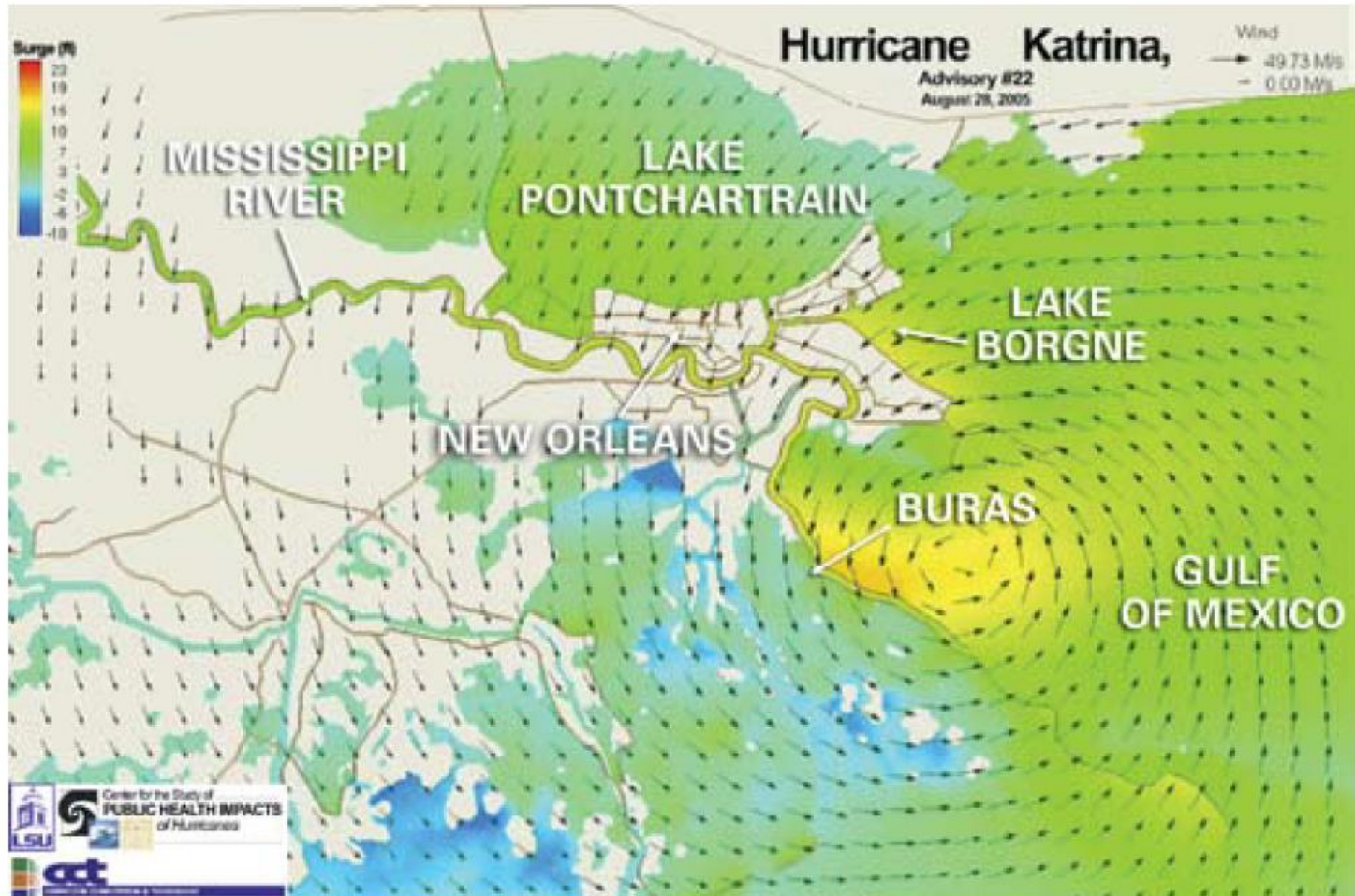
New Orleans

New Orleans Area



New Orleans, Louisiana, located near where the Mississippi River flows into the Gulf of Mexico, is one of the nation's most important ports.

Wind Vectors and Calculated Storm Surge about 7:30am on August 29, 2005



New Orleans was pounded by wind and water on the north and east. Wind drove water from the Gulf of Mexico into Lake Borgne. Water from Lake Pontchartrain was driven against New Orleans's lakeshore by winds blowing from the north.



U.S. DEPARTMENT OF COMMERCE
ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION
WEATHER BUREAU



HURRICANE BETSY

**AUGUST 27 -
SEPTEMBER 12, 1965**

Preliminary Report with Advisories and Bulletins Issued

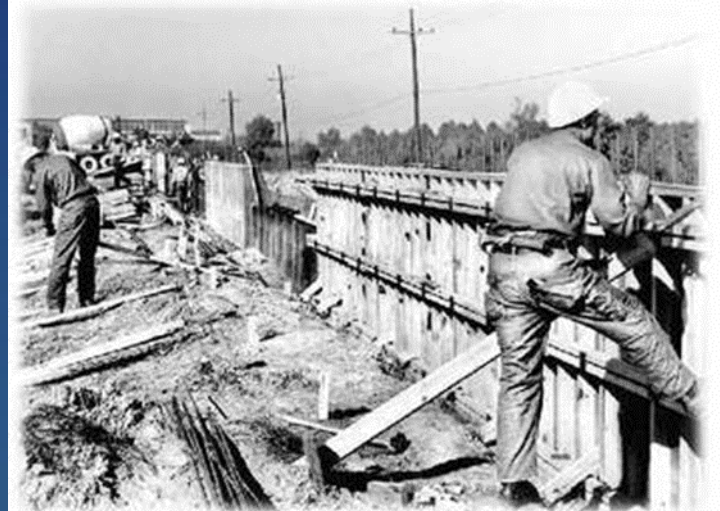


WASHINGTON, D. C.
SEPT. 15, 1965



THE SOLUTION

Reinforced by public opinion resulting from Betsy, the Army Corps of Engineers gained congressional financing for a series of flood-control and levee-building projects that were already under way to protect the New Orleans area from storms similar to hurricanes that hit the city in 1915 and 1947.



The Army Corps of Engineers began building the first concrete floodwalls along the east bank of the Inner Harbor Navigation Canal, such as here between Hayne Boulevard and Dwyer Road, in 1968.
STAFF FILE PHOTO

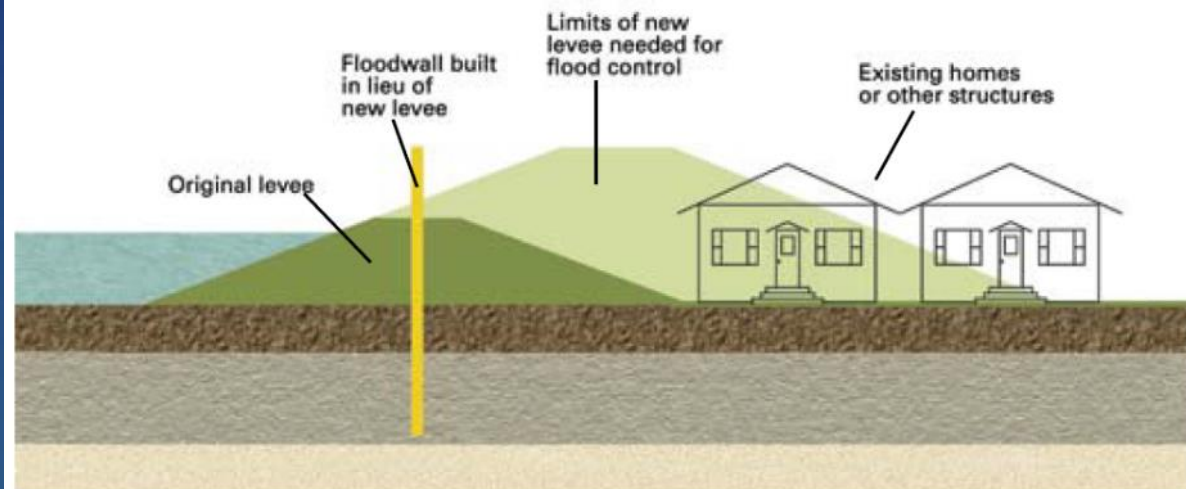
The "Bowl"



Levees protecting New Orleans were not built for the most severe hurricanes

- Responsibilities for levee operations and maintenance were diffuse.
- The lack of a warning system for breaches and other factors delayed repairs to the levees.
- The ultimate cause of the levee failures is under investigation, and results to be determined.

Increasing the Top Elevation of an Earthen Levee



Raising the top elevation of an existing earthen levee with additional earth fill also involves increasing its width. Where an existing levee was located adjacent to buildings, canals, or other structures, the USACE often resorted to using I-walls to avoid impacting adjacent development.

- The hurricane protection system was designed for meteorological conditions (barometric pressure and wind speed, for example) that were not as severe as the Weather Bureau and National Weather Service listed as being characteristic of a major Gulf Coast hurricane.
- Levee builders used an incorrect datum to measure levee elevations—resulting in many levees not being built high enough. Some levees were built 1 to 2 feet lower than the intended design elevation. Furthermore, despite the acknowledged fact that New Orleans is subsiding (sinking), no measures were taken into account in the design to compensate for the subsidence by monitoring the levees and raising them up to the pre-subsidence design elevation.

Standard Project Hurricane

The United States Congress directed the USACE to design the hurricane protection system for “the most severe combination of meteorological conditions that are considered ‘reasonably characteristic’ of the region.” The approach historically taken by the USACE for design of Gulf Coast structures employs the concept of the “standard project hurricane,” or SPH.

John F. Miller
Chief, Water Management Information
Division
Office of Hydrology, NWS

NOAA Technical Report NWS 23



Meteorological Criteria for Standard Project Hurricane and Probable Maximum Hurricane Windfields, Gulf and East Coasts of the United States

Washington, D.C.
September 1979

Failed I-Wall and Levee Sections



The levees and I-walls were constructed piecemeal with different top elevations and of different materials: earth, steel, and concrete. The floodwaters preferentially attacked the lower-elevation erodible earth first, causing major breaches.

Industrial Canal, East Bank, North Breach



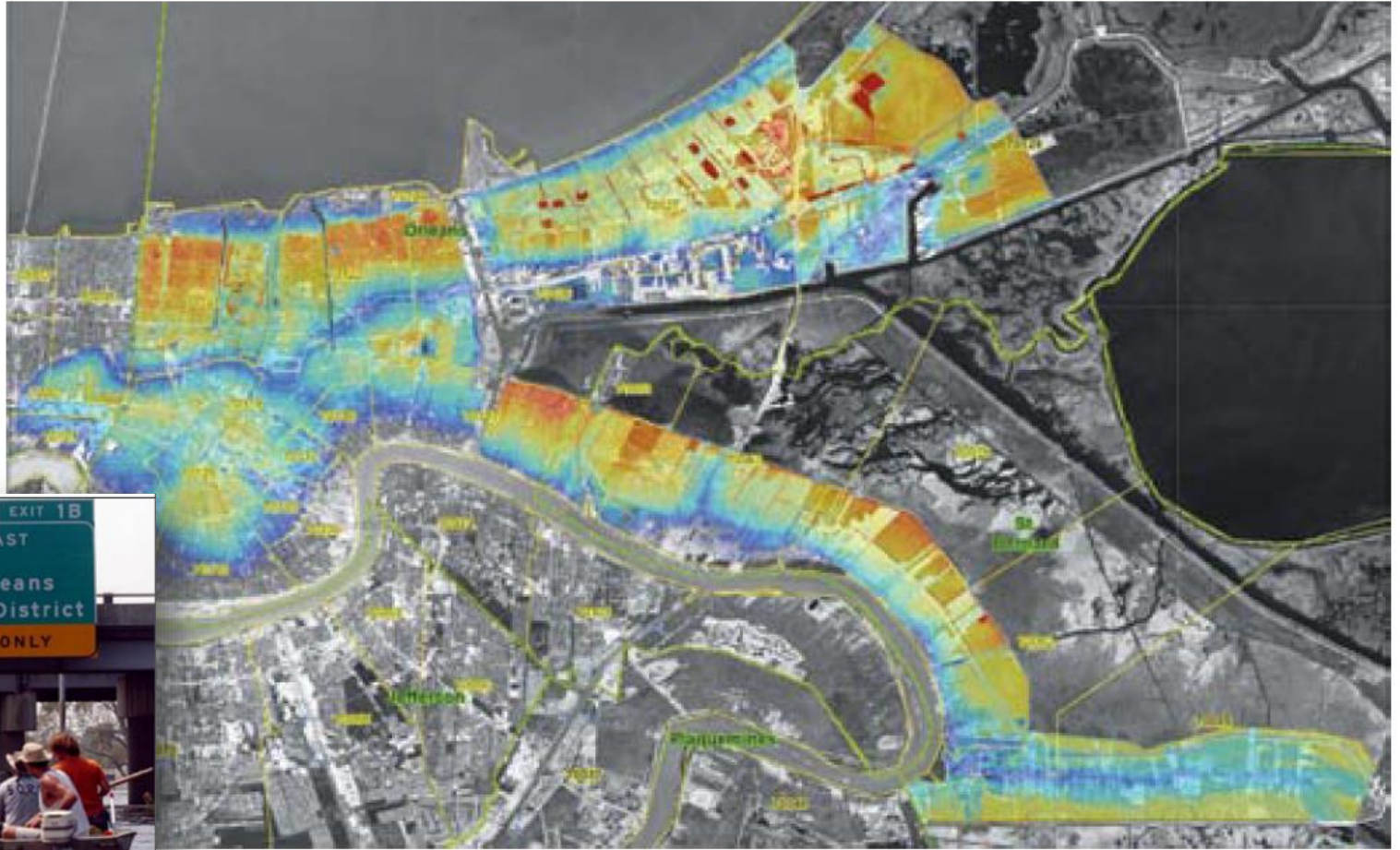
Floodwater from the Industrial Canal (top) rushed through a breach in the east bank I-wall into the Lower Ninth Ward (bottom). Water from the Industrial Canal also flowed into the Upper Ninth Ward, Bywater, and Tremé neighborhoods from breaches on the west side of the canal. (This photo was taken after floodwaters began to recede and water flowed from the Lower Ninth Ward back into the Industrial Canal.)

Industrial Canal, East Bank, South Breach



Water cascading over the floodwall at this location scoured out the wall's support and caused the breach. Waters from the Industrial Canal (bottom) rushed into the Lower Ninth Ward (top) with great force. (This photo was taken after the floodwaters began to recede and water flowed from the Lower Ninth Ward back into the Industrial Canal.)

Maximum Flooding Depth



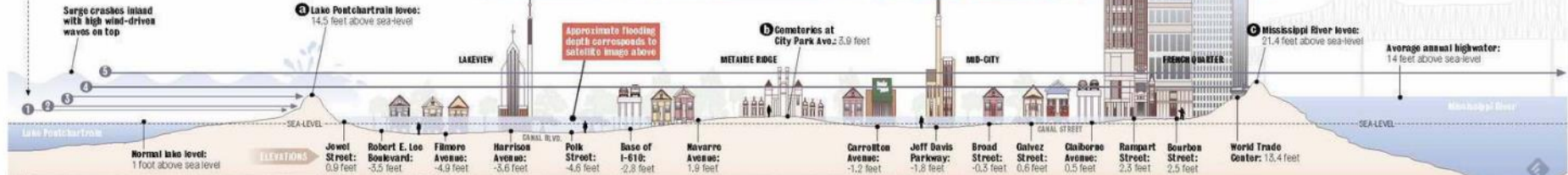
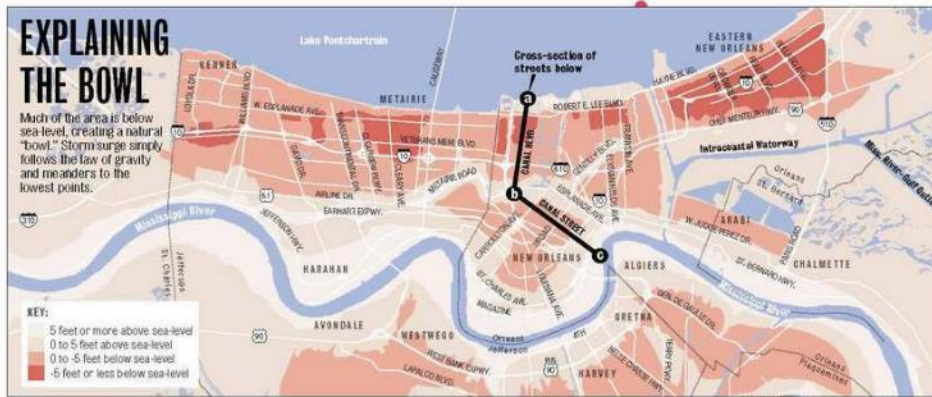
By September 1, 2005, portions of Lakeview, Gentilly, New Orleans East, and the Lower Ninth Ward were submerged in more than 10 feet of water (orange and red colored areas). Significant portions of the city stood in water more than 6 feet deep (green and aqua colored areas).

from a 2002 article...

CITY BELOW THE SEA

When a hurricane even stronger than Georges hits New Orleans, Lake Pontchartrain — a foot higher than sea level — will be the city's biggest threat. Surge water from the Gulf of Mexico, topped by towering waves, will swell the lake above levees and cause widespread flooding. A look at average surge levels by category, compared to a cross-section of the city known as "the bowl":

Hurricane Category	Surge and waves at low tide*	Effect on New Orleans
1	7 feet	Lake Pontchartrain's levees stop the low-level surge.
2	9 feet	Levees stop the surge, but some waves could find their way over.
3	14 feet	Levees stop bulk of surge, but waves could cause considerable flooding.
4	18 feet	Levees topped, causing catastrophic flooding.
5	24 feet	Entire city submerged including Mississippi River levees.



Note: Figures correspond to maximum surge heights, plus Lake Pontchartrain's +1 sea-level. High tides could add as much as 2 feet, and the surge level could rise even higher in some spots on the lake's shore. Elevations are approximate.

Source: LSU's Louisiana Water Resources Research Institute, Army Corps of Engineers, staff research.

New Orleans Flooded



Overtopping and breaching at approximately 50 locations in the hurricane protection system led to destructive flooding that covered more than 80 percent of New Orleans.

Rooftop Rescue



When floodwaters rose high and fast, residents had nowhere to go but up. Once water levels topped windows and doors, residents hacked through their roofs to await rescue.



A FAILURE OF INITIATIVE

Final Report of the Select Bipartisan Committee to Investigate
the Preparation for and Response to Hurricane Katrina

to respond to natural or man-made disasters, four and half years after 9/11, we are still not fully prepared. Local first responders were largely overwhelmed and unable to perform their duties, and the National Response Plan did not adequately provide a way for federal assets to quickly supplement or, if necessary, supplant first responders.



In the hours before the storm hit and then after it left — when the levees failed and everything changed — the people who remained in New Orleans streamed toward a place where usually they would go to watch football, the massive structure at the city's heart, the Superdome.

Over the next several days the Dome would sink into chaos. With limited power, no plumbing, a shredded roof and not nearly enough supplies to deal with 30,000 evacuees, it became a symbol of how unprepared the city and country had been for a storm experts knew could arrive.



AP PHOTO/ERIC GAY

"We were abandoned. City officials did nothing to protect us. We were told to go to the Superdome, the Convention Center, the interstate bridge for safety. We did this more than once. In fact, we tried them all for every day over a week. We saw buses, helicopters and FEMA trucks, but no one stopped to help us. We never felt so cut off in all our lives. When you feel like this you do one of two things, you either give up or go into survival mode. We chose the latter. This is how we made it. We slept next to dead bodies, we slept on streets at least four times next to human feces and urine. There was garbage everywhere in the city. Panic and fear had taken over."

PATRICIA THOMPSON
New Orleans Citizen and Evacuee

Medical care and evacuations suffered from a lack of advance preparations, inadequate communications, and difficulties coordinating efforts

- Deployment of medical personnel was reactive, not proactive.
- Poor planning and pre-positioning of medical supplies and equipment led to delays and shortages.
- New Orleans was unprepared to provide evacuations and medical care for its special needs population and dialysis patients, and Louisiana officials lacked a common definition of “special needs.”
- Most hospital and Veterans Affairs Medical Center emergency plans did not offer concrete guidance about if or when evacuations should take place.
- New Orleans hospitals, Veterans Affairs Medical Center, and medical first responders were not adequately prepared for a full evacuation of medical facilities.
- The government did not effectively coordinate private air transport capabilities for the evacuation of medical patients.

Memorial Medical Center



Evacuation of Memorial Medical Center



TWO FLIGHTS OF METAL STEPS TO THE HELIPAD AUG. 1, 2009 The final leg of an evacuation that included being passed through a hole in the wall into the parking deck. Paolo Pellegrin/[Magnum](#), for The New York Times

Triage



Triage is the process of determining the priority of patients' treatments based on the severity of their condition. This rations patient treatment efficiently when resources are insufficient for all to be treated immediately. The term comes from the French verb trier, meaning to separate, sift or select. [Wikipedia](#)



The hospital was surrounded by floodwaters, without electricity or sanitation, running out of food, experiencing indoor temperatures up to 110 °F (43 °C)...



September 11:
45 bodies were recovered from
Memorial Medical Center

“...investigators were surprised at the number of bodies in the makeshift morgue and were stunned when health care workers charged that a well-regarded doctor and two respected nurses had hastened the deaths of some patients by injecting them with lethal doses of drugs. Mortuary workers eventually carried 45 corpses from Memorial, more than from any comparable-size hospital in the drowned city...”

The collapse of local law enforcement and lack of effective public communications led to civil unrest and further delayed relief

- A variety of conditions led to lawlessness and violence in hurricane stricken areas.
- The New Orleans Police Department was ill-prepared for continuity of operations and lost almost all effectiveness.
- The lack of a government public communications strategy and media hype of violence exacerbated public concerns and further delayed relief.
- EMAC and military assistance were critical for restoring law and order.
- Federal law enforcement agencies were also critical to restoring law and order and coordinating activities.





A FAILURE OF INITIATIVE

**Final Report of the Select Bipartisan Committee to Investigate
the Preparation for and Response to Hurricane Katrina**

We repeatedly tried to determine how government could respond so ineffectively to a disaster that was so accurately forecast.



A FAILURE OF INITIATIVE

Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina

- Why situational awareness was so foggy, for so long.
- Why *all* residents, especially the most helpless, were not evacuated more quickly.
- Why supplies and equipment and support were so slow in arriving.
- Why so much taxpayer money aimed at better preparing and protecting the Gulf coast was left on the table, unspent or, in some cases, misspent.
- Why the adequacy of preparation and response seemed to vary significantly from state to state, county to county, town to town.
- Why unsubstantiated rumors and uncritically repeated press reports – at times fueled by top officials – were able to delay, disrupt, and diminish the response.
- And why government at all levels failed to react more effectively to a storm that was predicted with unprecedented timeliness and accuracy.

The accuracy and timeliness of National Weather Service and National Hurricane Center forecasts prevented further loss of life



Max Mayfield, NWS director

- NWS Director Max Mayfield personally spoke by telephone with the governors of Mississippi and Louisiana and the mayor of New Orleans two days prior to landfall to warn them of what was coming. He also gave daily pre-storm video briefings to federal officials in Washington, including top Federal Emergency Management Agency (FEMA) and DHS brass.
- The day before Katrina hit, the NWS office in Slidell, Louisiana issued a warning saying, "MOST OF THE AREA WILL BE UNINHABITABLE FOR WEEKS...PERHAPS LONGER...HUMAN SUFFERING INCREDIBLE BY MODERN STANDARDS."

The Select Committee determined — despite more recently revised reports that Katrina was actually a strong Category 3 storm at landfall, not a Category 4 — that Katrina's strength and the potential disaster it could bring were made clear well in advance through briefings and formal advisories. Inadequate response could not be blamed on lack of advance warning.



URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE NEW ORLEANS LA
1011 A.M. CDT SUN AUG 28 2005

...DEVASTATING DAMAGE EXPECTED...

.HURRICANE KATRINA...A MOST POWERFUL HURRICANE WITH UNPRECEDENTED STRENGTH...RIVALING THE INTENSITY OF HURRICANE CAMILLE OF 1969.

MOST OF THE AREA WILL BE UNINHABITABLE FOR WEEKS...PERHAPS LONGER. AT LEAST ONE HALF OF WELL CONSTRUCTED HOMES WILL HAVE ROOF AND WALL FAILURE. ALL GABLED ROOFS WILL FAIL...LEAVING THOSE HOMES SEVERELY DAMAGED OR DESTROYED.

THE MAJORITY OF INDUSTRIAL BUILDINGS WILL BECOME NON FUNCTIONAL. PARTIAL TO COMPLETE WALL AND ROOF FAILURE IS EXPECTED. ALL WOOD FRAMED LOW RISING APARTMENT BUILDINGS WILL BE DESTROYED. CONCRETE BLOCK LOW RISE APARTMENTS WILL SUSTAIN MAJOR DAMAGE...INCLUDING SOME WALL AND ROOF FAILURE.

HIGH RISE OFFICE AND APARTMENT BUILDINGS WILL SWAY DANGEROUSLY...A FEW TO THE POINT OF TOTAL COLLAPSE. ALL WINDOWS WILL BLOW OUT.

AIRBORNE DEBRIS WILL BE WIDESPREAD...AND MAY INCLUDE HEAVY ITEMS SUCH AS HOUSEHOLD APPLIANCES AND EVEN LIGHT VEHICLES. SPORT UTILITY VEHICLES AND LIGHT TRUCKS WILL BE MOVED. THE BLOWN DEBRIS WILL CREATE ADDITIONAL DESTRUCTION. PERSONS...PETS...AND LIVESTOCK EXPOSED TO THE WINDS WILL FACE CERTAIN DEATH IF STRUCK.

POWER OUTAGES WILL LAST FOR WEEKS...AS MOST POWER POLES WILL BE DOWN AND TRANSFORMERS DESTROYED. WATER SHORTAGES WILL MAKE HUMAN SUFFERING INCREDIBLE BY MODERN STANDARDS.

THE VAST MAJORITY OF NATIVE TREES WILL BE SNAPPED OR UPROOTED. ONLY THE HEARTIEST WILL REMAIN STANDING...BUT BE TOTALLY DEFOLLATED. FEW CROPS WILL REMAIN. LIVESTOCK LEFT EXPOSED TO THE WINDS WILL BE KILLED.

*AN INLAND HURRICANE WIND WARNING IS ISSUED WHEN SUSTAINED WINDS NEAR HURRICANE FORCE...OR FREQUENT GUSTS AT OR ABOVE HURRICANE FORCE...ARE CERTAIN WITHIN THE NEXT 12 TO 24 HOURS.
ONCE TROPICAL STORM AND HURRICANE FORCE WINDS ONSET...DO NOT VENTURE OUTSIDE!*



robert ricks

An aerial photograph showing a residential neighborhood completely inundated with floodwater. The water is dark and reflects the sky, surrounding the roofs of houses and some trees. The scene depicts the aftermath of a major disaster.

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Many of the problems we have identified can be categorized as “information gaps” – or at least problems with information-related implications, or failures to act decisively because information was sketchy at best. Better information would have been an optimal weapon against Katrina. Information sent to the right people at the right place at the right time. Information moved within agencies, across departments, and between jurisdictions of



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The failure of complete evacuations led to preventable deaths, great suffering, and further delays in relief

- Evacuations of general populations went relatively well in all three states.
- Despite adequate warning 56 hours before landfall, Governor Blanco and Mayor Nagin delayed ordering a mandatory evacuation in New Orleans until 19 hours before landfall.
- The failure to order timely mandatory evacuations, Mayor Nagin's decision to shelter but not evacuate the remaining population, and decisions of individuals led to an incomplete evacuation.
- The incomplete pre-landfall evacuation led to deaths, thousands of dangerous rescues, and horrible conditions for those who remained.
- Federal, state, and local officials' failure to anticipate the post-landfall conditions delayed post-landfall evacuation and support.



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There was also an element of simple bad luck with Katrina that aggravated the inadequate response. The hurricane arrived over a weekend, at the end of the month. People on fixed incomes had little money for gas or food or lodging, making them more likely to remain in place and wait for their next check. Communicating via television or radio with families enmeshed in their weekend routines was difficult at best, as was finding drivers and other needed volunteers.



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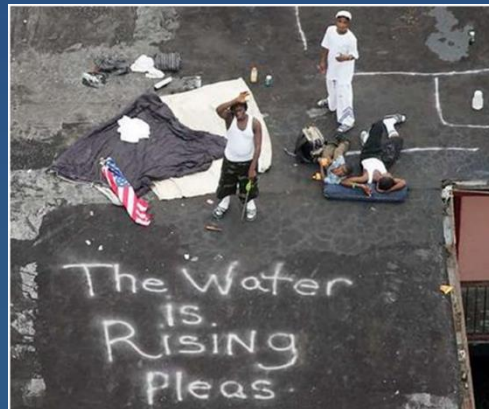
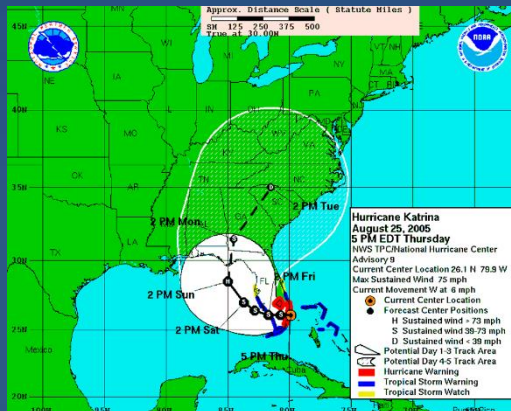


delayed the response. Officials at all levels seemed to be waiting for the disaster that fit their plans, rather than planning and building scalable capacities to meet whatever Mother Nature threw at them. We again encountered the risk-averse culture that pervades big government, and again recognized the need for organizations as agile and responsive as the 21st century world in which we live.

One-size-fits-all plans proved impervious to clear warnings of extraordinary peril. Category 5 needs elicited a Category 1 response. Ours was a response that

Hurricane Katrina: Major Takeaways (1)

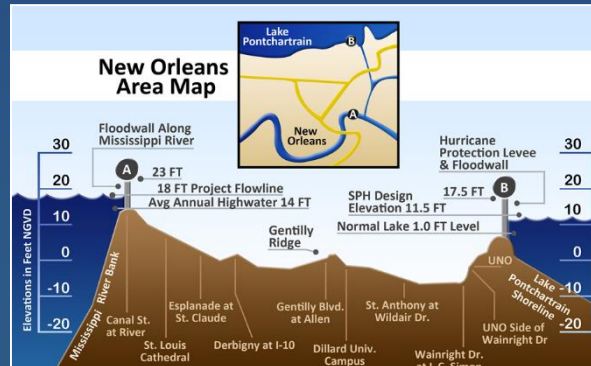
- Uncertainties in forecasts, need of continuous watch and update, alternative scenarios should be discussed
- Need of good communication between Meteo/Hydro, Emergency Managers and Municipalities
- Sometimes one has to evacuate, even if there is uncertainty in the forecast (the price of “Miss” is much bigger than that of “False Alarm”)





Hurricane Katrina: Major Takeaways (2)

- Text of the warnings has to be clear, including expected outcomes and guidelines for conduct
- To succeed in time of crisis, the scenario should be well known in advance, the emergency plans should be appropriate and exercised
- Special attention should be given to critical infrastructure (such as: hospitals, electricity, communication, water) and to the most vulnerable population



Hurricane Katrina: Major Takeaways (3)

- Not only exact science and engineering are needed in order to prevent or mitigate a disaster, social sciences are also needed



Case Study #2

European Heat Wave 2003

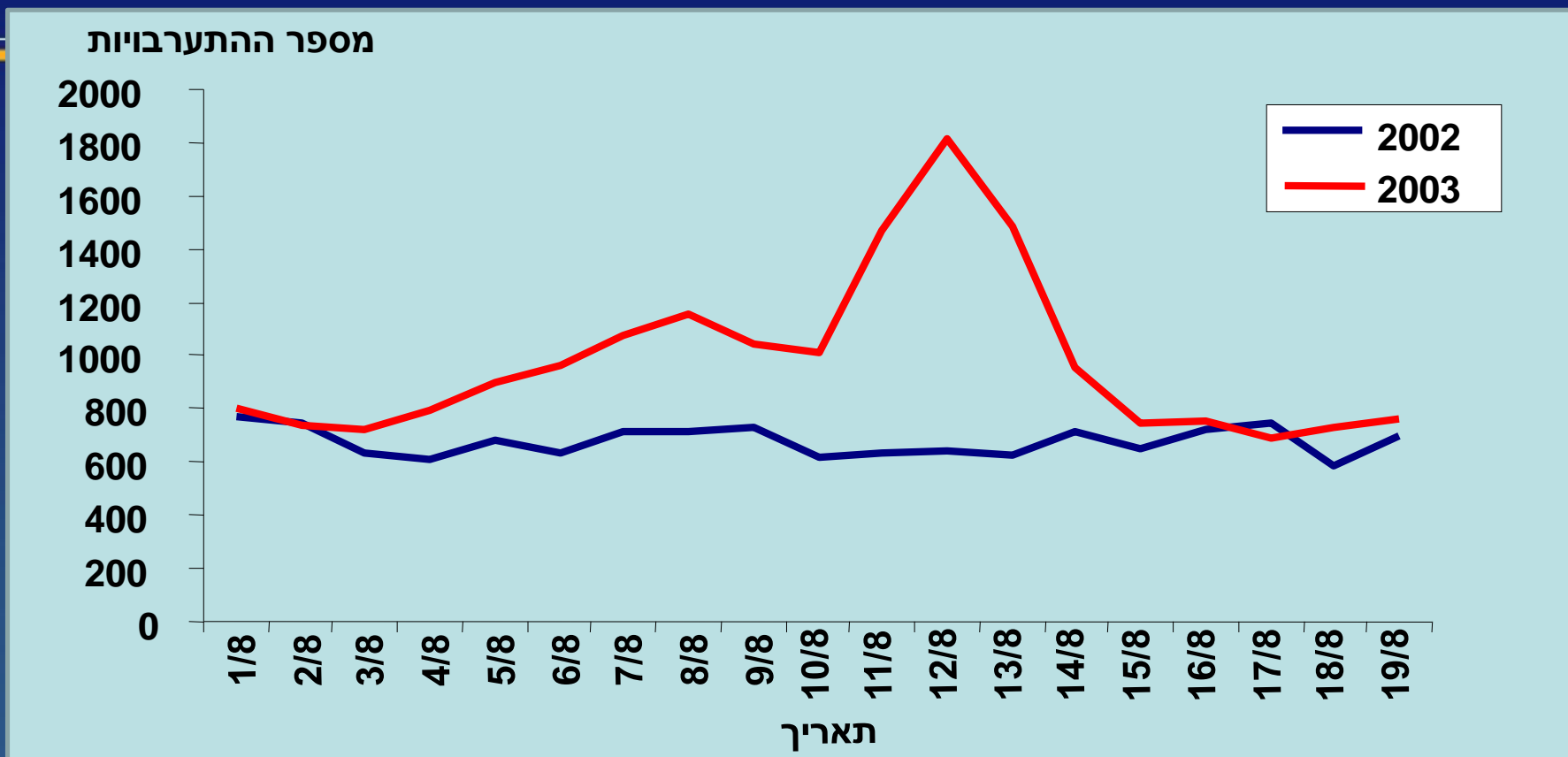


August 2003



“vacance”

Increased demand for first aid brigades: Paris summer 2003 vs 2002



Increased demand for emergency services: first aid brigades activity in Paris in August 2003 compared to 2002.



CATASTROPHE SANITAIRE. L'estimation du nombre de personnes directement victimes de la canicule est effarante : selon nos informations, il y a eu près de deux mille décès enregistrés en Ile-de-France au cours des huit derniers jours, et non la centaine officiellement admise. Pour la France entière, le bilan définitif sera donc beaucoup plus lourd. Les pouvoirs publics semblent avoir véritablement pris hier soir la mesure du drame que vit le pays en déclenchant un plan de mobilisation exceptionnel, alors que les services de secours, les hôpitaux, les sociétés de pompes funèbres tentent de faire face à une situation depuis longtemps catastrophique. On a même dû faire appel hier à des camions frigorifiques pour conser-

Emergency wards overflow





Wilting under the heat -- the Larzac plateau, southern France with temperatures above 40 degrees celsius.

The heat wave in France has had dramatic consequences: the newspaper *Le Parisien* spoke of over 2,000 deaths alone in the region of Ile-De-France around the capital of Paris in its Thursday edition. Nationwide the heat is believed to have claimed at least 3,000 victims.

And what is the French government doing? Till now it apparently has stayed home on account of the heat. That's likely what doctors throughout the country have thought as they stood helplessly before overflowing emergency wards. The same goes for the staff from old people's homes at a loss about how to beat the rising temperatures in the face of a lack of air conditioners, as well as

funeral homes and morgues, who couldn't handle the flood of applications and demands for their services. The bodies of the heat victims had to be stored temporarily in refrigerated tents (photo) at hospitals.



An inflatable refrigerated tent used as a makeshift morgue and already containing 15 bodies in Longjumeau outside Paris.

Anke Hagedorn,
DW, 15/8/03

Vacation more important

Until the beginning of this week, no member of the government other than Environment Minister Roselyne Bachelot found it necessary to interrupt their summer vacation to return to Paris.

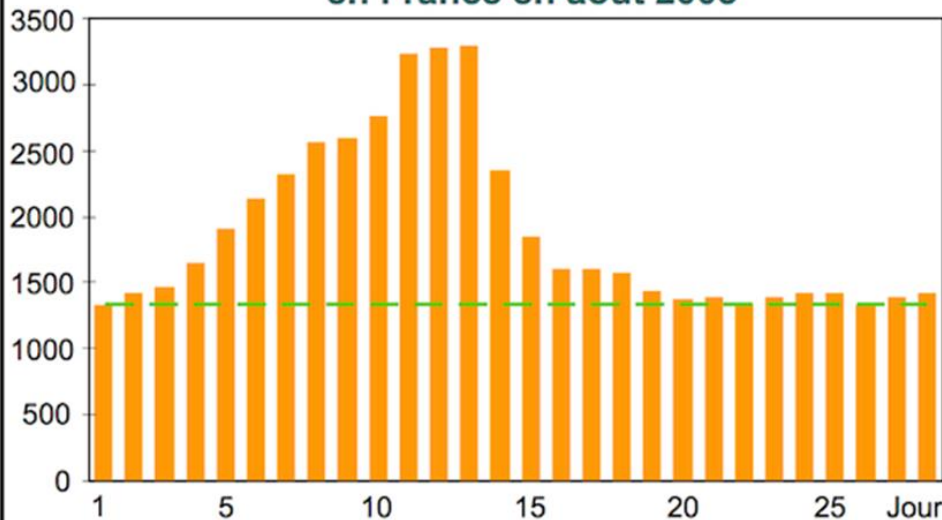
It was only after immense pressure and scathing public criticism, that Health Minister Mattei responded to the heat consequences from his southern French holiday resort, and the first thing he did, was to defend the government's stance. The Greens then emphatically demanded the health minister, who had so obviously goofed up with the crisis-management, step down.

Naturally a government can't be held responsible for extraordinarily high temperatures, much less so can it provide for rain. But it must react fast and efficiently to counter the effects of heat. In France, there's an emergency plan for all possible crisis situations: for nuclear accidents, for terrorist attacks, for plane crashes. But apparently the government wasn't equipped for the weather – in other words, they underestimated its ramifications.

Anke Hagedorn, DW, 15/8/03



Évolution journalière du nombre de décès, en France en août 2003



Source : Hémon, Jouglu, 2004

Fiche pédagogique, INED, www.ined.fr



AGENCE FRANCE-PRESSE

Patients are treated at Paris' Saint-Antoine Hospital for problems related to the heat wave. Many victims are elderly, officials said.

French government blames heat for up to 3,000 deaths

Large number of bodies overwhelms morgues

ASSOCIATED PRESS

PARIS — A blistering heat wave across Europe has caused as many as 3,000 deaths in France alone, the government said yesterday, and overburdened funeral homes and morgues are struggling to manage an overflow of bodies.

Critics raised new questions about the government's han-

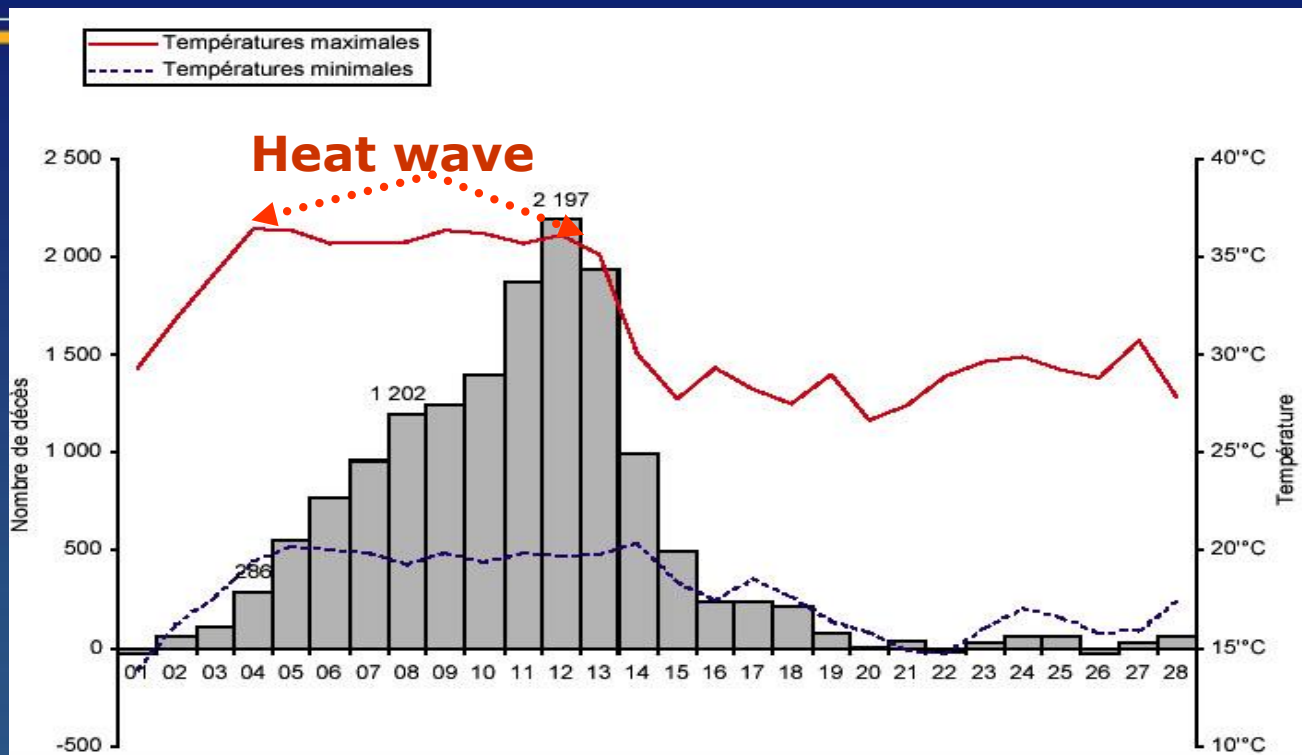
pitals from July 25 to Tuesday and from information provided by General Funeral Services. Doctors have listed heatstroke and dehydration among the causes of deaths.

"It's a nationwide catastrophe the likes of which we've never seen," Patrick Pelloux, head of the association for French emergency hospital physicians, told Europe-1 radio yesterday. He has repeatedly accused the government of reacting too slowly.

Mattel insisted that the government responded w

Heat Wave in France: August 2003

Surmortalité liée à la canicule d'août 2003 en France
 Dr Marc Cohen - OSE - France, 2003

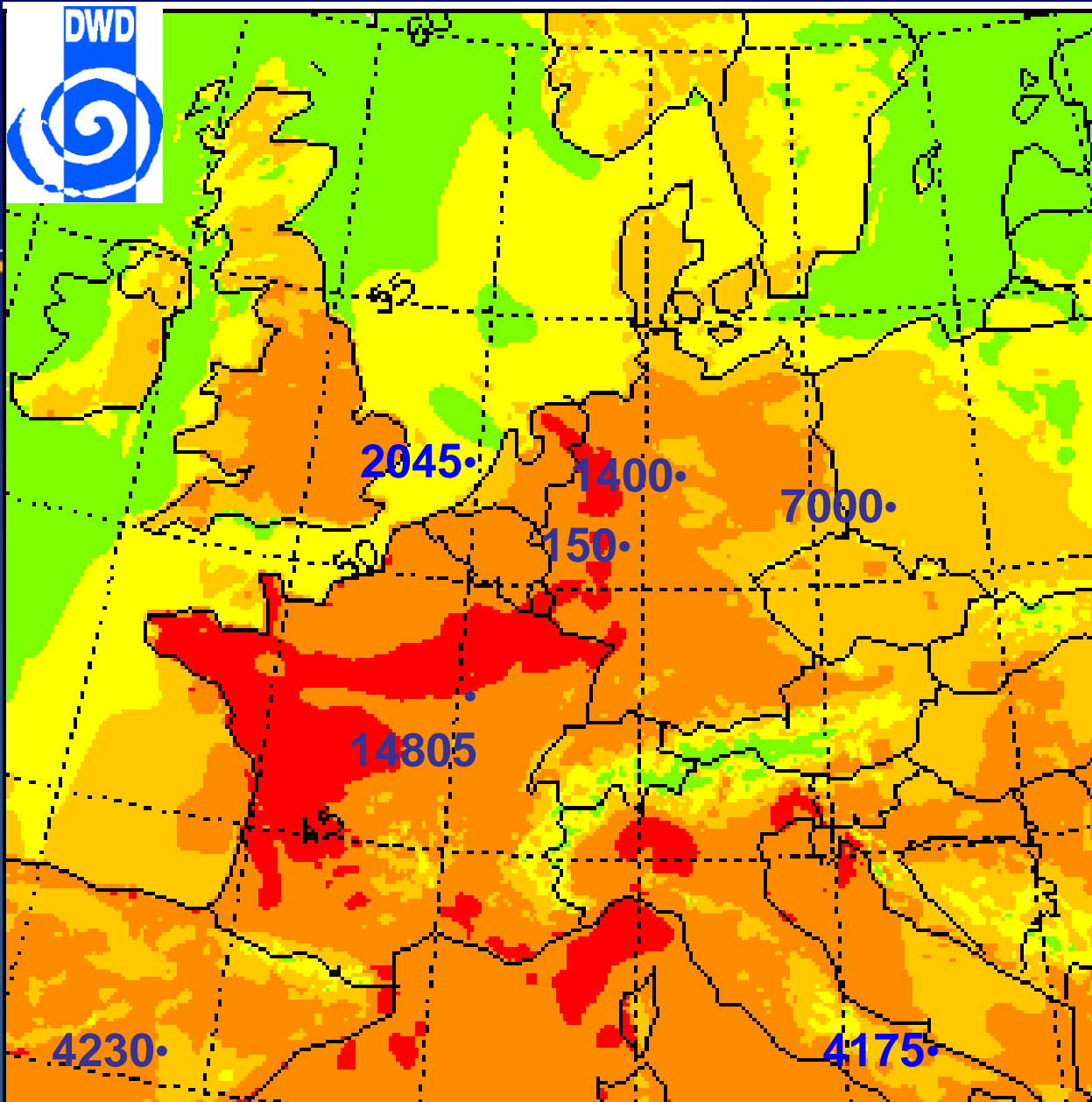


1/8/2003- 20//82003

Observed death cases - 41,621

Expected death cases - 26,819

Excess deaths in period -14,802 (55% increase)

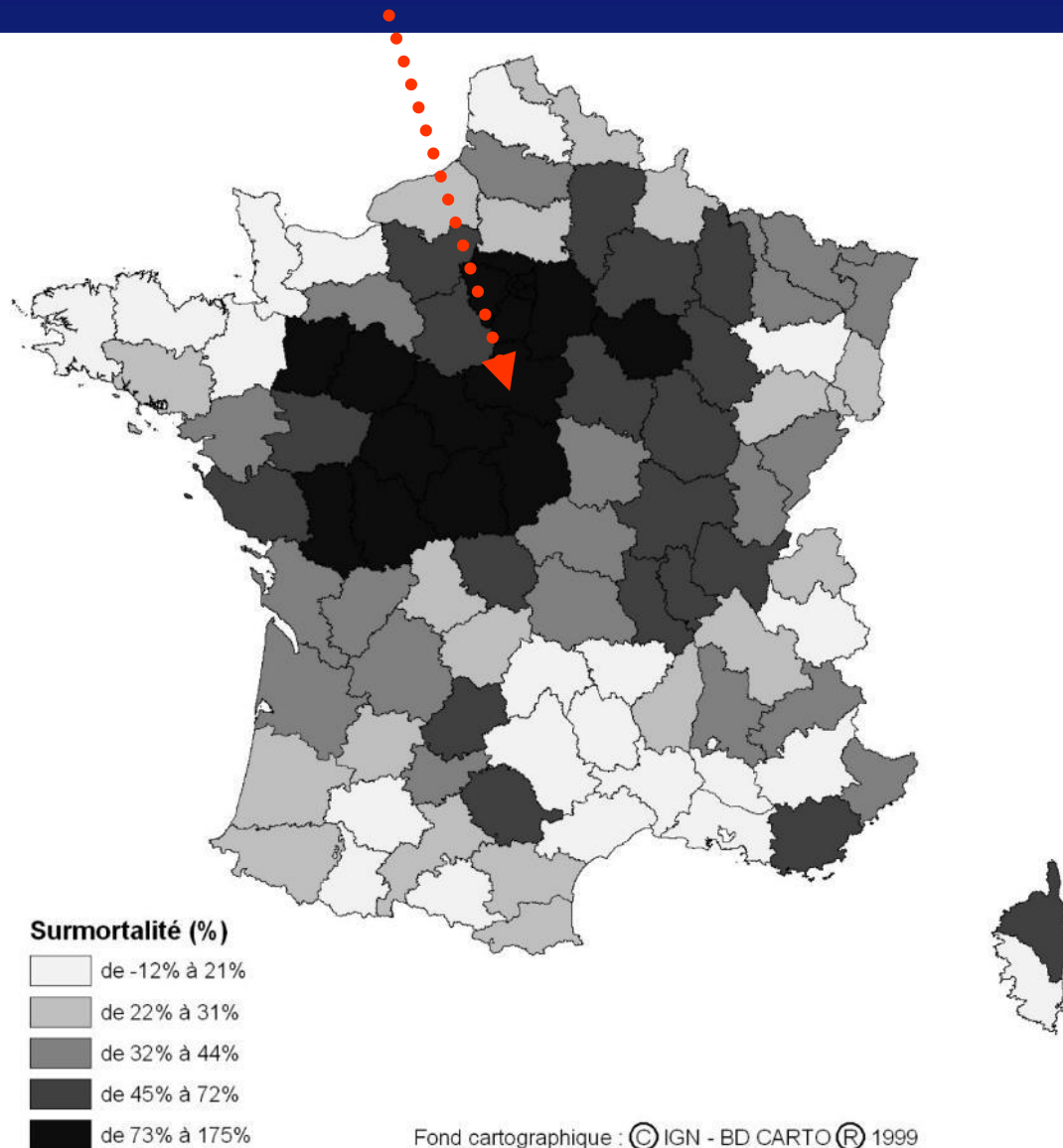


Heat related extra deaths in Europe, August 2003



PT map underlay
UTC13:00
Aug 9 2003

The mortality increase by regions was heterogeneous:
High mortality increase in the Centre regions of France.
Within Paris, the mortality increase rose to 127 %.



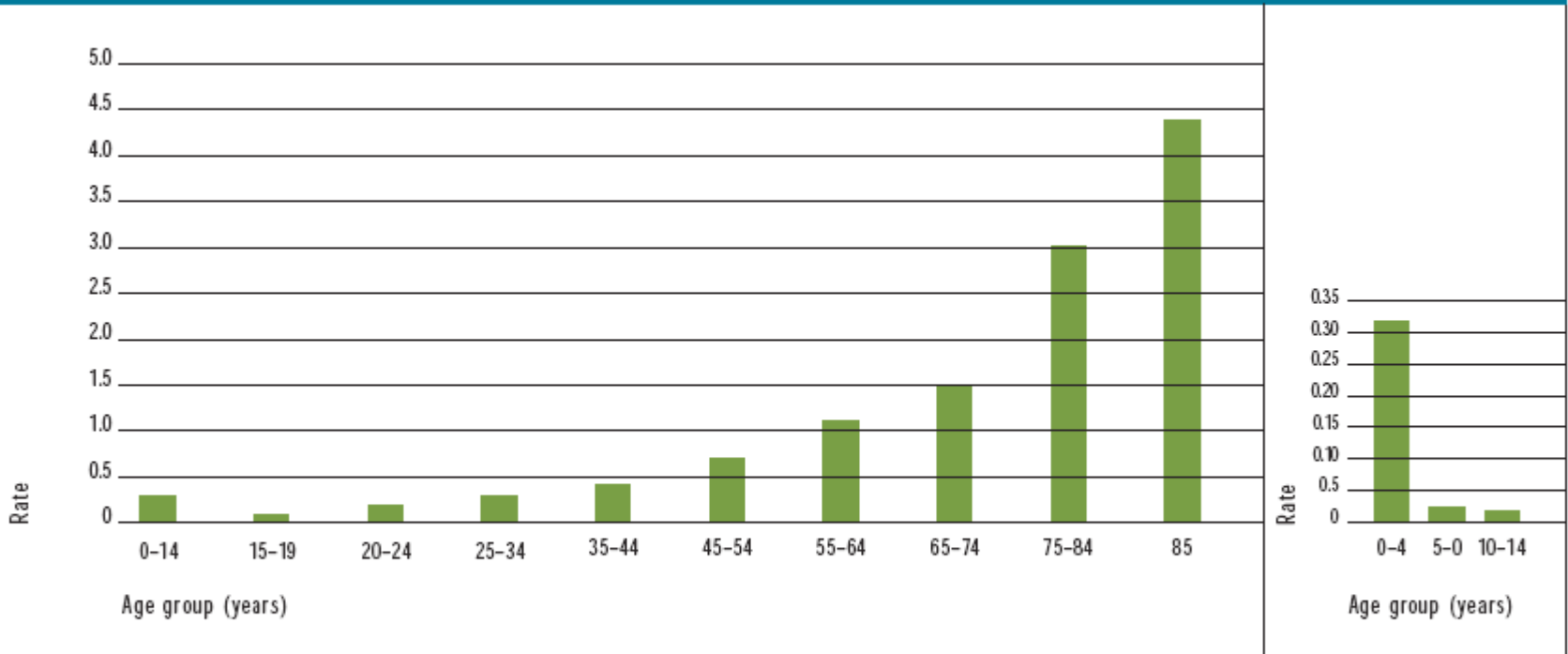
Risk = Vulnerability + Threat



Risks are the combination of a vulnerability and a corresponding threat.

Age sensitivity to heat waves

Fig. 7. Average annual rate of heat-related deaths* per million population in the United States resulting from weather conditions according to age group, 1979–1997



* Underlying cause of death attributed to excess heat exposure classified according to ICD-9 code E900.0 "due to weather conditions (deaths)".

Source: Centers for Disease Control and Prevention (2002).

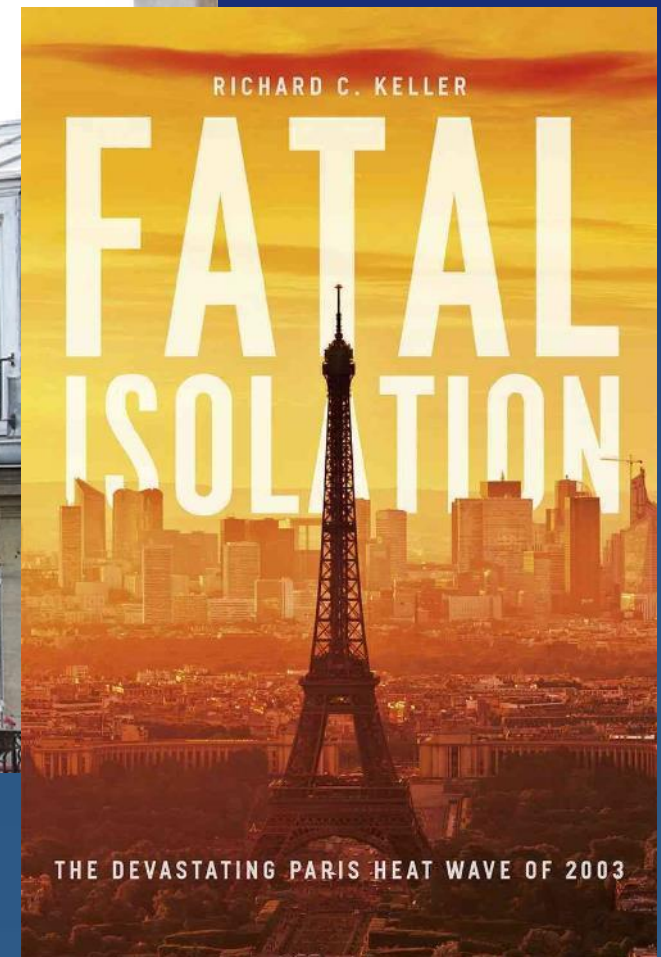
Risk factors for death in 2003 heat wave in France

Risk was highest in the following:

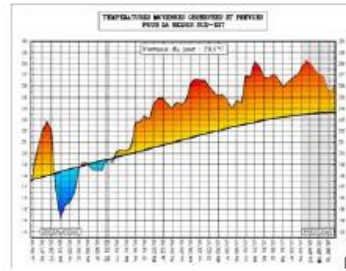
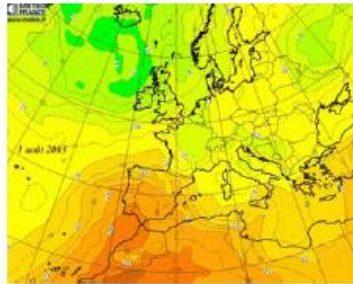
- Bed-bound – with heart, Neurological or psychiatric diseases
- Residing in old buildings, not insulated
- Bedroom located top floor
- In urban “heat islands” (e.g. no trees)



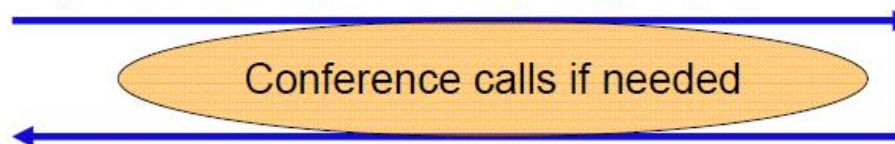
Risk = Vulnerability + Threat



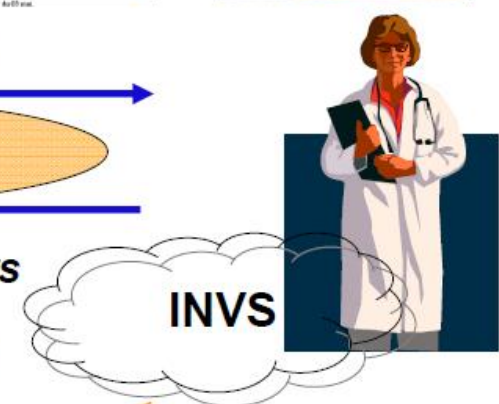
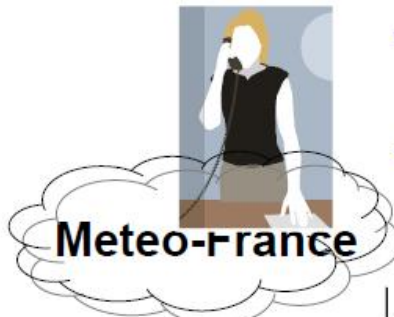
Heat wave specific cooperation



Specific data, indexes and expertise



Health reports, worsening factors



Local authorities
(Préfets)

Warning status
and proposals for action

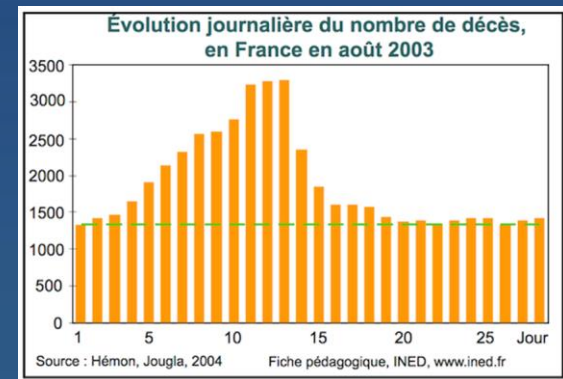
ACTION

2003 Heatwave: Major Takeaways (1)

- Heatwave can be more lethal than a hurricane... (there should be adequate warnings)
- Need for emergency plan for all crisis situations (crisis may be slow evolving, not necessarily abrupt)
- Need for continuous monitoring of emergency indicators (such as excessive load on emergency wards/ First aid)

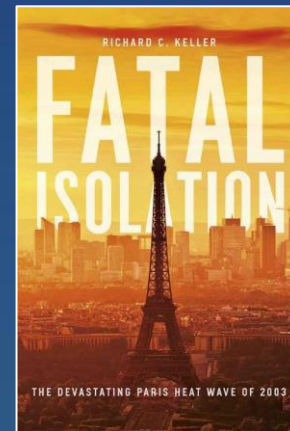


An inflatable refrigerated tent used as a makeshift morgue and already containing 15 bodies in Longjumeau outside Paris.



2003 Heatwave: Major Takeaways (2)

- Preparing emergency plan requires mapping of vulnerable population and designing actions appropriate for them
- Social Science is needed for such mapping and for the design of solutions





Trilateral workshop, FEWS, Shefayim 03/2022

Final Notes

Disaster Risk Reduction



Risk = Vulnerability + Threat



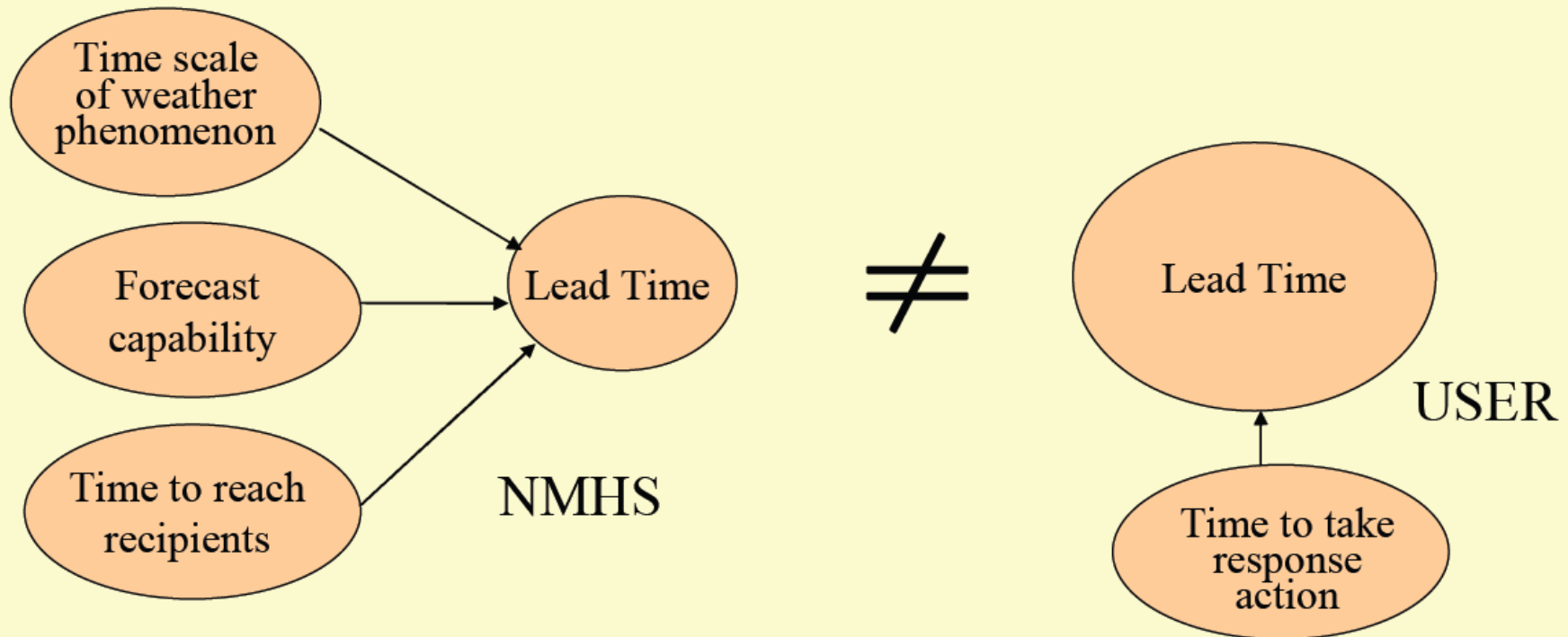
Risks are the combination of a vulnerability and a corresponding threat.

Besides being accurate, effective weather warnings should be:

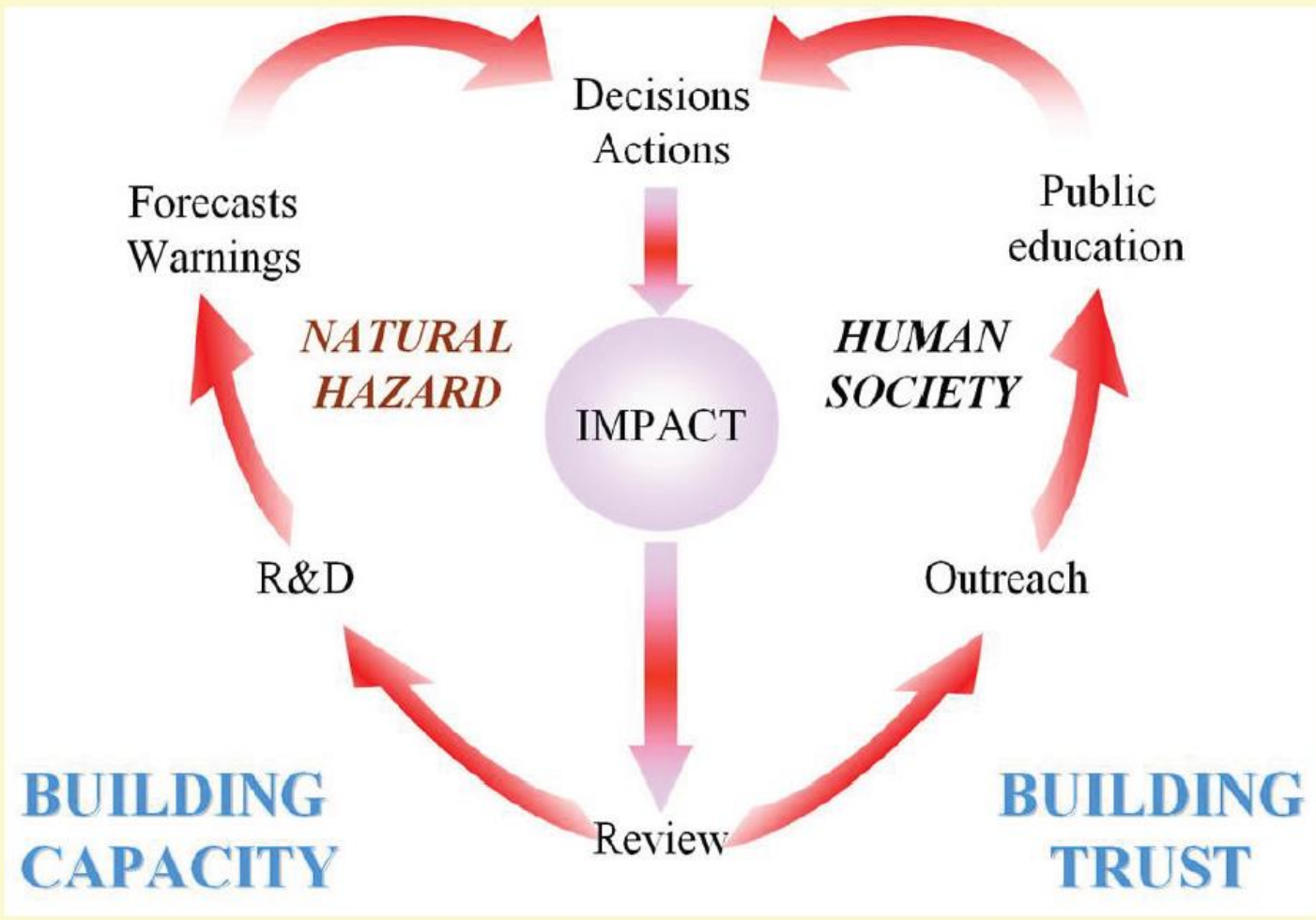
- I. Relevant
- II. Timely
- III. Effectively delivered
- IV. Capable of prompting actions
- V. ‘Graded’ to trigger matching actions
- VI. Evolving with changing needs
- VII. Trusted

II. Warnings should be timely

- Depend on how the recipient evaluates the product
- User expectation managed through education and outreach



NMHSs have to work on both science and human aspects





Introduction to the Course Via Case Studies

	Hurricane	Heat Wave
Possible Impacts, Danger		
Vulnerabilities, Population at risk		
Proper Preparedness		
Probable needed Response		
Time in Advance needed for Early Warning		
Expertise/Tools available for issuing Early Warnings, Uncertainties		
Updates needed during Response and Rehabilitation		

Questions?

