Il Processo Decisionale in Protezione Civile: Scienza, Rischi e Responsabilità

Decisional Process in Civil Protection: Science, Risks and Accountability

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Decision-making under large uncertainty conditions is quite common when managing (natural and technological) risks.

Key points need to be solved about the decisional chain, its complexities, the consequent responsibilities.
Civil protection organizations address such complex issues every day, especially when they have in charge not only activities to be undertaken after a catastrophic event, but also forecast and prevention activities aimed at mitigating risks.

This problem is even more intricate when civil protection is a system, to which several individuals and organizations contribute.

This is the case of the Italian Civil Protection.
Mandate of National System of Civil Protection in Italy

The National Service of Civil Protection of Italy (D.Lgs. N.1/2018) aims at safeguarding human life and health, properties, animals, national heritage, human settlements and the environment from natural or man-made disasters.

It deals with:
- Forecasting and Warning
- Prevention and Mitigation
- Rescue and Assistance
- Emergency overcoming
National Service of Civil Protection of Italy

Coordination activity

PRESIDENCY OF THE COUNCIL OF MINISTERS

Department of Civil Protection

High Risk Commission

National Fire-fighters Corps
Police
Prefectures

ISPRA

118

Financial Police

Army
Navy
Air Force
Carabinieri

TERNA

Costal Guard
ANAS
National Highway
National Railway

INGV
CNR
National Research Institutes

State Forest Corps

volunteers

National Service of Civil Protection of Italy
DISASTERS

NATIONAL LEVEL

- Head of the DPC / Commissario Delegato (L. 286/2002)
- Operational Committee
- Major risks Commission
- National conference of civil protection volunteers
- Central Functional Centre
- Direction of Command and Control
- State-Regions Committee
- DPC Operational Room

REGIONAL LEVEL

- Regional Functional Centre
- Regional Operational Room
- Civil Protection Regional Fund (L. 388/2000)
- Regional Volunteers (L. 112/98)

PROVINCIAL LEVEL

- Province
- C.C.S.
- C.O.M./C.I. Com. Montana

MUNICIPALITY LEVEL

- Municipality
  - Mayor, first authority of civil protection
  - C.O.C.
CP vs. Hazards and risks (in Italy)

- seismic
- hydrogeological
- floods
- volcanic
- forest fire
- industrial and nuclear
- technological
- transports
- supply networks
- environmental
Within the **Risk Cycle**, **Decision Makers** and **Scientists** provide different contributions to the risk management, with frequent and intricate interactions that can cause distortions in their roles, and thus of their responsibilities.

Other subjects play important roles, and thus indirectly condition decisions:

- Mass media
- Citizens
- Judiciary
Two different points of view have to be reconciled.

<table>
<thead>
<tr>
<th>Scientists</th>
<th>Decision makers</th>
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<tbody>
<tr>
<td>Scientists often model events that occurred in the past in order to understand their dynamics</td>
<td>Decision makers need well tested and complete models, able to describe events possibly occurring in the future</td>
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<tr>
<th>Scientific approach</th>
<th>Decisions</th>
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<td>Scientific approach to risks is often probabilistic, always affected by uncertainties</td>
<td>Decisions require a yes/no answer</td>
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Scientists need a relatively long time, in order to acquire more data to reduce uncertainties, preferring to wait rather than to be wrong.

Decision makers must generally give an immediate response, often balancing low probabilities vs. catastrophic consequences.
To clarify specific roles and responsibilities, decision makers should be distinguished into:

- **Political Decision Makers (PDMs)**
- **Technical Decision Makers (TDMs)**

Additional distinctions could be made, e.g. **PDMs** operating:

- at **national or local** level,
- on **general** risk management policies or **specific** scenarios.
Steps of an ideal civil protection decision-making process:

1) definition of the acceptable level of risk according to established policy;
2) quantitative evaluation of risk (H*V*E);
3) identification of specific actions capable of reducing the risk to the acceptable level;
4) cost-benefit evaluation of possible risk-mitigating actions;
5) adoption of the most suitable technical solution;
6) implementation of risk-mitigating actions.

- Scientists should deal with steps 2 and 4;
- PDMs should deal with step 1;
- TDMs typically manage steps 3, 5 and 6.
Distortions of the roles imply some confusion and undue responsibilities in the decision.

This occurs especially if some of the participants in the decisional process:

- **do/can not** accomplish their tasks
- **go beyond** their role.
Decision-Making process in Civil Protection

- **Scientists** could either:
  - not provide *fully quantitative evaluations*,
  - not supply *scientific support in cost-benefit analyses*,
  - give *undue advice concerning civil protection actions*;

- **PDMs** could decide *not* to establish “*acceptable risk*” levels;

- **TDMs** could tend (or be forced, in emergency conditions) *making and implementing decisions* they are not in charge for, because of the *lack* of:
  - *scientific quantitative evaluations*,
  - “*acceptable risk*” *statements* (or impossibility to get).
Civil protection and citizens

In peace time:

Every citizen should **reduce** the **risks** affecting his life and goods:

- being **aware of the risks** he is exposed
- adopting **personal//family precautionary measures**
- verifying that CP authorities prepare **civil protection plans** to contrast catastrophic events and **knowing them**
- inducing political representatives to carry **prevention policies**
In case (or in the imminence) of an event:

Citizens should **undertake different actions**, depending on the kind of risk and its related forecasting probabilities:

- In case of an **alert**, citizens should follow and **implement the civil protection plan** and the correct **individual behaviours**

- In case of **very low occurrence probabilities**, citizens should adopt **individual behaviours**, calibrated on their own **risk acceptability**
We have the duty of communicating with citizens, but we are voiceless and invisible if we don’t pass through the «cultural mediation» of the information channels and their managers. Maybe we have neither analyzed deeply enough the consequences of such mediation, nor we have learned well enough to avoid traps and to take the possible advantages.

(F. Gabrielli, Head of DPC, 2011)

**Advantages**
- Dissemination of knowledge about risks and prevention to increase people awareness
- Immediate spread of useful information during emergency

**Traps**
- Information distorsion
- Accreditation of a-scientific ideas and opinions
- Political exploitation
- Fake news / False alarms
"Cause and effects" in theories of mass communication

**Berelson (1949):** "Some kinds of communication, on some kinds of issues, brought to the attention of some kinds of people, under some kinds of conditions, have some kinds of effects."

**Wilbur Schramm (1954):** "It is misleading to think of the communication process as starting somewhere and ending somewhere. It is really endless. We are little switchboard centers handling and rerouting the great endless current of information...."
… a significant increase of the judiciary actions after a disaster has occurred, to find the guilt in the behaviour of the catastrophe management actors. The investigation area is enlarged to the phase of forecast and of “forecast information management” …

(F. Gabrielli, Head of DPC, 2011)

The question is very complex and also depends on the legal framework of each country.

It is interesting to look at the considerations of magistrates and experts made during a dedicated meeting “Civil Protection and Responsibilities in the Risk Society”, 2011.
Civil Protection and Judiciary

• “I realize ... that most of the people feel the need to find a responsible, ... to know who has to be blamed for what happened. ... And the mass media world amplifies this request of justice” (*)

• “Accusatory approach to the error: a scheme of analysis for which, ..., the main effort is made to find who is the possible responsible for the occurred event, in order to punish him”...(**)

• "... progressive and regular adoption of behaviours not aimed at better managing the risk, but rather at attempting to minimize the possibility to be personally involved in a future legal controversy”(**)

• “The idea of allowed risk ...: it is difficult to establish the equilibrium point ... the referee who establishes the boundary between licit and illicit is just the judge”(***)

(*) Renato Bricchetti, President of the Court of Lecco
(**) Francesco D’Alessandro, Professor of Criminal Law, Università Cattolica di Milano
(***) Rocco Blaiotta, Judge of the Supreme Court of Cassation

(From “Protezione Civile e responsabilità nella società del rischio”, 2011 )
The meaning of “acceptable risk”: how safe is safe enough

A thing is safe if its risks are judged to be acceptable (Lowrance, 1976)

Risk Evaluation

Conceptual scheme for risk evaluation from Renn (2006)
Who decides which is the acceptable risk?

In many situations each of us decides what is her specific acceptable level of risk, with consequences that are usually negligible. We decide, however, which level of risk is acceptable for us also when the consequences can be severe. We make individual decisions that usually involve only ourselves or, in some cases, very few people, e.g., our relatives, friends or colleagues.

But there are some risks that involve large parts or all of our community, and whose acceptable levels are not established individually. Many stakeholders participate to the related decision-making process. Who decides in these cases?

Establishing the acceptable level of a risk that affects a community is an eminently political decision (although also based on contributions by scientists and technical professionals). BUT …
Analysis of the behavioral elements affecting the high-level decision process

... political decision-makers very often prefer not to decide which is the acceptable level of risk for many reasons.

We identified four general reasons that make it difficult to take such a decision.
Possible reasons why political decision-makers very often prefer not to decide which is the acceptable level of risk – 1

<table>
<thead>
<tr>
<th>General reasons</th>
<th>Specific reasons</th>
<th>Behavioral mechanisms (heuristics, etc.)</th>
<th>Biases</th>
<th>Possible solutions</th>
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</thead>
</table>
| 1. Difficulty to understand these kinds of risks (statistical nature of information) | 1a. Risks usually expressed in probabilistic terms, difficult to be (fully) understood | Lack of time and technical skills:  
Risk aversion  
Procrastination | All the biases related to the information “format” | Provide clear and effective information to the political decision-maker |
| | 1b. Disastrous events generally characterized by very low probability of occurrence and high impact | Others’ risk acceptance (in favor to the politician’s interests)  
Procrastination | | |
| | 1c. Disaster risk very rarely reported in comparison with other more familiar | Availability | Disasters with long recurrence time underestimated.  
Disasters just occurred overestimated | Provide quantitative comparative analyses |
Possible reasons why political decision-makers very often prefer not to decide which is the acceptable level of risk – 2

<table>
<thead>
<tr>
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<tr>
<td>2. Difficulty to define the mitigating actions to achieve the acceptable level of risk</td>
<td>2a. Actions to reduce the current risk to the acceptable level</td>
<td>Need to activate System 2</td>
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<td></td>
<td></td>
<td>Procrastination</td>
<td></td>
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<td></td>
<td>2b. Cost/benefit evaluation for comparisons with other needs</td>
<td>Same as for point 2a</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Availability</td>
<td></td>
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<td></td>
<td>2c. Fatalistic approach. Disregard for activities devoted to risk mitigation</td>
<td>Salience of emergency with respect to prevention: availability</td>
<td>Same as point 1c</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Representativeness: emergency considered as an equivalent of risk</td>
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<td></td>
<td>2d. Accountability in case of emergency management, not for lack of prevention</td>
<td>Intertemporal choice applied to both self and others interests</td>
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<td>2e. Need to prioritize actions to be undertaken</td>
<td>Risk aversion (referred to the politician’s interests)</td>
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<td>Intertemporal choice applied to both self and others interests</td>
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Possible reasons why political decision-makers very often prefer not to decide which is the acceptable level of risk – 3 and 4

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<th>General Reasons</th>
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<tr>
<td>3. Low probability–high impact risks: low priority with respect to other more urgent issues</td>
<td>3a. Investing today in disaster risk reduction: results after the duration of a political life</td>
<td>Intertemporal choice applied to both self and others interests</td>
<td>Cognitive control</td>
<td>Short-term gratification to adopt long-term investments</td>
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<td>3b. Disaster risk reduction not among the first points of a political agenda</td>
<td>Lack of salience</td>
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<td>3c. For citizens, no priority for disaster risk reduction</td>
<td>Lack of salience</td>
<td></td>
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<tr>
<td>4. Difficulty to communicate risk acceptability</td>
<td>4a. Difficulty to admit that, besides the economic losses, a certain number of deaths are acceptable</td>
<td>Social norms et similia</td>
<td>Self vs. others interest</td>
<td></td>
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<tr>
<td></td>
<td>4b. Risks not particularly appealing to talk about</td>
<td>Social norms et similia</td>
<td>Self vs. others interest</td>
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The ‘L’Aquila trial’ involved members of the Italian Major Risks Commission (CGR) and officers of the national Civil Protection. It took place after the April 6th, 2009 earthquake that hit the Abruzzo region, particularly L’Aquila.
Seismicity near L’Aquila in 2009

- **January 2009**, seismic activity in the L’Aquila area increased, however with only M<3.0 earthquakes.
- **March 30th**, an event of magnitude Mw 4.0 occurred.
- **March 31st**, four members of the Major Risk Commission met in L’Aquila, along with the Director of the INGV National Centre of Earthquakes, the Deputy Head and the Director of the Seismic Risk Office of the Civil Protection Dept (DPC), the Assessor of Civil Protection of the Abruzzi Region, the Mayor of L’Aquila and the Head of the Regional Civil Protection, as well as other representatives of DPC and of the Region.
- **April 6th, 3:32**, an earthquake of Mw 6.3 hit Abruzzi causing the death of 309 people. It was preceded by two quakes of MI 3.9 and 3.5, respectively 5 and 3 hours before the main shock.
Seismic predictions by Giuliani

- During the sequence, **G. Giuliani**, an INFN (National Institute for Nuclear Physics) **laboratory technician**, publicly issued predictions of impending large earthquakes in the region, based on variations of **radon** concentration.

- The procedures of correlation he used were not made available, and they were **not acknowledged as valuable** by the International Commission on Earthquake Forecasting for Civil Protection, after the April 6th, 2009 earthquake.

- At least two of his specific predictions resulted to be false alarms, but they generated widespread public concern.

- On **April 2**, he said that there was **no more danger** of a big quake
Just before the meeting of March 31\textsuperscript{st}, an interview was given by De Bernardinis. He tried to balance alarm and reassurance of population, e.g. saying \textit{“we must keep a state of attention, without being in a state of anxiety”}.

This interview was \textit{broadcasted many times after the meeting}, without specifying that it had been released before.
Outcomes of the meeting

• The meeting had “been made necessary by the need to examine the seismic phenomena that have been taking place in the province of L’Aquila for several months, …”.

• **Minutes** were released after the April 6th, 2009 earthquake and presented **three main conclusions**:
  
  (i) a small magnitude **seismic swarm cannot be considered as a precursor** of a strong earthquake;
  
  (ii) earthquakes are **not predictable** in a deterministic sense;
  
  (iii) the only defense against earthquakes is **the improvement of the seismic resistance** of buildings and of the emergency preparedness.

• On April 1st, L’Aquila Mayor asked for the ‘state of emergency’ declaration. Municipality plan had been activated in ‘attention phase’, and schools activities were suspended for some days.
The L’Aquila Trial

- **June 2010**, the four members of CGR along with De Bernardinis, Dolce and Selvaggi, were charged with **manslaughter**, for having provided an **inadequate risk assessment** and then **unclear, incorrect and incomplete information** to the public.

- The trial lasted from **September 2011 until October 22, 2012**.

- The seven scientists and public officials were found **guilty** for **multiple unintentional manslaughter** and serious injuries.

- The faults consisted of “**negligenza, imprudenza e imperizia**” (negligence, incautiousness and unskillfulness), leading to:
  - **6 years** in prison (suspended until Cassation judgment);
  - perpetual **interdiction** from public offices and legal interdiction (suspended until Cassation judgment);
  - **financial compensation** to the families of the victims (**€ 8M**, immediate enforcing).
November 10th, 2014, Appeals sentence mostly subverted previous sentence where six out of the seven were judged innocent, and De Bernardinis’ condemn was reduced from 6 to 2 years.

The Appeals magistrates attacked the previous convictions on multiple grounds, stating that no blame could have been laid on the scientists for the risk analysis they carried out, concluding that they were innocent because there was no reason to think the swarm had increased the risk of a major earthquake.

De Bernardinis, they said, was guilty of *negligence and imprudence* in making a series of reassuring comments to a television journalist ‘ahead’ of the experts' meeting.

November 19th, 2015, The Cassation trial ended on with a definitive sentence confirming that issued by the Appeals Court.
Behavioral sciences are an innovative and powerful tool to interpret the entire cascade of decisions that involved politicians, population and media, and ended with the trial.
Heuristics / biases at work

The availability heuristic, acting in all the phases of the incident.

- The long seismic sequence was a lively experience and induced people to believe that the occurrence of a severe seismic event was highly probable at that time, in spite no sounded scientific information supported this idea.

- This information had been provided to the population and local political decision-makers in interviews of researchers to local media, but the continuous and physically perceived seismic sequence, along with the attention posed on it by the media (heuristics of accessibility and relevance) made it available as imminent the occurrence of a strong earthquake in spite of its real probabilities.

- This heuristic also affected the public prosecutor, who implemented the first level of the trial, and the judge, who issued the related first verdict.
The confirmation bias

- The laboratory technician and amateur scientist G.G. Giuliani, having made earthquake predictions that were exactly what the population expected to hear on the basis of the heuristic of availability, was considered much more credible than the entire seismological scientific community.
- His predictions were taken into account by the population in spite of the total lack of any scientific basis: the phenomenon for which people choose to believe to groundless prophecies follows well-known mechanisms.
- The words of the technician increased public awareness also because the public was susceptible to the possibility effect: rare events are generally not considered but when they are, they are overweighed.
The illusory correlation, the mistaken impression that two unrelated variables are correlated. People find it difficult:

• to understand the probabilistic nature of the earthquakes science, preferring therefore a whatever deterministic prediction, even wrong, in any case much easier to be understood and managed;

• to compute covariation assessments; they tend to rely only on positive cases. To assess a causality between a seismic sequence and a major earthquake one has not only to rely on the positive events (when a sequence led to an earthquake) but also on: (1) cases where the sequence did not lead to an earthquake, (2) cases where an earthquake occurred without a sequence and, (3) cases where no sequence was present and no earthquake occurred. These further information is rarely considered by individuals when judging a relationship.
Heuristics / biases at work

The framing built up by the media, which outlined a tale made by juxtaposing the frames of inducing ‘concern’ vs. inducing ‘relief’.

The hindsight bias, for which, after April 6th, 2009 main shock, its deterministic predictability was considered fully evident and easy to be understood ‘before’ the event, in spite of any scientific possibility to carry out such a prediction.
• It is a question of defining which is the acceptable level of risk, in this case for earthquakes, a question that neither had been addressed by the political decision-makers, nor by the population.

• From the perspective of the reasoning developed with this case study, it seems clear that the L’Aquila trial is the consequence of the lack of any long-term policy on disaster risk reduction in matter of seismic risk, lack that has heavy consequences also in terms of social awareness.
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