



Evidence for Policy School - Disaster Risk Management: *SCIENCE AND TECHNOLOGY IN SUPPORT OF DECISION MAKING, IN AN ENVIRONMENT OF UNCERTAINTY*

13-15 January, 2020, Florence, Italy

Prevention and Mitigation | Masterclass n. 3

Science for Disaster Risk Management – liability of the scientific world

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PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

This masterclass is mainly focused on:

- ✓ **identifying the different actors of the decision making process in Disaster Risk Management**
- ✓ **clarifying roles and responsibilities of scientists and decision-makers**
- ✓ **understanding where the scientist liability starts/ends**
- ✓ **reflecting on the steps of the ideal decision-making process**

- **Risk management: roles and responsibilities in the decision-making process**
- **Masterclass organization**
- **Details on Case studies**

- **Risk management: roles and responsibilities in the decision-making process**
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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.



Introduction 2

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 prevision 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.



Scientists and decision makers in the risk management

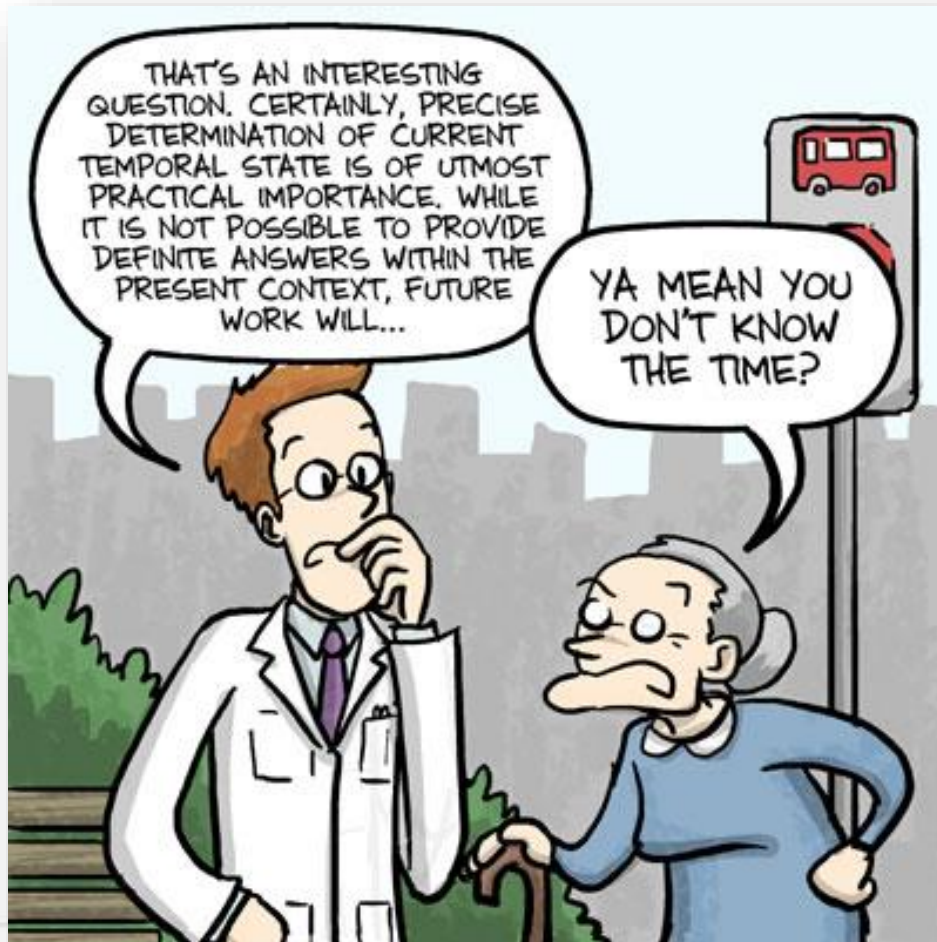
Within the **Risk Cycle**, **Decision Makers** and **Scientists** provide different contributions to the risk management, with frequent and **intricate interactions** that can cause **distortions in the roles** to be played, and thus of the **responsibilities**.

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

- **Mass media**
- **Citizens**
- **Judiciary**



Two different points of view have to be reconciled.



- **Scientists** frequently model events that occurred in the **past** in order to understand their dynamics
- **Decision makers** need well tested models, which are able to describe events possibly occurring in the **future**.
- **Scientific approach** to risks is often **probabilistic**, always affected by **uncertainties**
- **Decisions** require a **yes/no** answer.

Timeliness:

Scientists need a relatively long time for their work, 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 occurrence probabilities vs. envisaged catastrophic consequences.



Political vs. Technical Decision Makers

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 (i.e. the acceptable probability of consequences for lives and property);
- 2) **quantitative evaluation of risk** $\rightarrow f(H, V, E, C)$;
- 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.

In many cases the contribution of the different actors can be hardly separated → at least some **feedback** is often necessary.

Moreover, the contribution of different actors is sometimes required also **within a single step**:

- **Scientists**, in difficult problems, could also provide important contributions to help decision makers **in all the other steps**;
- **PDMs** decisions are needed also **in step 5** (adoption of the most suitable technical solution), in some complex scenarios;
- **TDMs** are often required to interact with the scientists in **steps 2** (quantitative evaluation of the risk) and **4** (evaluation of costs and benefits).

Distortions of the roles imply undue **responsibilities**.

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

- **do/can not** accomplish their tasks;
- **go beyond** their role.



- **Scientists** could either:
 - not provide **fully quantitative evaluations**,
 - miss to 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 them).

- Risk management: roles and responsibilities in the decision-making process
- **Masterclass organization**
- Details on Case studies

Agenda

Timing (sharp ...)	activity
15'	Presentation by Facilitators
20'	1st case study – 2012 Emilia Romagna Earthquakes
20'	2nd case study – 2019 Stromboli volcano activity
20'	3rd case study – Italian Tsunami Alert System
15'	Presentation of the work done and discussion

Masterclass organization

The participants will be divided in three groups

ALPHA, BETA and CHARLIE

that are asked to play, in turn, the role of **Political Decision Makers (PDM)**, **Technical Decision Makers (TDM)** and **Scientists (Sci)**.

Each of the groups will play all the roles, rotating in the different case studies.

Case studies

Reference scenario	<ul style="list-style-type: none"> • Type of event • DRM phase for decision making • Time frame for decision 	Real case
Aftermath of a strong earthquake; on going seismic sequence	<ul style="list-style-type: none"> • Sudden-onset event • Response • <u>Short term</u> 	2012 Emilia Romagna Earthquakes
Volcanic paroxysm; monitoring on going	<ul style="list-style-type: none"> • Rapid-onset • Preparedness • <u>Medium to short term</u> 	2019 Stromboli volcano activity
Tsunami disaster risk reduction	<ul style="list-style-type: none"> • Very rapid-onset (low frequency/high impact event) • Mitigation • <u>Long term</u> 	Italian Tsunami Alert System

Case studies

Political Decision Makers	Technical Decision Makers	Scientists	Case study
ALPHA	BETA	CHARLIE	2012 Emilia Romagna Earthquakes 2019 Stromboli Volcano activity Italian Tsunami Alert System
CHARLIE	ALPHA	BETA	
BETA	CHARLIE	ALPHA	

Questions

In all case studies, each group (ALPHA, BETA and CHARLIE) has to find a common answer to the questions that follow.

Considering the role you are playing (**PDM**, **TDM**, **Sci**):

- what are you thinking to do?
- what data, information, analysis, etc. would you like to receive from the other groups?
- what kind of data, information, analysis, etc. would you be able to provide/not provide to the other groups?

There are three flipcharts for **PDM**, **TDM** and **Sci**, respectively.

Write your answers on the flipcharts.

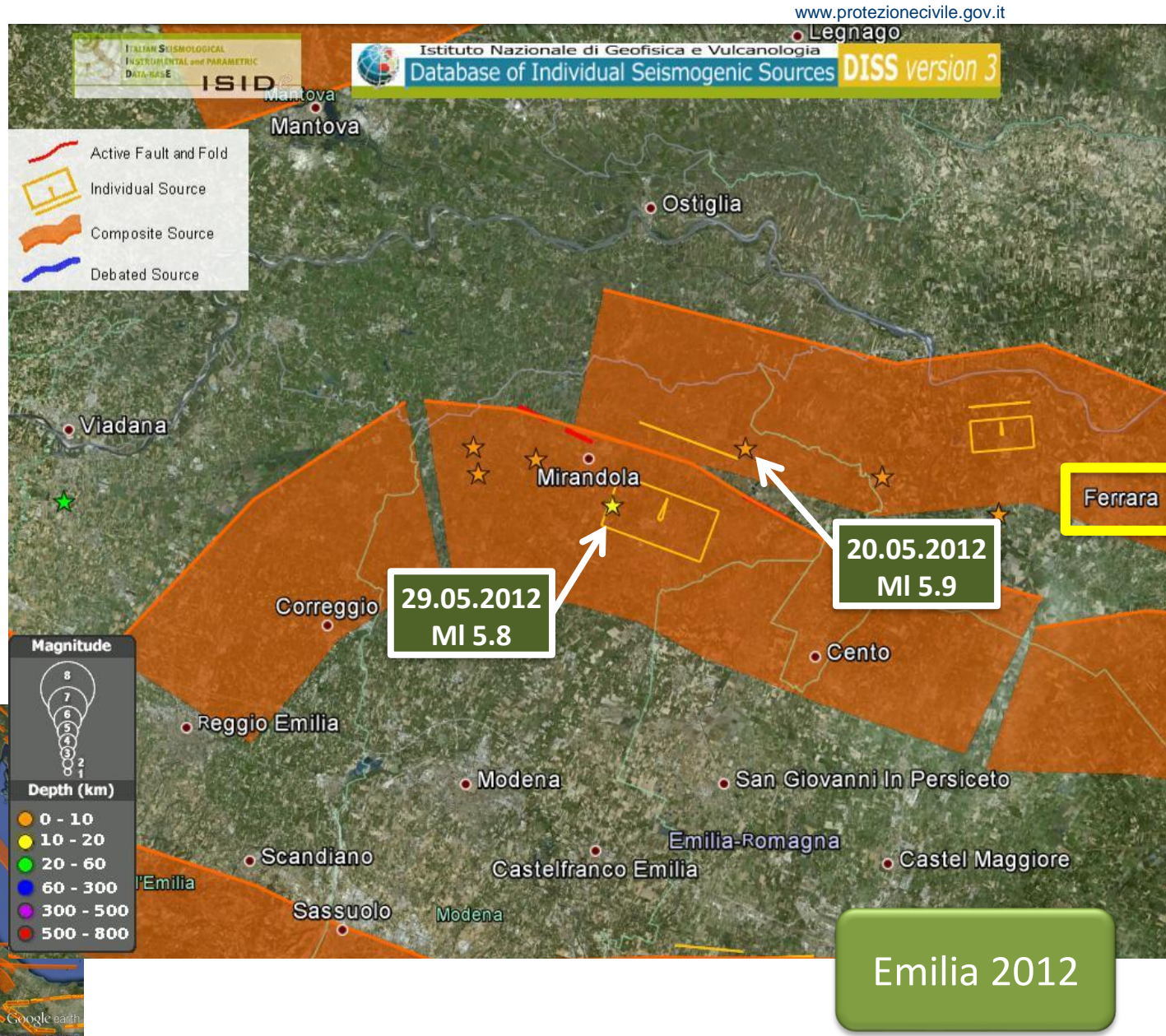
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1) The 2012 Emilia Romagna Earthquakes:

managing the information of a significant (but not quantified) probability to have a third main shock in the Ferrara city area

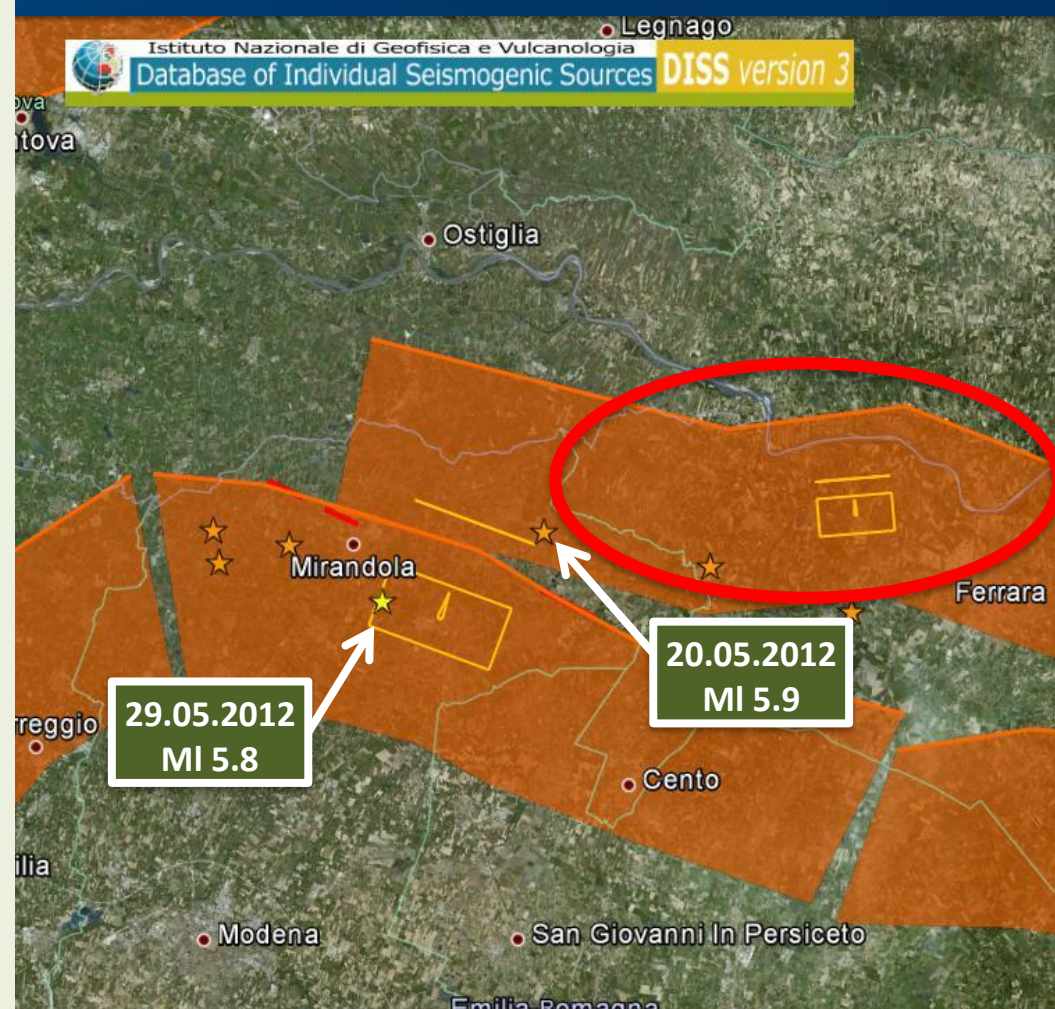
Details on case studies

Ferrara has about 132,000 inhabitants. The town, with streets and palaces dating from the Renaissance, is a UNESCO World Heritage Site.



On 5 June 2012, the Major Risk Commission stated that:

“in the case of a resumption of seismic activity in the area already affected by the current sequence, **the probability that the segment between Finale Emilia and Ferrara will be activated with events of magnitude up to 6 is significant**”.



Now, imagine that you are working in the civil protection framework at national level, and you are in the first 24 h after having received this information. Discuss with the colleagues of your group and of the other groups, and answer the questions.

2) The 2019 Stromboli volcano activity:

managing the information of reliable
precursor signals not yet included in civil
protection procedures



Details on case studies



In a small volcanic island, repeated paroxysmic eruptions are occurring before summer, when tourists will be present.

The scientists who monitor the volcano inform you that there are instrumental signals that can be used as a precursor of each paroxysm.

The precursory signal is observed ~3 minutes before the eruption. This signal is reliable but it is not included in the emergency procedures yet.

Now, imagine that you are working in the local civil protection framework: you have few weeks (before summer) to take into account the received information.

Discuss with the colleagues of your group and of the other groups, and answer the questions.

3) The Italia Tsunami Alert System:

managing the tsunami alerts related to your city, where no automatic alert systems are still available



Details on case studies

As part of the civil protection system of a coastal city, you are receiving alert messages (**advisory** and **watch** → run-up **lower** and **higher** than 1 m, respectively), sent through email and text messages by the national level, in case of a potential tsunami wave approaching your coasts.

The messages arrive within 14 minutes from the occurrence of a tsunamigenic earthquake, and the tsunami wave can arrive up to 60' after the message.

Now, imagine that you are working in the municipal civil protection framework: you have one year to implement, at the city level, a contingency plan that includes the tsunami risk and the information above.

Discuss with the colleagues of your group and of the other groups, and answer the questions.

Final remarks



Any questions?

- Dolce M. & Di Bucci D. (2014) - National Civil Protection Organization and Technical Activities in the 2012 Emilia earthquakes (Italy). Bulletin of Earthquake Engineering, 12 (5), 2231-2253. Special issue on the Emilia Earthquake. doi: 10.1007/s10518-014-9597-x.
- Dolce M. & Di Bucci D. (2014) - Risk management: roles and responsibilities in the decision-making process. In: Silvia Peppoloni & Max Wyss (Eds.): Geoethics: Ethical Challenges and Case Studies in Earth Science. Section IV: Communication with the Public, Officials and the Media. Chapter 18, 211-221. Elsevier. Publication Date: November 18, 2014 | ISBN-10: 0127999353 | ISBN-13: 978-0127999357 | Edition: 1
- Dolce M. & Di Bucci D. (2015) – Civil Protection Achievements and Critical Issues in Seismology and Earthquake Engineering Research. In: A. Ansal (Ed.), Perspectives on European Earthquake Engineering and Seismology, Volume 2. Springer series “Geotechnical, Geological and Earthquake Engineering”, 39, Chapter 2. 21-58. DOI 10.1007/978-3-319-16964-4_2
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- <http://www3.ogs.trieste.it/gngts/files/2018/S21/Riassunti/DAngelo.pdf>