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Deciding (or not) on the acceptable level of seismic risk: first behavioural considerations on the L'Aquila trial

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ABSTRACT This work analyses the issue of the acceptable level of risk in the civil protection field from a behavioural perspective. Choosing the acceptable level of risk for a community is a task that political decision-makers are charged with. However, it so happens that politicians do not manage to accomplish this. The reasons for this and some possible solutions have been broached by Di Bucci and Savadori (2018). Starting from that paper, this work aims at proposing some preliminary reasoning on the so-called L'Aquila trial, which involved scientists and Civil Protection officers after the 6 April 2009 Abruzzo earthquake (Italy). Behavioural sciences provide a key to understanding what happened through heuristics and biases that affected all the actors in this story, including the local population, the media, and judiciary, in the frame of coming to no practical decision about the acceptable level of risk. The conclusion is that scientific, technical, and professional communities could and should foster the awareness of people, the media, and political decision-makers (and judiciary), and allow the communities and their decision-makers to take on participated and shared decisions on their acceptable level of risk. These should include the consequences of their decisions and, in a broader perspective, the residual risks that, in a general appraisal, they will decide to accept.

Key words: seismic risk reduction, political decision-making, risk perception, heuristics and biases, 2009 Abruzzo earthquake.

1. Introduction

Behavioural sciences are progressively providing different communities of decision-makers with a new interpretative key to better understand the decision-making process and the reasons why it results in a given outcome. Contributions from this branch of knowledge have developed on the boundaries between economics, psychology, and sociology (see the Nobel prize in Economic Sciences to D. Kahneman in 2002 and to R.H. Thaler in 2017), but they are now expanding further, for instance towards the humanitarian and environmental fields (e.g. Moore *et al.*, 2014), to the judiciary (e.g. Forza *et al.*, 2017) and disaster risk reduction (e.g. Di Bucci and Savadori, 2018, with references). In particular, starting from the conclusive remarks of the latter paper, this work aims at proposing some relevant thoughts, after more than two years following the Suprem Court sentence (21 November 2015), on the so-called L'Aquila trial (Gabrielli and Di Bucci,

2015, and references therein), which involved scientists and Civil Protection officers after the 6 April 2009 Abruzzo earthquake (M_w 6.3).

Behavioural sciences are an innovative and powerful tool to interpret the entire cascade of decisions that, starting from a seismic sequence and some false earthquake predictions, involved politicians, the community, and the media [as shown for instance by Morcellini (2015), with regard to the framing made by the media in narrating the story], and ended with the trial. Among the many parts of this trial to which a behavioural science approach can be applied, we focus in particular on the lack of a decision on the acceptable level of seismic risk at a regional/subnational scale for the zone hit by that earthquake, and on the consequences of not having identified and made it explicit. The ultimate goal pursued here, starting from the achievements of Di Bucci and Savadori (2018), is to promote the development of a behavioural analysis and discussion on this theme, aimed at understanding how to avoid further cases like the one analysed here.

The work published by Di Bucci and Savadori (2018) addressed, from a behavioural perspective, high-level political decision-making on the acceptable level of risk in the civil protection field. In particular, the authors identified some basic elements coming from the behavioural sciences that can be useful for the aims of the present work. Behavioural sciences initially focused on the analysis of some errors or systematic cognitive distortions (biases) observed in an individual's choice. These cognitive errors were such because they differed from statistical, logical or economic norms. For most of the time, human beings do not possess the necessary capacities, motivation, cognitive resources, and self-control to make a "normative" decision (Thaler and Sunstein, 2008). On the contrary, starting from these errors, behavioural scientists identified the underlying reasoning mechanisms that individuals use to make decisions and that sometimes lead to mistakes. This reasoning relies on heuristics or other kinds of automatic and fast rules of thumb. As an example, consider the availability heuristic, through which individuals judge the probability of an event inferring it from the easiness with which instances of that event comes to mind (Tversky and Kahneman, 1973, 1974). The availability heuristic is effective and usually leads rapidly to well-calibrated judgements, however, given that it relies on the easiness of instance recovery, anything that influences instance recovery indirectly influences probability judgment. For example, something might be easy to remember because the media have just reported it, or because it just happened to you or to a close friend of yours, not because it is objectively very frequent. The availability bias then occurs because the event is judged as very frequent although it is not. These heuristics can be considered a kind of mental algorithm that simplifies the analysis of a lot of data and information, allowing a rapid choice to be made in an essentially automatic and unconscious way. Generally, these heuristics are an effective tool, but there are some cases in which they can determine systematic distortions, serious mistakes that in this context are called "biases" and can strongly affect the decision process, producing undesired outcomes.

Another basic concept that can be useful for the proposed reasoning is a model that was introduced by several scholars (Stanovich and West, 1998; Kahneman, 2003, 2011; and references therein) to provide a simple but effective description of the way the mind operates. It can be schematized as the activity and interaction of two systems, called System 1 and System 2. Intuition is the hallmark of System 1. This system is automatic, instinctive and quick, it does not require a huge effort because it does not need great computational capacity and it is beyond voluntary control, as it essentially operates in an unconscious way through automated

behavioural schemes, learned through repeated experience. Therefore, in this system the heuristic algorithm automatically processes data and information to make decisions. Biases (systematic errors) arise from System 1 essentially because the automated behavioural schemes learned through experience are not flexible enough to account for every different context: therefore, given a certain stimulus, the same response is generated, irrespective of the specific context. On the contrary, analytic reasoning characterizes System 2. This system comes into play when attention is needed to carry out mental activities that are particularly demanding, such as difficult computations, deep memory involvement, complex reasoning and, in general, the processes of analytical intelligence. System 2 cannot work continuously, because it is too costly in terms of effort and concentration, therefore, most of our decisions are governed by System 1, even if the decision-maker is not aware of it.

The few concepts above summarized will be useful in the following sections to analyse some issues of the L'Aquila trial from a behavioural perspective.

2. Deciding what is an acceptable level of risk

In spite of the impressive steps made by scientific research, it is recognized that the related achievements are always accompanied by limits, which are progressively overcome and substituted by new ones, but are always present and must be considered. In other words, uncertainties intrinsically affect the information that decision-makers obtain by the scientific community. Also under these conditions, decisions have in any case to be made, managing, therefore, an uncertain information. Quantifying this uncertainty is one of the main efforts scientists who work on disaster risk estimations are committed to, and to do this they usually follow a probabilistic approach. Therefore, they express hazards and risks in terms of probability of occurrence of a given event or, better, probability of exceeding a parameter describing the considered hazard/risk in a given area and time window, accompanied by the related uncertainties (both aleatoric and epistemic). This approach, that for seismic hazard and risk is nowadays consolidated and part of the national regulations and seismic codes, does not provide a unique output. On the contrary, scientists provide a continuum of values among which who decides must establish the threshold values that are the most appropriate for each specific scope. As one can easily imagine, System 2, the locus of analytic reasoning, has a primary role not only in carrying out the scientific activities, but also in the decision process. Moreover, deciding hazard and risk thresholds to undertake, for instance, effective actions of risk reduction also includes some psychological and social aspects. That is why, according to many authors (Fischhoff *et al.*, 1984; Fischhoff, 1985; Yates and Stone, 1992), the definition itself of risk is a political act, as it represents some of the essential values (e.g. human life, environment, productive activities, etc.) characterizing the society that is exposed to that risk. In this perspective, the adopted definition of risk is closely related to the political debate and to the possible strategies for risk mitigation at different territorial scales, including funds allocation and, ultimately, the distribution of the political power within a community. One can conclude that, for these reasons, there is no one-fits-all definition for the acceptable level of a given risk. It can vary according to the values of a given community, its social conditions, the possibility that other risks affect the same people, and the social misery caused by these further risks.

There is a great deal of literature on the concept of acceptable, tolerable and intolerable level of risk (e.g. Starr, 1969; Lowrance, 1976; Fewtrell and Bartram, 2001; Renn, 2008; Manuele, 2010; among many others). One of the main points characterizing this concept is that the threshold of acceptability is arbitrary but, in any case, the decision-maker has to make this choice in a transparent and reproducible way, making explicit the analytic approach followed, including the cost-benefit analysis, as well as the adopted scale of social values.

Focusing on natural disasters compared with man-made disasters, however, Starr (1969) states: *"No benefit figure was assigned in the case of natural disasters"*. This highlights the difficulty of carrying out a cost-benefit analysis for these risks, and, therefore, establishing an acceptable level for them, given that one can do very little or nothing at all to reduce the hazard to which these risks are related. In these cases, one has to turn the problem upside down, and think that to reduce victims, injuries and losses, the only way is to focus attention on activities that can reduce vulnerability and exposure, i.e. the other components of the risk in addition to the hazard (UNISDR definition of disaster risk: "*the potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity*" (www.unisdr.org/we/inform/terminology). The consequence of this reasoning is that, in a cost-benefit analysis for disaster risks, the benefits can be found mostly in the field of prevention.

The concept of acceptable risk is well-established for disaster risks, both natural and man-made. According to the UNISDR (2009), it corresponds to "*the level of potential losses that a society or community considers acceptable given existing social, economic, political, cultural, technical and environmental conditions*" (www.eird.org/esp/educacion2/we/inform/terminology.html#letter-a). Moreover, *"the extent to which a disaster risk is deemed acceptable or tolerable depends on existing social, economic, political, cultural, technical and environmental conditions*" (UN-GA, 2016).

The acceptable level of disaster risks generally depends on two variables: the frequency, which describes the occurrence through time of an adverse impact connected to those risks, and the intensity, which measures the severity of such an adverse impact (Mechler and Hochrainer-Stigler, 2016, among others). These concepts are quite clear, once the risk is quantified in terms of casualties and losses for a given region and time period. In other words, given a certain territory, the casualties and losses per time unit result from both how frequent and how damaging the event is.

Keeping in mind the general framework given above on the identification of the acceptable level of risk for a community and on its resilience to adverse events connected to that risk, it is interesting at this point to approach the decision process in case of risks that involve most or all of a community.

In these cases, the related acceptable levels cannot be decided individually by each person involved. Decision-making sees the participation of different stakeholders, e.g. political and technical decision-makers, scientists, citizens, media, and even the judiciary (Dolce and Di Bucci, 2014). All of these categories contribute, directly or indirectly, to the decision process, but the final decision is (or should be) mainly the duty of only one of them. This issue is specifically addressed by the European Commission that, in a Communication on the precautionary principle, states: "*Decision-makers need to be aware of the degree of uncertainty attached to the results of the*

evaluation of the available scientific information. Judging what is an 'acceptable' level of risk for society is an eminently political responsibility" (European Commission, 2000). According to the Commission, the decision is therefore essentially political, although also based on contributions provided by scientists and technical professionals working in public administrations, and has to take into account the level of risk that a given community is able to cope with. The decision is political because, according to Heimann (1997), politics is about who gets what, when and how much and, therefore, it also corresponds to the approach adopted to allocate resources, usually limited, taking into account the different competing interests.

In spite of this clear reasoning, confusion can sometimes arise on the responsibilities of scientists and technical decision-makers in the decision process on the acceptable level of risk. This is because, as outlined by Dolce and Di Bucci (2015), feedback and interaction are needed among scientists, technical and political decision-makers, and this can make it difficult to separate their different contributions to the decision process. However, the same complex links among them can cause distortions in their roles, distortions that can become 'pathologic' if some of them do not, or cannot, properly accomplish their tasks. On this point, an international debate is currently ongoing on the possible accountability of science at the boundary between research and decision-making (e.g. Pielke, 2007; Arcuri and Simoncini, 2015; Benessia and De Marchi, 2017).

Political decision-makers can fall short of conducting their assignments in several ways. For instance, they could: decide to not establish the acceptable level of risk for their communities; maintain that their goal is 'zero' risk (namely, a non-decision, because zero risk is scientifically impossible); not invest appropriate resources for disaster risk reduction (i.e. for prevention).

When this is the case and a disaster finally occurs, it may happen that the community (as well as media and judiciary) assigns to scientists and technical decision-makers the responsibility for having failed their tasks, even when this is not true.

3. Failures in the political decision process

As anticipated in the previous section, it is quite common that politicians choose not to decide on what the acceptable level of a given risk is for their community, often referring inappropriately to the precautionary principle (European Commission, 2000). This lack of decision is particularly evident in case of disaster risks and, most of all, of natural risks (earthquakes, floods, wildfires, etc.).

There are many reasons that induce such a behaviour. These causes have been analysed in detail by Di Bucci and Savadori (2018), who classified them in general and specific reasons, underpinned by behavioural mechanisms among which heuristics, and who also identified some possible biases and related solutions. Without going into too much detail on this, one can focus on some main points. Among the general reasons, there is the difficulty in understanding the statistical and probabilistic nature of the risk science, and to decide about the mitigation actions needed to reach an acceptable level of risk, which are the inevitable consequence of having defined it. These complexities, in turn, generate difficulty for the politician to communicate the idea of risk acceptability to their relevant community, which means to communicate that, for instance, a certain number of fatalities per year is acceptable. Finally, very often disaster risks are

characterized by low probability of occurrence, therefore by low priority with respect to some more urgent issues even though, in case of an event, they will result in very high impacts.

From a behavioural point of view, these points correspond to the difficulty of activating the analytic reasoning, i.e. the System 2 and, therefore, to the activation of behavioural issues such as the heuristics of availability, representativeness and (lack of) salience, and mechanisms such as intertemporal choices, mental accounting, risk aversion, procrastination and cognitive control (Mischel *et al.*, 1972, 1989; Tversky and Kahneman, 1973; Loewenstein and Thaler, 1989; Kahneman, 2011; Savadori and Mittone, 2015; Starcke and Brand, 2016). All of this leaves room, in the decision process, to the world of social preferences and norms, which always play a fundamental role in the relationships within a community (e.g. Fehr and Fischbacher, 2002; Bicchieri, 2005, among many others).

To understand better the decision process, it is also worthwhile noting that a cost-benefit analysis, although representing a rational approach, is not sufficient because, as clearly stated by Kahneman (2011), "*people attach values to gains and losses rather than to wealth, and the decision weights that they assign to outcomes are different from probabilities*". Considering that, for a given area, major disasters are generally characterized by a low probability of occurrence, the consequence of Kahneman's reasoning (Kahneman, 2011) is that people usually do not care about them, as low-probability events are generally ignored. Nevertheless, eventually rare disasters do happen and, in these circumstances, the attention they capture will be disproportionate on the opposite side. Moreover, in case of an emergency, the shocking evidence of that risk, often enhanced by the pressure exerted by public opinion and media, makes the political decision process even more complex, due to the effects of the availability heuristic (Tversky and Kahneman, 1973).

The driver, therefore, is the attention, i.e. how focused are peoples' minds on the rare event when they are involved in a decision process on this issue. The attention can be focused by the event itself, in case of its occurrence, as well as by some social catalysts, for instance a media campaign. Under these circumstances, both laypeople and politicians will be much more prone to a positive decision-making to reduce/mitigate the considered risk. On the contrary, in ordinary times, when the considered risk does not appear among a community's priorities, much more effort is required by the politician to address the decision on the acceptable level of that risk, which implies calling into play the analytic System 2.

In these cases, according to Di Bucci and Savadori (2018), the effects of the intertemporal choice and mental account apply both to the politician's and to others' interests. In short, given a disaster with a low probability of occurrence, the question for a politician is: will an investment in risk prevention be a gain (in an undefined future, I will have reduced casualties and losses caused by a disaster, and my voters will reward me for this), or a loss (I wrongly invested the public budget I was responsible for, because I should have used it better for different aims, and the considered disaster may not occur in the future, especially during my political life)?

4. The 'L'Aquila trial' facts

The 'L'Aquila trial' was a court case that involved members of the Italian Major Risks Commission and officers of the national Civil Protection. It took place after the seismic

crisis that hit the Abruzzo region (central Italy) and its regional capital, L'Aquila, in 2009.

The National Commission for forecasting and prevention of Major Risks (Major Risks Commission) is a public body interconnecting, at the highest level, the Italian Civil Protection Department and the scientific community. It is an independent scientific consultation body of the Civil Protection Department, but it is not part of it. The Commission was established by Law n. 225/1992, and its organization and functions were re-defined in 2011 (Decree of the President of the Council of Ministers, 7 October 2011). According to the recently enforced Code of Civil Protection (Legislative Decree 1/2018), the Major Risks Commission provides advice on technical-scientific matters, and may provide recommendations on how to improve capabilities for evaluation, forecasting, and prevention of the various risks.

Seismic activity in the L'Aquila area increased in January 2009. M<3.0 earthquakes were felt in the L'Aquila region, and they continued during the following months up to 30 March when an event of magnitude M_w 4.0 occurred, followed on the same day by three events of M>3.0.

During this sequence, G. Giuliani, a laboratory technician of the National Institute for Nuclear Physics (INFN), publicly issued predictions of impending large earthquakes in the region. Notice that these predictions were not backed by his scientific institution. These predictions were based on variations of radon concentration measured with gamma-ray detectors built by the technician himself. The procedures of correlation he maintained to use were not made available, and when he presented them later to the International Commission on Earthquake Forecasting for Civil Protection, after the 6 April 2009 earthquake, "*the Commission was not convinced of any correlation between his radon observations and seismic activity, finding unsatisfactory the way in which anomalies were identified above the background and noting the lack of quantitative procedures to substantiate any correlation*" (Jordan *et al.*, 2011). At least two of his specific predictions proved to be false alarms, but they generated widespread public concern.

On 31 March 2009, the day after the M_w 4.0 shock, four members of the Major Risks Commission met in the city of L'Aquila (F. Barberi, vice president of the Commission; E. Boschi, INGV president; G.M. Calvi, EUCENTRE president; C. Eva, University of Genoa). Boschi was accompanied by the director of the INGV National Centre of Earthquakes (G. Selvaggi). The Civil Protection Department was present with his deputy head (B. De Bernardinis), accompanied by the director of the Seismic Risk Office (M. Dolce). The assessor of Civil Protection of the Abruzzo Region, the mayor of L'Aquila and the head of the Regional Civil Protection were also present, along with other representatives of the Civil Protection Department and of the Region.

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, and which culminated on 30 March 2009 in a M 4.0 shock*", as reported in the meeting minutes. These minutes, which were released after the 6 April 2009 earthquake, presented three main conclusions: i) a small magnitude seismic sequence cannot be considered as a precursor of a strong earthquake; ii) earthquakes are not predictable in a deterministic sense; iii) the only defence against earthquakes is the improvement of the seismic resistance of buildings and of the emergency preparedness.

Just before the meeting, an interview was given by De Bernardinis, who declared, amongst other things (see the Appendix for the Italian version of the following interview):

Interviewer: *"Isn't it a bit anomalous, so long-lasting* (referred to the ongoing seismic sequence)*?"*

De Bernardinis: *"In its structure, now scientists will evaluate it* (he refers to the meeting that was going to start after the interview)*, now I am an operational officer, by now I have abandoned the role of the ... the academic, I'd say, however it is part, let's say, of a phenomenology certainly normal from the point of view of the ... the seismic phenomena that can be expected in this, let's say, kind of territory ... that, in the end, is centred around Abruzzo, however it struck Latium a little, Marche a little, oscillated, let's say, in the zone of central Italy.*

Instead, from the Civil Protection point of view, I believe, it must teach us two facts. The first fact is that we have to coexist with this territory, which is made in this way, which is made not only of landslides or floods, but it is made of seismicity. The second fact is that we must keep a state of attention, without being in a state of anxiety, while understanding exactly that we have to face, in certain situations ... we must face them, be ready, but also being serene and living our daily life, knowing that around, along with us, there are and there is those ready to intervene to give the maximum support. I believe that this is the most important part."

Interviewer: **"***Professor, you are from our region, aren't you?"*

De Bernardinis: **"***Yes, I am ..."*

Interviewer: *"From Ofena* (an Abruzzo village)*. Therefore, you know this territory also personally?"*

De Bernardinis: **"***Yes, I'd say that, ... uh ... besides the beauty! I'd say that is ... yet of my great-grandfather, of my parents ... of my child's memory, they told us, you know! ... They used to tell me about the seismicity, of the events and about how they themselves, you know! ... they were ready to deal with them and how they remembered those of their fathers, because we have to go, if not ... now ... if I'm not wrong, but we have to go back to the 1700s to have ... 1600s-1700s to have the maximum events. But, let's say that, in some way ... uh ... it is, they must be a people, myself I am ... they should be prepared to coexist with this situation, there is not a danger, I told this to the mayor of Sulmona* (he refers to what happened a couple of days before, when, after an *M* 3.9 quake in Sulmona, about 50 km from L'Aquila, G. Giuliani made a prediction for a big earthquake to arrive in Sulmona in the next days, that caused a great alarm in that city, with people escaping from there), *the scientific ... uh... community ... uh... continues to confirm (to tell me) that, rather, it is a favourable situation, therefore a continuous discharge of energy and, therefore, substantially there are also rather strong events, they are not very strong, therefore in some way we have had ... we have seen few damages, let's say, given the very long-lasting sequence of the events. Therefore, I believe that we are ready to face the situation, I ask citizens to be ... rather, to the inhabitants, to the population to stand by us and to stand by themselves."*

Interviewer: **"***Meanwhile, let's drink a good glass of wine, from Ofena!"*

De Bernardinis: **"***Absolutely, absolutely, a Montepulciano* (the name of the wine made in Ofena) *one the absolutely D.O.C., let's say. To me it seems, to me this seems important.*"

This interview was broadcasted after the Major Risks Commission meeting, without specifying that it had been released before.

In the following days, the media gave great prominence to the meeting.

On 1 April L'Aquila mayor asked for the 'state of emergency' declaration. A municipality plan had been activated in 'attention phase', and several schools evacuated after felt seismic events.

On 6 April 2009, at 3:32, an earthquake of M_L 5.9 (M_W 6.3, later revised as M_W 6.1; see cnt. rm.ingv.it/event/1895389) hit the Abruzzo region causing the death of 309 people. It was preceded by two quakes of M_L 3.9 and 3.5, which occurred respectively 5 and 3 hours before the main shock.

More than one year after the earthquake, in June 2010 the four members of the Major Risks Commission who participated at the meeting, along with the other three people above mentioned (De Bernardinis, Dolce, and Selvaggi), were charged with manslaughter by F. Picuti, one of the L'Aquila deputy prosecutors, for having provided an inadequate risk assessment that led to a scientifically unclear, incorrect, and incomplete information to the public (for a complete and detailed overview on the L'Aquila trial, also see: terremotiegrandirischi.com).

The trial started on September 2011 and ended on 22 October 2012. According to the verdict by monocratic judge M. Billi, seven scientists and public officials who attended the Major Risks Commission meeting of 31 March 2009 were found guilty for multiple manslaughter and multiple unintentional serious injuries (Tribunale di L'Aquila-Sezione Penale, 2012).

The faults consisted of "*negligenza, imprudenza e imperizia*" (negligence, incautiousness and malpractice). Each of them was condemned to:

- six years in prison (suspended until final level of judgment);
- perpetual interdiction from public offices and legal interdiction during the enforcement of the sentence (suspended until final level of judgment);
- financial compensation to the families of the victims (8M €, immediate enforcing).

More than 900-pages-long verdict motivations can be summarised as follows:

- a Major Risks Commission meeting was convened in L'Aquila on 31 March 2009, following a six month long, low magnitude seismic sequence, culminating with a M 4.0 the day before (30 March 2009);
- all the seven indicted people, along with the assessor of Civil Protection of the Abruzzo Region, the mayor of L'Aquila and the head of the Regional Civil Protection, were considered members of the Commission, even though only four out of ten actually were. In this way, the legal number of ten was considered as reached, and therefore the meeting was interpreted as an official assembly of the entire Commission;
- the Commission had special duties of assessment of the risk situation in L'Aquila and of providing correct information to the population;
- the Commission failed in those obligations of assessment and information, and all the seven people mentioned above were considered accountable for the violation of such obligations;
- the wrongdoing consisted in an approximated evaluation of the situation and in having contributed to spreading reassuring messages to the population;
- because of this, 29 deaths out of 309 fatalities, who would normally flee from their homes when alarmed by small quakes, remained at home on the night of 6 April 2009, and died as a result of the collapse of the buildings in which they had remained.

The scientific information officially available to the judiciary in the trial was obtained as follows.

Different choices concerning technical-legal consultants or expert witnesses were made by the prosecutors, the defendants, the appellants, and the judge.

The prosecutors, who already had numerous different legal proceedings underway for the collapse of buildings and the relevant fatalities, made use of legal consultancies, based on

earthquake engineering and engineering seismology expertise, already available for these proceedings. Concerning human behaviour aspects, a researcher of the University of L'Aquila with expertise in ethno-anthropology was asked for an ad-hoc consultancy.

The defendants presented consultancies made by several experts with the following different kinds of expertise: seismology, earthquake engineering, satellite interferometry, media studies, and cognitive neurosciences, each of them producing a written report on the specific case.

The several appellants operated differently, calling many expert witnesses, only few of whom produced a specific study on the case: seismologists, engineers, a petrologist, a statistician, a criminologist, a safety-engineering expert, a satellite interferometry expert. Most of them were asked whether they would have been able to demonstrate that the earthquake could somehow have been predicted.

Finally, the judge chose not to ask for any specific technical-legal consultancy, but he made use of the above consultancies and technical testimonies produced by the parties.

The appeals trial ended on 10 November 2014, with a sentence which mostly undid the previous one, declaring six out of the seven previously condemned as innocent, and reducing the duration of De Bernardinis' sentence from 6 to 2 years (Corte di Appello dell'Aquila, 2014).

In a 389-page-long document, the appeals magistrates criticised the previous convictions on multiple grounds, stating that no blame for the risk analysis they carried out could have been laid on the scientists [among the others, see Cartlidge (2015a) and www.sciencemag.org/news/2015/02/why-italian-earthquake-scientists-were-exonerated]. In its ruling, the appeals panel, headed by F. Francabandera, accepted one of the most controversial aspects of the indictment: that official reassurances were decisive in causing some of the quake victims to stay indoors. Francabandera and her colleagues ruled, however, that those reassurances were the exclusive fault of the public official De Bernardinis, and should not be blamed on the other six. 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.

The appellate judges were particularly critical of the indictment, brought against the seven by public prosecutor Picuti and almost completely endorsed by judge Billi, for its reliance on what they call a "*purely regulatory*" measure of guilt. The appellate judges said that the experts should have been judged on how well they adhered to the science of the time. The appellate judges concluded that the scientists were innocent because there was no reason to think the swarm had increased the risk of a major earthquake. They maintain that the triggering of larger earthquakes by smaller ones is an idea that scientists have only taken seriously since the L'Aquila earthquake.

In particular, the Appeals court wrote: "*Prof. Gasparini* (…) *affirmed that in the last 30 years, in Italy, the seismic sequences which preceded earthquakes with magnitude M≥5 correspond to 0.1/0.3% of all of the cases, and that, in the 20th century, 23 of these sequences affected the Abruzzo region, 8 of which near L'Aquila, without evolving into strong earthquakes.* (…) *Prof. Marzocchi* (…) *underlined* (…) *that the majority of the strong earthquakes in Italy was not preceded by any seismic sequence and that the seismic sequences recorded in our country are at least 10 per year*".

The Supreme Court trial ended on 19 November 2015, with a definitive sentence which

confirmed that issued by the Appeals Court (Corte Suprema di Cassazione, 2015). The Supreme Court prosecutor G. Fodaroni, whose role was to analyse the legal validity of the Appeals Court's judgment, concluded that De Bernardinis was guilty of having reassured the public, having made his reassuring comments before the Commission's meeting (see Cartlidge, 2015b; www.sciencemag.org/news/2015/11/italy-s-supreme-court-clears-l-aquila-earthquake-scientists-good). Moreover, she claimed, the message from the other experts during the meeting — that the chance of a major quake had neither increased nor decreased — was "*neutral*" and therefore not reassuring.

5. First behavioural considerations on the L'Aquila trial

The incident can be analysed through a wide spectrum of heuristics and biases that can be used as the key for describing and understanding what happened. The story is paradigmatic of how a series of simplified -yet wrong- interpretations of complex facts, in this case carried out by the people and the judiciary, can result in an incorrect, heavy verdict of guilt, issued at the first level of judgement and, then, mostly overturned in the second and third levels.

The main heuristics at work are:

– the availability heuristic, in all the phases of the incident. The long seismic sequence, which had been going on for some months when the meeting of some members of the Major Risks Commission was convened in L'Aquila, on 31 March 2009, made it very easy for the citizens to imagine an instance of a seismic shock occurring. The seismic sequence was an animated experience and induced people to believe that the occurrence of a severe seismic event was highly probable at that time, despite no sound scientific information supporting this idea. In Italy, seismic sequences are recorded in the order of dozens per year, and the probability that they forerun a strong earthquake is very low. These pieces of 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 given to it by the media (heuristics of accessibility and relevance) made the occurrence of a strong earthquake appear imminent 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, for which the laboratory technician and amateur scientist G. Giuliani, not even graduated, having made earthquake predictions that were exactly what the community 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 community in spite of the total lack of any scientific basis (maybe his local origins also induced a *home bias*?): the phenomenon for which people choose to believe groundless prophecies, like the so-called Mayan 2012 phenomenon, follows well known mechanisms [see, among many others, Yuhas (2012)]. 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. A small, 1% probability of earthquake is seen as a very high chance once the mind has focused its attention on it. The overweighting

of rare events can be explained as a combination of three biases: the focusing illusion, the confirmation bias, and the cognitive fluency. The focusing illusion predicts that any aspect of our life upon which we focus our attention is seen as determinant in the final evaluation. The confirmation bias induces individuals to look for confirming instances rather than disconfirming instances of a hypothesis. The cognitive fluency predicts that if something comes up easily in mind it must be true. All these biases impacted on explaining why what the technician had said created such a public awareness. The confirmative modality pushes individuals to recall selectively instances and images that make the assertion true (there will be an earthquake) and the final probability judgement is determined by the fluency and ease with which a plausible example was generated (there will be an earthquake);

– the illusory correlation and, more in general, the recognized difficulty that people encounter in understanding the probabilistic nature of the earthquakes science, preferring therefore whatever deterministic prediction, even wrong, in any case much easier to be understood and managed. The illusory correlation is the mistaken impression that two unrelated variables are correlated (Nisbett and Ross, 1980). Many people find it difficult to compute covariation assessments and they tend to rely only on positive cases. To accurately assess causality between a seismic sequence and a major earthquake, one has not only to rely on the positive events (frequency of cases where a sequence led to an earthquake) but also on information 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. This further information is rarely considered by individuals when judging a relationship: they tend to use only the first information regarding the present-present case. The explanation for this illusory correlation tendency in human judgment is twofold. According to some authors, it is sustained by an availability heuristic: illusory correlations arise because distinctive or salient pairings (sequence-earthquake) are highly 'available' in memory and are therefore overestimated in frequency. According to other studies, the representativeness heuristic explains the illusory correlation: one event (the sequence) appears very typical of, or similar to, the other event (the earthquake) and therefore the frequency of the probability that a sequence causes an earthquake is overestimated;
– the framing built up by the media, which outlined a tale made by juxtaposing the frames of inducing 'concern' vs. inducing 'relief' (Morcellini, 2015);
– the hindsight bias, for which, after the 6 April 2009 main shock, its deterministic predictability was considered fully evident and easy to be understood 'before' the event, in spite of any scientific possibility of carrying out such a prediction.

Exploring all the facets of the L'Aquila trial using the lens of the behavioural sciences is beyond the scope of this work, as it would require a specific study fully dedicated to this end. From the perspective of the reasoning developed in this paper, however, it seems clear that the L'Aquila trial is the consequence of the lack of any long-term policy on disaster risk reduction in matters of seismic risk, a lack that has heavy consequences also in terms of social awareness.

At that time, the screenplay was fully set in the present. When the availability heuristic brought the seismic risk issue to the community's, local administrators, and media attention, the problem was addressed in terms of 'predicting, alerting and evacuating' (or not). These three

verbs, however, are not suitable at all for the earthquakes in Italy: i) the deterministic prediction of a specific earthquake made with reliability and skill sufficient to permit civil protection actions is not yet possible (Jordan *et al.*, 2011); ii) the geographic and seismotectonic setting of the Italian peninsula does not allow current seismic early warning systems to be used for civil protection purposes (Dolce and Di Bucci, 2015); and (iii) the probabilities that a strong earthquake will occur tomorrow in a specific area are so low, as aforementioned, that they do not support any kind of evacuation. Moreover, in such a case, for how long and how wide an area or an important city like L'Aquila, with ca. 70,000 inhabitants, should be evacuated? Days? Months? Who decides what the acceptable duration for an evacuation is, and on which basis? And in (the probable) case the earthquake will not occur, in accordance with what is suggested by the scientific information, who will be responsible for the direct and indirect losses due to such an evacuation? For having severely damaged the productive activities of that area?

Even though earthquakes are part of that community's memories, as folks state while remembering their grandparents' tales, the well-known notion that the seismic hazard of the Abruzzo region is high was not put in any correlation with what the political decision-makers should have done in the previous decades to manage this condition. It is worthwhile noticing that very few among the community, if not anyone, asked the local administrations about what had been done in the previous -let us say- ten years to try to reduce the overall well-known vulnerability and exposure conditions of the region [some studies were already available to the local administrations, such as MLPS-DPC-GNDT (1999) and Lucantoni *et al.* (2001)], and to try to reduce the related risk. On the contrary, the question was essentially about why scientists and technical decision-makers had not been able to predict the earthquake occurrence, though expressed by the L'Aquila prosecutor as why scientists and technical decision-makers had not been able to evaluate the specific seismic risk related to the conditions at that moment (which is, from a scientific point of view, exactly the same as asking for a prediction).

It is, once again, a question of defining what 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 local community.

6. Towards a possible decision

The last point on the acceptable level of risk brings us back to the questions posed at the end of section 3: given a disaster with a low probability of occurrence, in particular an earthquake, will an investment in risk prevention, i.e. in reducing the level of risk to the acceptable one, be a gain or a loss for a politician? And for their relevant community? Do their answers coincide or not?

These questions can be referred both to the short and long term, considering the first one in the order of five years, a typical duration for a political mandate, and the second one in the order of fifty years, the nominal life usually adopted in the seismic codes for residential buildings. On these issues and, in particular, on the consequences of not making any decision on the acceptable level of a given risk, Di Bucci and Savadori (2018) conclude that from a political point of view the disadvantages are very few and they concern reputation and professional integrity. For the

community, on the contrary, in the long term the disadvantages are very high. This is because, in case a disaster affects its territory when it is exceedingly vulnerable:

i) the costs for the emergency management and reconstruction will be much higher in terms of lives and property;
ii) the recovery period will be considerably longer; and
iii) there is a higher possibility that an economic depression will affect the damaged zone, due to the disaster impact on business activities.

Moreover, these authors underline that heuristic decision-making underlie the politicians' decision mechanisms. In particular, the following mental processes prove to be mostly involved:
availability heuristic (Tversky and Kahneman, 1974): the occurrence of a rare event captures the focus of attention and causes an overestimation of disaster potential. If it did not occur recently, the same event will be underestimated/ignored;
intertemporal choices (Loewenstein and Thaler, 1989; Prelec and Loewenstein, 1991; O'Donoghue and Rabin, 2004; Berns *et al.*, 2007, and references therein; Figner *et al.*, 2010): the current investments could return advantages in a future time that is defined only as a possibility with very low probabilities of occurrence and large uncertainties. In this case, a politician's self-interests could prevail with respect to others' interests (e.g. Polman, 2012);
mental accounting [or narrow framing; Kahneman and Tversky (1979)]: the politicians want to close their mandate with a positive overall balance (mental account). Hence, they will not be inclined to make any risky choice for themselves and future political activity.

Therefore, "*choosing not to choose*" (Sunstein, 2014), for a political decision-maker could be due in part to a deliberate preference for personal advantages, and in part to the weakness of their cognitive control processes, in particular, of those which control and delay the impulse to obtain an immediate gratification. And, for a politician, an immediate gratification certainly comes from an immediate political consensus (and related advantages). This reward should be provided to the politician by their community of reference that, what is more, is the one that would mostly benefit from the decision. However, the population is generally not fully aware of this and does not look for actions of risk reduction in election programs. In this framework, what can allow for a politician's and community's change of perspective? At national and supra-national scale, Di Bucci and Savadori (2018) suggest some possible solutions to intervene and modify the current state toward a more diffuse awareness of the need of risk reduction policies:
"*1. identify short-term gratifications for political decision-makers who must be involved in long-term risk reduction policies;*
2. intervene and modify the current state toward a more diffuse awareness of the need for risk reduction policies by:
• *activating trendsetters to promote a change in the public opinion;*
• *stimulating statespersons to implement policies which consider the disaster risk reduction a public good and therefore are willing to make decisions on the acceptable level of risk;*
3. acknowledge the primary role on the previous points played by the scientific, technical and professional communities".

Following this general reasoning, one can try to apply it to the seismic risk thinking, in particular, about what could be done by the political decision-makers at a territorial level (let us say, from regional to municipal level). Actually, the more we move toward a local scale, the

shorter the perspective for long term policies, therefore, it seems preferable to define a rewarding strategy starting from the short term. In this frame, an example is analysed here below from a mayor's point of view. It is intended as a starting point for an analysis and a discussion about the pros and cons of a participative approach to the decision process.

Let us consider the safety of schools, a problem that can be successfully addressed even at the municipality level. This issue is always salient for all kinds of risks: parents and grandparents want to be sure that their children and grandchildren spend many hours per day in safe school buildings, and frequently ask for a check of such a safety. In turn, these requests are made even more salient by media and taken into account by the judiciary. Therefore, the availability heuristic is nearly always in action. The political decision-makers know these requests: providing satisfactory responses could be highly appreciated by their voters, and therefore rewarding and beneficial for themselves. Nevertheless, also in cases like this, some behavioural elements operate in a sense that reduces the reward.

Imagine a mayor who decides not to accept anymore a too high seismic risk for the schools in their municipality and, therefore, funds a plan to seismically upgrade these buildings.

From the citizens' point of view, this is a very sound decision. Negative events indeed loom larger than positive ones: a single cockroach spoils the pleasure of a bowl of cherries while a cherry does not have any effect in a bowl of cockroaches. This asymmetry towards bad outcomes induces citizens to be loss averse (losses weigh more than gains) which is, according to some, a human characteristic that has allowed us to survive through the centuries: it is more dangerous to collect a poisonous mushroom than to avoid a good mushroom. Therefore, citizens' expectations regarding the acceptable level of risk are clearly different from those of the mayor, i.e. they would prefer not to risk. Any risk level has some degree of inaccuracy. Setting a risk level that increases the mistakes of the false-alarm type (detect a danger when the danger is not there) is certainly better than setting one that increases the mistakes of the missing type (miss detecting a danger when the danger is there). This citizen's gut approach recalls the aforementioned zero risk option (although having of course a counterpart on the acceptability of the costs associated to this option).

The same is not true, however, from the mayor's perspective. In the short run, one can observe that high costs have to be immediately faced. The related budget could be obtained by reducing other primary investments initially destined, for instance, for the maintenance of the road network or to the street furniture. The recovered budget could be insufficient, however, for all the schools of the municipality, implying that some priorities have to be defined, choosing to start from a selection of the schools and augmenting the duration of the plan in order to have more time to find the needed funds. Alternatively, the mayor could impose higher local taxes or, in case there is no possibility of recovering some of the budget, they could decide to concentrate all the students in a reduced number of schools that have been assessed as sufficiently safe. This would imply student shifts.

Therefore, even in case of a risk that is salient from the community's and politician's perspective, and whose reduction could represent a short term reward for the political decision-maker, it is easy to imagine that some disadvantages will emerge. For instance, some citizens not directly interested in the safety of the schools, although recognizing the ethical value of this choice, nevertheless will be unhappy with this decision. Moreover, parents whose children attend

their lessons in schools that are out of the first selection will surely complain about this decision. Finally, some people could consider the mayor as being ineffective in obtaining supplementary funds from higher political levels (Region, State, etc.).

Let us consider now that the same initial conditions induce the mayor to fund a plan to seismically upgrade all the schools limitedly to the 60% of the target safety for new buildings. This choice implies the decision to accept a higher level of risk for all the schools as a counterpart to a larger number of schools upgraded and of the possibility to conclude the program in a relatively short period. Even in this case, in spite of the mayor's good intentions, some further criticisms could be added to those previously described. In particular, parents might not accept the idea of a higher residual risk for their children once the program of schools upgrading is completed. Zero risk is an emotional concept that may appear the only possible answer in case of children's safety, although it is scientifically meaningless.

The case just illustrated exemplifies how difficult it is to make a decision, even at a local scale, on the acceptable level of seismic risk, and consequently on the actions to undertake in order to achieve that level in case the real conditions correspond to a higher risk. And this is true even when a local political decision-maker is willing to intervene to reduce the risk to which their community is exposed.

7. Discussion and conclusions

What are the preliminary lessons we can draw from the experience of the L'Aquila trial with respect to the choice on the acceptable risk, in light of the behavioural sciences? This is the question that one can raise, relating to the content of this paper and, in particular, to the final considerations of the previous section.

As seen before in section 6, among the solutions suggested by Di Bucci and Savadori (2018) to promote a more diffuse awareness of the need of risk reduction policies at national and supra-national scale, they propose to "*acknowledge the primary role ... played by the scientific, technical and professional communities*". This suggestion, more so than the other two, can be applied in the short-to mid-term to the territorial-local levels.

The role of the scientific, technical and professional communities is twofold. On one side, these communities can, and usually do, play a role as advisors of the decision-makers, who ask them for support in understanding the scientific issues that underlie their choices. On the other, these communities could, and should, play a proactive role, promoting the use of scientific information to ground evaluations and decisions at all levels. In the following, these two possible involvements of the scientific, technical and professional communities are considered in some detail by observing them applied to the L'Aquila incident, from a behavioural viewpoint.

Let us start from how the scientific contribution was considered in the L'Aquila case study. The national institutional level, i.e. the Italian Civil Protection Department, decided to refer to some members of the Major Risks Commission to obtain an analysis of the seismic sequence that was ongoing. Therefore, they chose to refer to the highest scientific consultancy body. One of the Civil Protection public officials, however, individually accepted to release an interview before the meeting of 31 March 2009, and during the interview he also touched on some scientific issues (on

which his conviction was based). In De Bernardinis' behaviour, one could recognize instances of overconfidence bias.

At the same time, many people in L'Aquila city and surroundings were inclined to refer to the pseudo-scientific predictions issued by G. Giuliani. Although Giuliani was not a scientist and these predictions were not scientifically grounded, he was able to capture the attention of the local media and local population and to obtain a certain trust from them. As known from the behavioural sciences and already described in section 5, in these choices the followed approach is almost never purely rational.

The media did not choose to refer to a selected scientific source of information. To capture an as wide as possible audience, they decided to play out the juxtaposition between the two points of view expressed by the official science and the outsider amateur scientist. In particular, this juxtaposition was effectively rendered in some TV talk-shows where G. Giuliani and E. Boschi (the latter representing the entire National Institute of Geophysics and Volcanology, being its president), were juxtaposed, involved in a heated debate and alternatively interviewed by the anchor-man (e.g. www.rai.it/dl/RaiTV/programmi/media/ContentItem-53075d6f-2680-4548-b6ea-c51fbf2846f5.html#p=; www.rai.it/dl/RaiTV/programmi/media/ContentItem-f1fd5056-3830-4ad0-b12f-7c3ae723b336.html#p=). From a behavioural point of view, this is an interesting approach, because the opposing theories were represented as having the same weight, even though the number of scholars who supported one of the two positions was considerably higher than the other one. Within this kind of framing, the general public is induced to consider both theories as equally well grounded and reliable, and therefore they will form their opinion based on criteria that differ from the scientific content. Some of these criteria have been described in the previous sections.

Now, let us consider how the scientific contribution was managed within the trial, in particular during the first level of judgement. We have already seen in section 5 how the prosecutors, the defendants, the appellants, and the judge approached the scientific information. Among these, the position of the judge deserves to be observed through the behavioural lens. Actually, even having a large number of scientific contributions from many experts, more or less qualified with respect to the specific case - contributions that in many cases were strongly contrasting among them and debated during the trial -, nevertheless the first level judge decided that he did not require any scientific consultancy to interpret them impartially. One might suppose that he considered himself able to manage and correctly interpret all the available scientific information by himself and to form in this way an unbiased and defendable judgement. Considering the outcomes of the second and third levels of judgement, also in this case, the overconfidence bias seems to have played some role.

What has been considered up to now suggests rethinking the interconnection between an authoritative scientific-technical-professional component and all the other components of a community. For sure, and rightly, the community and decision-makers want to have a scientific background both for their personal evaluations and for making decisions that can have societal impact. However, most of them are not in the condition to assess whether and how a given scientist is reliable and authoritative. Behavioural sciences tell us that also scientists, as everyone, make use of heuristics and are affected by biases. For instance, while conducting their studies or providing advice, they could be affected by the overconfidence, confirmation, anchoring biases.

Moreover, they could be interested in promoting their studies or those carried out by their research groups. To try to avoid wrong decisions induced by these biases, the community and political decision-makers should be aware of this, especially when dealing with scientifically complex cases such as the L'Aquila trial, and try to overcome this issue. A solution could be tentatively found, for instance, by asking advice from scientific institutions rather than from single scholars. In this way, an institutional consultancy could be obtained by a wider group of scientists, within which single biases could be mediated.

Let us consider now the possible proactive role that scientific, technical and professional communities could have played in the L'Aquila trial incident. These communities are used to discuss technical and scientific issues and contrasting points of views internally, and generally neglect to publicly challenge a-scientific theories or points of view that circulate among laypeople. However, the diffusion of these theories and opinions, while being amplified by social media in contemporary times, could be societally damaging, and can also negatively affect the decisions of community officials, such as mayors and other authorities. Therefore, the scientific, technical and professional communities should become, and indeed are now becoming more and more present, both in the territories and side-by-side with the decision-makers (information campaigns, institutional educational websites and use of social media, availability of reliable researchers to carry out the task of communicating on behalf of their research institutes). In the considered case of L'Aquila trial, their vigorous and massive, proactive presence on the mass media since the beginning of the phenomenon, would perhaps have helped the local community to form a more grounded opinion on what was happening and on the science limitations in matters of earthquake predictions.

This interaction among scientists and professionals, people and decision-makers at local level has an important impact also in terms of both structural and non-structural prevention. A continuous collaboration and information transfer among them lays the foundation for an increased awareness of the level of seismic risk to which the entire community is exposed, and for a series of reduction and mitigation actions to be progressively undertaken. At national level, the Italian Civil Protection Department has a long-lasting tradition on this kind of collaboration, which has proved very positive and beneficial for the implementation of risk prevention strategies.

In conclusion, scientific, technical and professional communities can facilitate the awareness of the community, media, and political decision-makers (and of the judiciary), by activating critical thinking and capability to discern. Provided with these intellectual tools, the communities and their decision-makers will be able to take on participated and shared decisions on their acceptable level of risk. In this way, they will be fully aware of the consequences of their decisions and of the residual risks that, in a general appraisal, they will decide to accept, in a logic of disaster risk reduction that all of them recognize as a common good.

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Appendix: Part of the original Italian version of the De Bernardinis' interview (31 March 2009) reported in section 4

[omissis]

Cronista: "non è un po' anomalo così lungo?"

De Bernardinis: "Nella sua forma, adesso lo valuteranno gli scienziati, io faccio l'operativo, oramai ho smesso il cappello del … dell'accademico direi, però si colloca diciamo in una fenomenologia senz'altro normale dal punto di vista del … dei fenomeni sismici che ci si aspetta in questo diciamo in questa tipologia di territori che poi, è centrata attorno all'Abruzzo però ha colpito un po' il Lazio, un po' le Marche, oscillata diciamo nella zona del centro Italia. Dal punto di vista credo, invece, da un punto di vista della Protezione Civile, ci deve insegnare due fatti, primo fatto che noi dobbiamo convivere con questo territorio che è fatto in questo modo, che non è fatto solo di frane o di alluvioni ma è fatto di sismicità, secondo che noi stessi abbiamo … dobbiamo mantenere uno stato di attenzione, senza avere uno stato d'ansia capendo esattamente che dobbiamo affrontare, in determinate situazioni … dobbiamo affrontarle, essere pronti, ma essendo anche sereni di vivere la nostra vita quotidiana, sapendo che attorno assieme a noi ci sono e c'è chi è pronto ad intervenire a dare il massimo supporto, questo credo sia la parte più importante."

Cronista: "Lei professore è delle nostre parti eh!?"

De Bernardinis: "sì, sono …"

Cronista: "Di Ofena, quindi conosce anche personalmente questo territorio?"

De Bernardinis: "Sì, direi che … eh … a parte la bellezza! Direi che è … ancora del mio bisnonno dei miei … della mia memoria di fanciullo, ci raccontavano, no! Mi raccontavano della sismicità, degli eventi e di come loro stessi, no!, erano pronti ad affrontarli e come si ricordavano quelli dei loro padri, perché dobbiamo andare, se non … adesso … non vado male, ma dobbiamo andare al settecento per avere … seicento-settecento per avere i massimi eventi. Però diciamo che in qualche modo eh … è una, deve essere un popolo, io stesso sono… dovrebbe essere preparato a convivere con questa situazione, non c'è un pericolo, io l'ho detto al Sindaco di Sulmona, la comunità eh scientifica, mmm, mi continua a confermare che anzi è una situazione favorevole

perciò uno scarico di energia continuo, e quindi sostanzialmente ci sono anche degli eventi piuttosto intensi, non sono intensissimi, quindi in qualche modo abbiamo avuto … abbiamo visto pochi danni, diciamo, vista la sequenza temporale molto lunga degli eventi. Quindi credo che siamo pronti a fronteggiare la situazione, io chiedo ai cittadini di stare … anzi, agli abitanti, alla popolazione di starci vicino e stare vicino a loro stessi."

Cronista: "Intanto ci facciamo un buon bicchiere di vino, di Ofena!"

De Bernardinis: "Assolutamente, assolutamente un Montepulciano di quelli, assolutamente D.O.C. diciamo, mi sembra, mi sembra importante questo."