

Response, Radiation and Rational Deliberation

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Henrick Svensen in *The End is Nigh* recounts the following story concerning a volcanic eruption that destroyed the Mexican town of Armero in 1985. Researchers collecting information at seismic stations around the volcano Nevado del Ruiz, became aware of an impending eruption and gave the alert that a lahar, a flow of water, mud and rocks was building up and should it race down the mountain side it was threatening to engulf the town. After some hesitations the civil defense gave the evacuation order, while in the town of Armero local authorities, in spite of minor tremors and noise coming from the volcano, had been repeating that all was fine. Once the order was given firemen went from door to door to inform residents of the danger and of the necessity to leave town immediately. Most residents refused, saying that they had received assurances to the contrary earlier. As the unconvinced mayor was having radio contact with the civil defense, the last thing he reputedly said was:

“wait a minute, I think Armero is being flooded.” A large part of Armero was swept away by the devastating force of the large masses. Twenty-three thousand people died. Thousands of people needed medical help and the consequences for the economy and agriculture were enormous. Large areas of land were ruined, 12,000 farm animals perished and 7,700 people were made homeless.[1]

As the above example clearly shows, information does not simply exist “out there” as something objective that has certain characteristics like being sufficient, conclusive or determinate. It also needs to be believed, or if you prefer, information also needs to be trusted, it must stem from an ‘authority’ that makes it ‘real’ and ‘relevant’. Rational agents will not make the right decision if they do not believe or trust information which, as in the case of the residents of Armero, can be critically relevant.

The importance of this reliance on others for rational choice[2] is indirectly suggested by the difference between Martijn Boot’s first criteria, ignorance, and the three others, (in)sufficiency, (in)conclusiveness and (in)determinability. The last three, as mentioned earlier, can be seen as objective characteristic of the information

available to the agent. Is the information sufficient to reach a decision? Is it conclusive about the effects of radiation? Can we determine the cost and benefits of this or that decision? But ignorance... how should we understand the term? In the text given the way it is used, ignorance does not function as an objective characteristic of the information available to the agents, but as a characteristic of the agents making the decision. Conceptually this is quite different. Of course one can also understand "ignorance" as a characteristic of the information, at which points it pretty much corresponds to "the (current) limits of human knowledge" and becomes very hard to distinguish from inconclusiveness and indeterminability. However the term as used in "Radiation and Rational Deliberation" simply means that some agents -- foreign governments, journalists, private individuals -- for a reason or another did not have, or did not have access to, correct relevant information.

Ignorance, so understood points to the question "who should I believe?" Indeterminability and inconclusiveness as Martijn Boot finely analyzes them, point to the importance of that question and to how difficult it is to answer rationally. Who should the residents of Armero have believed? At first sight, the answer seems clear, the firemen who urged them to evacuate. Right, but to some extent that answer is only clear because, as we often say, hindsight is always 20/20. When they were urged to leave town nobody yet knew exactly what was happening a few kilometers above on the side of the volcano.

In his text Martijn Boot reminds us that on March 15, 2011 four days after an earthquake and tsunami had severely damaged the Fukushima Daiichi nuclear plant, the American & French governments, as well as those of many other countries, advised their citizen to leave Tokyo. At that time the Japanese government had ordered people living within a 20 kilometers radius of the plant to evacuate, recommended to those living in a 30 kilometers to stay indoors, and kept reassuring people living in Tokyo, 240 kilometers away from the site of the accident, that there was no danger and that radiation levels did not require any special measures.

Following the guidelines of the International Commission on Radiological Protection (ICRP) and the radiations levels at that time in Tokyo, Martijn Boot suggests that correct knowledge of the dangers of radiation did not justify the alternative recommendations of foreign governments. Was this ignorance? Maybe not, I believe that there is another possible explanation, one that highlights the importance both of trust and of inconclusiveness and indeterminability.

Since the publication of the official report of *The Fukushima Nuclear Accident Independent Commission* prepared for National Diet of Japan, we know that Japan narrowly escaped a much greater nuclear catastrophe. Thousands of rods of used fuel stored in a pool on top of reactor No.4 where threatening to go critical as the water level in the pool was dropping and the temperature rising. We also know that at that time the Japanese government asked the American government for help in the eventuality of having to evacuate Tokyo. Furthermore, a personal anecdote tends to confirm that the danger was real and the probability of another much more serious explosion quite high. During the events of March 2011, I was visiting professor in Paris, two friends of mine members of the French Commission on Nuclear Energy told me that the situation was highly dangerous. As members of the Commission they were bound to secrecy and could not tell what was happening, but if I knew anybody there I should urge them to leave Tokyo as the situation at Fukushima was very, very dangerous, and if things went wrong, they told me, it would make Chernobyl look like a child's play.

My suspicion then is that in this case the different agents, the French and American Governments, as well as the Japanese Government, in spite of the different recommendations they gave their citizens, all acted perfectly rationally from the point of view of decision theory. On March 15, 2011 the situation in Fukushima was dangerous, uncertain and volatile. No one knew whether or not the used fuel rods would go critical as helicopters of the Japanese Self-Defence Forces and fire trucks were frantically trying to pour water into the pool located tens of meters above the ground and that could not be accessed directly because of the high level of radiation. Had the worst scenario turned out to be real, immense quantity of radioactive material would have been released in the atmosphere and it is likely it would have been necessary to evacuate Tokyo. For the Japanese government the choice was between waiting and evacuating Tokyo immediately, a city of close to 30 millions people, and pretty much bringing Japan's economy to a standstill. Evacuating a city that size is not something you do in a few hours or even overnight. It takes at least a few days in the best of conditions (and these were not the best of conditions). In consequence, unless you can precisely know when the criticality accident will happen there is no point in giving an early evacuation order. The best thing is to be prepared for when it happens, if it happens.

Foreign government were facing a completely different situation. Evacuating a few thousands persons is not so expensive, nor does it have as many negative consequences. It does not impose such burdens either on the state or on the individuals. Furthermore,

in this case, time was of the essence. If foreign government were to evacuate their citizens, they should do it now, before the accident happened, when the transport systems were still working normally. Once the accident happened, if it did happen, some people were bound to get hurt or die in the ensuing panic, chaos and confusion of a massive evacuation of the city. The greatest benefits of the decision to evacuate could thus only be obtained if the decision was taken early.

In the two cases the costs and benefits of waiting or of acting now were completely different. In view of this it seems that foreign governments, given what the costs and benefits were for them, were perfectly rational in acting now. Given the radically different situation it faced, it seems that the Japanese government was also perfectly rational in waiting it out and hoping for the best.

What explains the contradictory recommendations of the foreign and Japanese governments then is not ignorance, but, the fact that these various agents were facing quite different situations which involved radically different costs and benefits. If we assume, as I do, that the issue was not that of the radiation level in Tokyo, on which the general public was focused, but what was happening in Fukushima, then we must conclude that everyone acted rationally, from a rational choice point of view. However, the discrepancy between the advice of foreign governments and the official stance of the Japanese government only added to the suspicion that the government was lying, and hiding things (which it was), and that it could not be trusted.

Many years ago Ulrich Beck argued that one of the characteristics of risk, as opposed to 'clear and present danger', is that two different agents faced with the same risk can adopt radically different solutions, and yet both can be perfectly rational in their contradictory choices. The above analysis may be seen as an example of this rational indeterminacy when faced with identical risks. Here is another one. You are young, a woman and pregnant, I am a man and much older, we are faced with the same level of radiation. You will choose to leave; in view of the danger for you and your unborn child your decision is perfectly rational. I will choose to stay and my decision is also perfectly rational. One way to resolve the difficulty, and to claim that nonetheless one single determinate (good) answer exists for each one of us is to argue that the risk which the same level of radiation presents for you, or for me, is not the same.

At first sight this seems like a reasonable answer, however one important aspect of this solution to the difficulty is that it makes risk dependant on costs and benefits. The risk is greater for you because the cost of staying and being exposed to radiation is higher. In consequence it becomes impossible to determine the level of risk without

taking into account the costs and benefits. Yet it is risk that determines the costs and benefits of different future actions. It is the danger of radiation that determines the cost of staying. What does it mean if we now say that it is the cost of staying that determines the risk? This circularity is indeterminability with a vengeance.

Notes

[1] H. Svensen, *The End is Nigh A Natural History of Disasters*, London: Reaktion Books, 2009, 125.

[2] On the importance of social relations to epistemology see: S.C. Goldberg, *Relying on others an essay in epistemology* (Oxford University Press, 2010); M. Kush, *Knowledge by Agreement. The Programme of Communitarian Epistemology* (Oxford University Press, 2002).