

The perception of actual and potential nuclear accidents in France (1986-2018)

Ludivine Gilli^{1*}, Cynthia Réaud²

¹*Institut de radioprotection et de sûreté nucléaire, 31, avenue de la Division Leclerc, Fontenay-aux-Roses, 92260, France*

²*CR Consultant, 26B route d'Arcangues, Biarritz, 64200, France*

*ludivine.gilli@irsn.fr

Abstract. For over 30 years, the French Institute for Radiation Protection and Nuclear Safety (IRSN) has been following the evolution of risk perception in France, with a particular focus on the risks associated with nuclear power. As such, this Barometer is a valuable tool to analyse risk perception by the French population, its evolution, and to design better risk management policies.

The perception of potential accidents has been a subject of study very early on in the Barometer, but especially after the Chernobyl accident in 1986, and again after the Fukushima Daiichi accident of 2011. When questioned about the catastrophic potential of different types of industrial activities, the French population strongly singles out nuclear power plants. It underlines the fact that when people envision a nuclear accident, they tend to picture a large scale event. It also explains why “the risk of an accident” is the first item people mention as a strong argument against nuclear power, far ahead of radioactive waste, with a remarkable stability over the past 20 years.

Focusing more specifically on the accidents of Chernobyl and Fukushima, the Barometer tells us they affected only marginally the opinion of French people on the safety of their own NPPs. One perception they do affect is the perception of an accident’s possibility in France, which first rises and then decreases as time passes. One fact remains, however: the Chernobyl and Fukushima nuclear accidents are the events which frighten the most the French population, more than events such as Hurricane Katrina or Haiti’s 2013 earthquake.

KEYWORDS: *perception, risk, nuclear, accident.*

1 INTRODUCTION

The French Institute for Radiation Protection and Nuclear Safety (IRSN), then IPSN, first looked into the opinion of the French population on nuclear matters in the 1970s. What started with small surveys grew into a systematic study called “*Structures de l’opinion*” (Structures of the opinion), dedicated to put nuclear power into perspective with other controversial issues of the time. These studies soon matured into the *IRSN Barometer on Risk and Security Perception by the French Population*, which has been offering for more than 30 years now regular data on the perception of risk and its evolution in France, with a particular focus on the risks associated with nuclear power.

Every year, a public opinion survey is conducted among a different sample of 1,000 people representative of the French population. The survey includes a core of questions which are kept from one year to the other and allow the study of the perception of different risks and their evolution over time. As such, it is a valuable tool to analyse risk perception by the French population, its evolution, and to design better risk management policies.

The survey starts with general questions on the main current preoccupations, with items such as unemployment, environmental issues or security. It then addresses a variety of risk situations such as radioactive waste, medical X-rays, chemical plants, but also heat waves, obesity, GMOs, etc. before focusing on nuclear issues.

After the Chernobyl accident, in 1986, several specific questions were added to the survey to study the perception of the accident itself and the effect it had on the perception of the nuclear power. Some of these questions were submitted again in 1996, ten years after the accident, and again in 2011, when the Fukushima accident took place. They offer an insight on the effect these two accidents had on the French opinion, on its evolution over time, and a possibility of comparison between their respective effects.

2 THE PERCEPTION OF POTENTIAL NUCLEAR ACCIDENTS IN FRANCE

2.1 Risk assessment, risk perception and efficient risk management

Risk can be approached in a number of ways. Experts usually assess risk from a scientific point of view,

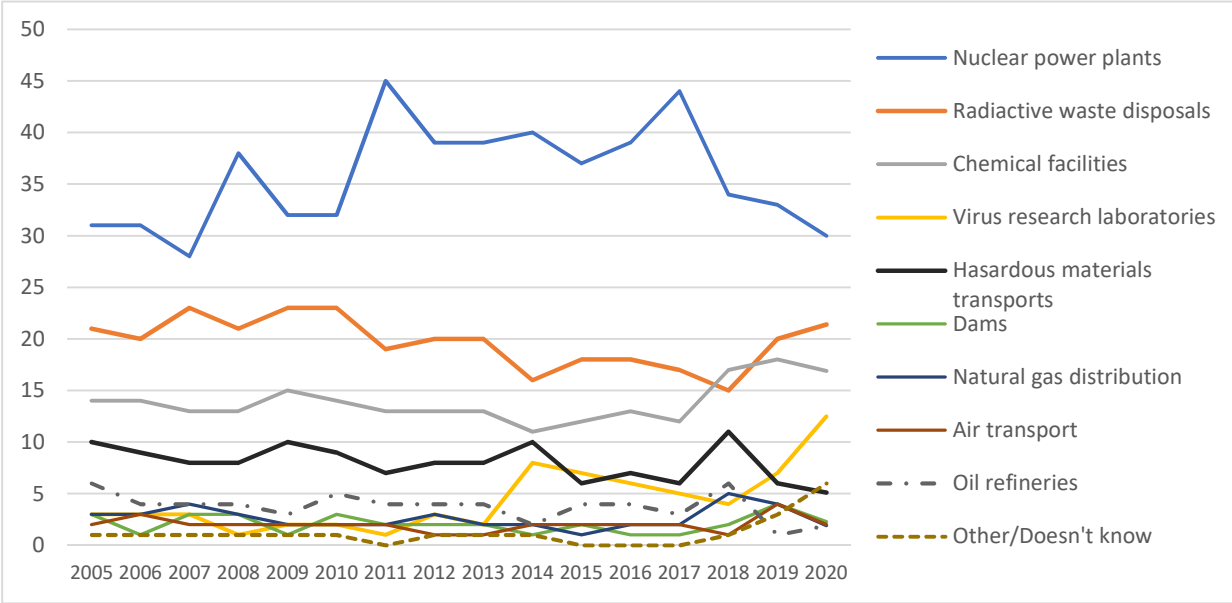
using proven tools and methods including probabilistic and systematic approaches. The public has a different perspective, relying more heavily on personal experience, intuition, and giving less weight to concepts such as the probability of occurrence. This frequently leads to significant differences between the level of risk calculated by experts and the level of risk perceived by the public. For instance, the public tends to overestimate the risk of terrorism and to underestimate the risk of domestic accidents. Overlooking this difference in approaches can lead to ill-adapted and therefore ineffective risk management strategies, because these strategies don't address the relevant issues or don't address them in a relevant way. For example, there is no use in launching a campaign explaining *how* to prevent domestic accidents without making people understand first it *is* an issue: unaware of the actual risk, they will dismiss the campaign, believing it does not concern them. A better understanding of how risk is perceived by the public can help tailor policies that will take into account not only actual levels of risk but also the way they are perceived by the public, and design ways to mitigate risk more efficiently.

2.2 The catastrophic potential of nuclear facilities compared to other industries

When questioned about the industrial or technological activity which is most likely to cause a serious accident, the French population strongly singles out nuclear power plants (NPPs), as shown in figure 1. NPPs have been leading all other replies since 2005 – when the question was first asked – gathering annually more than 30 % of replies (except for 2007). Radioactive waste disposals and chemical plants come in after, usually in that order, with respectively around 20 % and 15 % of responses. NPP's clear lead, as well as the consistency of these results in time, show that nuclear plants are seen as having the biggest catastrophic potential among industrial activities.

The Fukushima accident amplified this perception. Between 2010 (before the accident) and 2011 (after), the percentage of people quoting “nuclear power plants” as the activity most likely to cause a disaster jumped from 32 % to 45 %, pointing to a direct effect of the accident on the perception of NPPs as a potential source of accident. However, we can see this effect dissipate over time as the score decreases gradually to go back to its pre-Fukushima levels in 2018, still leaving NPPs in the lead with 30 %.

Figure 1: “According to you, which of the following industrial or technological activities is most likely to cause a serious accident or disaster in France?” (2005 - 2020, in %)



2.3 The possibility of a nuclear accident in France: a perception deeply affected by actual accidents

A large part of the population associates the word “nuclear” with NPPs or energy production¹. However, a significant number of people see nuclear power as alarming and potentially dangerous, associating the word “nuclear” with “danger”, “pollution” or “explosion”. When approached about nuclear risk, the public tends to picture serious accidents with dire consequences. For instance, about nine in ten French people interviewed from 2004 to 2017 declared that “were an accident to occur in a nuclear power plant, it could have dire consequences”.

In 1986, 56 % of the French people declared that an accident as severe as Chernobyl could happen at a French NPP, while 22 % said it might and 18 % said it could not. Five years later, the number saying it could happen had dropped to 47 %, while 28 % said it might and 21 % it could not. In these five years the total portion of people believing that an accident “could” or “might” happen decreased by a small percentage, from 78 % to 75 %. The structure of replies changed, however, as less people responded with a strong “yes”, suggesting that their views became less radical with time. After 12 years, in 1998, the responses showed a significant shift with a reduction of the “yes” replies to 39%, of the “maybe” to 15% and an increase of the “no” to 42%. At this time, 54 % of the French people were still believing a Chernobyl-like accident could or might happen in France, while 42 % believed it could not, which was more than double the score recorded in 1986. Four years later, in 2002, the question was asked again with a slight change: the response choices were restricted to yes or no. It showed this time a stabilisation of the perception: 53 % replied “yes”, 40 % replied “no”. Then came the Fukushima accident. In the 2011 survey, conducted a few months after the accident, 69 % replied that such an accident could happen in France, while 29 % said it could not. The perception of the possibility of an accident in France had risen again, almost reaching the levels recorded after Chernobyl. In 2018, seven years later, a new decrease had taken place: to the same question, 49 % replied a Fukushima-type accident could happen in France, while 38 % said “no”, pointing towards the same phenomenon which happened after Chernobyl: the accident drives up the perception that an accident is possible, but as time passes, this feeling recedes.

2.4 The risk of accident: main argument against nuclear power

The fear of an accident and of its consequences affect the opinion of French people regarding nuclear energy. Questioned since 2002 about the strongest argument to be made against nuclear power, the French people have consistently positioned “the risk of an accident” first, with particularly high scores in 2011 (42 %), 2012 (40 %) and 2013 (43 %), in the aftermath of the Fukushima accident. The scores slightly decline in the following years, but this proposition remains first in 2018 (35 %), far ahead of radioactive waste (23 %) and “the vulnerability of NPPs” (19 %).

3 THE PERCEPTION OF THE CHERNOBYL AND FUKUSHIMA ACCIDENTS IN FRANCE

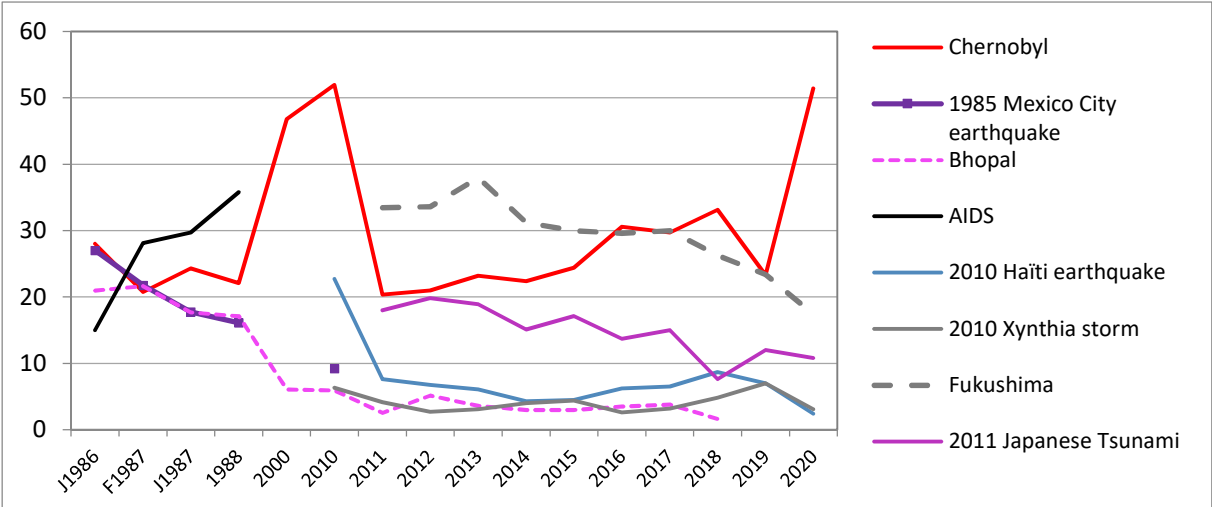
3.1 The Chernobyl and Fukushima accidents: most frightening disasters

Almost 10 years have passed since the Fukushima nuclear accident and more than 35 since the Chernobyl accident. Yet both are still ingrained in the memories in France. They currently are by far the two most dreaded catastrophic events. When the question was asked in 1986 (“*which of the following catastrophic events to you find the most frightening?*”), the Chernobyl accident gathered 28 % of replies, ahead of the dramatic 1985 Mexico City earthquake (27 %) and the non-less tragic 1984 Bhopal chemical accident (21 %). Over the years, however, the memory of and the fear associated with the Mexican earthquake and the Bhopal accident decreased, while the fear of the nuclear accident remained vivid. In 2010, Chernobyl had jumped far ahead of any other catastrophe with 52 % of replies while the Mexico City earthquake and the Bhopal accident gathered merely 9 % and 6 %.

¹ For more details, see part 4 question 1 in the 2020 IRSN Barometer: <http://barometre.irsn.fr>. The results are presented under the form of word clouds in the comprehensive annex “Les graphiques”.

When the Fukushima nuclear accident happened in 2011, it immediately became the most feared event (33 %), surpassing Chernobyl (20 %) and the 2011 Japanese earthquake and tsunami (18 %). One could make the argument that the most recent catastrophe of a certain type will take the lead, and to a certain extent it is true, since the Fukushima accident did. Other factors are however also at play, because despite being older, the Chernobyl accident started gaining ground on Fukushima in 2014 and came ahead for the first time as soon as 2016. In 2018, the two catastrophic events frightening the French the most were in that order the Chernobyl and the Fukushima nuclear accidents, with respectively 33 % and 26 % of the replies. In May of 2020, Chernobyl (51 %) jumped far ahead Fukushima (17 %), as featured in figure 2 below. Three important factors in this phenomenon are the geographic proximity of the Chernobyl power plant compared to the Japanese one, which is further away from France, the fact that there was actual fallout of the Chernobyl accident in France (as opposed to the negligible traces due to the Fukushima accident), and the French controversy that surrounded the Chernobyl plume, which is frequently revived in the media and keeps the myth alive.

Figure 2: “Which of the following catastrophic events seems the most frightening?” (1986-2020, in %)



The study of replies by age group is revealing of the lasting impact of the Chernobyl accident in France. In 2019, we asked the French people which event among a list was the most striking to them. The first three replies by age group, featured below in figure 3, show that the older the people are, the more they mention the Chernobyl accident as the most striking. There is a strong difference between the 18-24 years old, who quote Fukushima at 27 % and Chernobyl at 13 %, and the people 65 years old and older, who quote Chernobyl at a rate of 31 % and Fukushima at only 19 %. It is understandable as the question appeals to a connection they personally feel with one catastrophic event in particular. Therefore, the chosen event tends to be an event they experienced personally: the Fukushima nuclear accident and the 2011 Japanese tsunami for the youngest people, ahead of the Chernobyl accident which they only know through images and stories, but did not experience first-hand.

However, when asked (in 2018) which event is the most frightening to them, the 18-24 years old place the Chernobyl accident ahead of Fukushima, with respectively 31 % and 27 % of their replies. The gap is smaller than it is among the 65 years and older, who reply Chernobyl at 39 % and Fukushima at 21 % only. However, it signals that even among the people who have not personally experienced the Chernobyl accident, it conveys more fear than the Fukushima accident, showing the memory of the accident and the stories that have surrounded it over the years are still vivid.

Figure 3: “Which of the following catastrophic events is the most striking to you?” (2019, in % by age group)

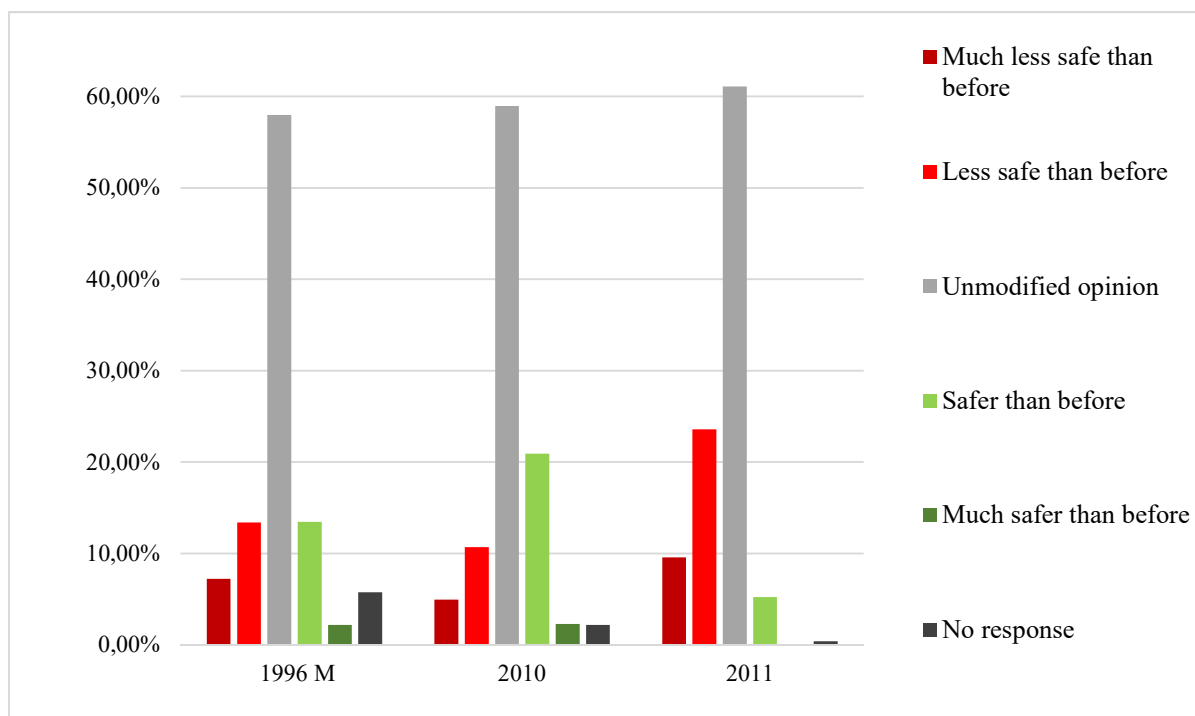
	18-24 years old	25-34 years old	35-49 years old	50-64 years old	65+ years old
1	Fukushima (27 %)	Fukushima (26 %)	Tie Fukushima – Chernobyl (21 %)	Fukushima (28 %)	Chernobyl (31 %)
2	2011 Japanese tsunami (18 %)	Chernobyl (19%)	-	Chernobyl (27 %)	Fukushima (19 %)
3	Chernobyl (13 %)	2011 Japanese tsunami (14 %)	AZF (13 %)	AZF (15 %)	AZF (13 %)

3.2 The impact of the Chernobyl and Fukushima accidents on the perception of French NPPs

As mentioned above, a large majority of French people believed in 1986 that an accident such as Chernobyl could or might happen in a French NPP. This belief declined with time, rose up again after the Fukushima accident to decline for a second time after a few years.

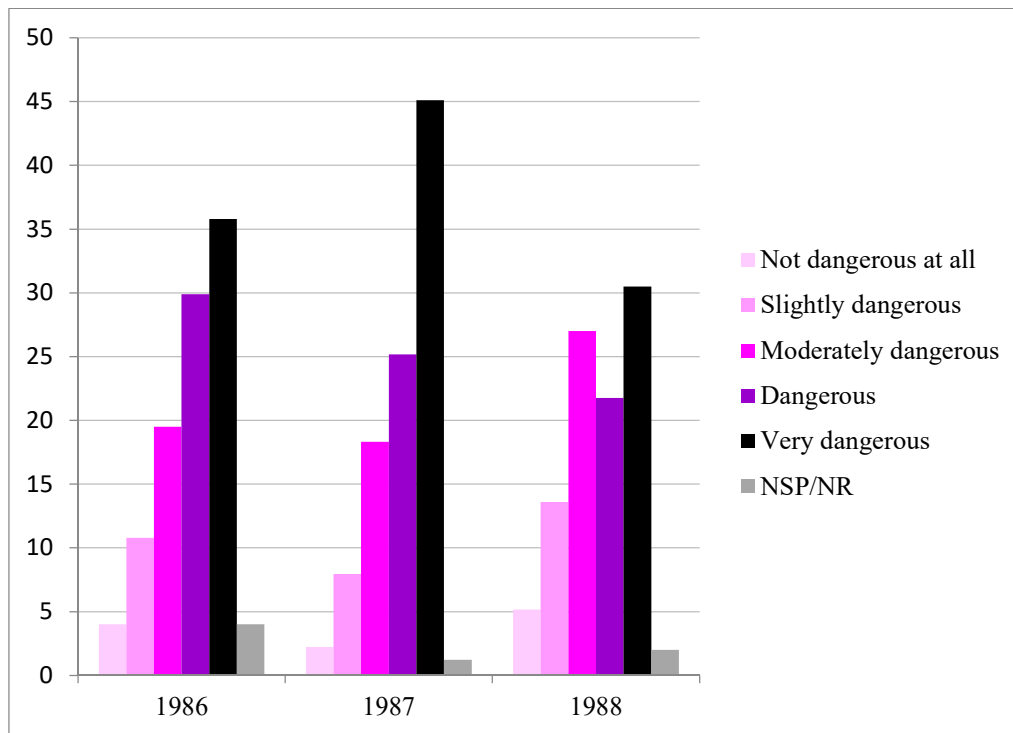
However, the increased belief in the possibility of a French accident did not mechanically translate into a deterioration of opinion on the French nuclear power plants. Immediately after the Fukushima accident, the French people were asked if it changed their opinion on the safety of the French NPPs. As picture in figure 4, a large majority (59 %) replied their opinion was unchanged, 34 % declared they now felt less safe and 5 % found them safer. A year later, an even larger 71 % declared an unchanged opinion, 23 % found them less safe and 6 % safer.

Figure 4: “Has your opinion about French nuclear plants changed after the Fukushima accident?” (2011 and 2012 results, in % of citations)



The perceived danger associated with nuclear power plants in general follows the same pattern: it rises at first, before decreasing. In 1986, 36 % of the French people think NPPs are “very dangerous” and 30 % believe they are “dangerous”. A year after the Chernobyl accident, the perceived danger has risen even more, reaching scores of respectively 45 % and 25 %. In 1988, however, the dust starts settling. The French are 30 % to find the NPPs “very dangerous” and 22 % to find them “dangerous”.

Figure 5: “I will list several activities, techniques, products... For each one, I will ask if you consider them dangerous: nuclear power plants” (1986, 1987, 1988, in % of replies)



After the Fukushima accident, the rise and decrease are smaller and take place over a shorter time frame. The spike is measured in 2011, a few months after the accident. The percentage of French people believing that for French people in general, the level of risk due to nuclear power plants is “high” or “very high” goes from 48 % the year before to 55 %. A year later, the perceived level of risk is actually lower than it was before the accident with a subtotal of 45 %.

Figure 5: “For French people, do you believe the level of risk due to nuclear power plants is...”

	Very low	Low	Subtotal low	Moderate	Subtotal high	High	Very high	Does not know
2010	3,0	16,7	19,6	32,2	47,6	33,0	14,6	0,6
2011	2,7	15,2	17,9	27,0	54,9	32,9	22,0	0,2
2012	3,4	18,8	22,2	32,1	45,3	29,4	15,9	0,4

4 CONCLUSION

The French population views nuclear power plants as a potential source of catastrophe, more so than chemical activities, and when the French people envision a nuclear accident, they tend to picture a large scale event with dire consequences. This is probably the reason why the risk of an accident has long been the first argument they mention against nuclear power.

The accidents of Chernobyl, and more recently Fukushima, have had a lasting impact on the minds. They affected only marginally the opinion of the French on the safety of their own nuclear power plants. However, they revived the feeling that an accident of this nature may happen in France.

The Chernobyl and Fukushima nuclear accidents remain the events which frighten the most the French population, far ahead of events such as Hurricane Katrina or Haiti’s 2010 earthquake. An interesting evolution of late is that the Chernobyl accident is now mentioned as more frightening by the French people than the Fukushima accident.

5 REFERENCES

- [1] Barny, M-H., Bonnefous, S., Iliakopoulos, A., 1986. Impact sur l'opinion de l'accident de Tchernobyl, exploitation des données recueillies par Agoramétrie de mars 1977 à juin 1986, CEA IPSN, Département de protection sanitaire, Laboratoire de statistiques et d'études économiques et sociales, rapport DPS 86/05 LSEES.
- [2] Barny, M-H., Bonnefous, S., Iliakopoulos, A., 1986. Impact sur l'image du nucléaire de l'accident de Tchernobyl, exploitation des données recueillies par Agoramétrie entre juin 1985 et juin 1986, CEA IPSN, Département de protection sanitaire, Laboratoire de statistiques et d'études économiques et sociales, rapport DPS 86/14 LSEES.
- [3] Barny, M-H., Bonnefous, S., Pages, J.P., 1987. Huit mois après Tchernobyl, image du nucléaire, CEA IPSN, Département de protection sanitaire, Laboratoire de statistiques et d'études économiques et sociales, note DPS 87/06 LSEES.
- [4] Barny, M-H., Bonnefous, S., Iliakopoulos, T., 1987. Les structures de l'opinion en 1987, enquête Agoramétrie : principaux résultats, CEA IPSN, Département de protection sanitaire, Laboratoire de statistiques et d'études économiques et sociales, note DPS 87/11 LSEES.
- [5] Barny, M-H., Bonnefous, S., Pages, J.P., 1987. Le nucléaire et l'opinion publique quatorze mois après Tchernobyl, CEA IPSN, Département de protection sanitaire, Laboratoire de statistiques et d'études économiques et sociales, note DPS 87/16 LSEES.
- [6] Eljammal, M-H., Rollinger, F., Baromètre IRSN 2011. La perception des risques et de la sécurité par les Français, résultats d'ensemble.
- [7] Gilli, L., Charron, S., Réaud, C., Baromètre IRSN 2019. La perception des risques et de la sécurité par les Français, Les essentiels.
- [8] Gilli, L., Velez, R., Réaud C., Baromètre IRSN 2020. La perception des risques et de la sécurité par les Français, L'analyse.
- [9] Website of the IRSN Barometer: <https://barometre.irsn.fr>.