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Alerting the population in emergency plans: examples of local public policy in Provence

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Abstract

Article 8 of the European Seveso-1 Directive on 1982 imposed that the measures of self-protection to be adopted in the event of an industrial disaster were to be supplied to all persons who might have been concerned by a major accident. The second version of the Seveso Directive calling for a larger public participation has been applicable in France since February 3, 1999. At the dawn of this new text coming into effect, it is necessary to draw up the balance sheet of the actions undertaken in the field.

In France, the public authorities and industrialists were actively engaged in this public policy of increasing public awareness of the industrial risks and safety measures to be applied in case of an accident. The first information campaign was launched in the spring of 1989. To evaluate the impact of this campaign, we will compare the results of three sociological surveys in the area: the first was carried out during the months of January and February 1988 before the public awareness campaign. The second survey was completed in December 1989 after the information campaign. The third and final survey was just after a major accident at the Total plant at La Mède.

Insights from public reactions show needs for an appropriate sociological background so that information to the public might correspond to citizens' expectations.

Keywords: Major accidents; Seveso Directive; Information to the public; Public participation; Emergency preparedness and response

1. Introduction

The disasters that occurred in Flixborough and Seveso brought out the helplessness and distress of the populations when confronted with catastrophic incidents. The lack of knowledge of the nature of the risks the inhabitants were exposed to and the elementary protection measures to be put into practice in such situations made things worse for

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them. Therefore, in 1982, in addition to the technical measures of prevention aimed at reducing risks at their origin, a European directive obliged the member states of the European Union to inform the people living in the surroundings of industrial sites (involving chemicals, oil and gas) where major disasters may occur. Control of nuclear risks was not included in this directive.

This regulatory framework, called the "Seveso Directive" (in reference to the 1976 chemical disaster on the outskirts of Milan) made it obligatory to inform the public of the safety measures that the neighbourhoods close to industrial facilities had to be aware of for their protection in case of an accident.[1] After a number of further accidents (e.g. Mexico City, Bhôpal or even Chernobyl) an appendix was added (appendix VII of the amendment 88/610/EEC to the directive — see also Ref. [1]). This calls for a more ample information on industrial risks, the prejudice caused by important disasters and the means of controlling the risks with a concern for the double aspect of prevention and emergency intervention. At the dawn of the second version of the Directive (96/82/EC) which dates from December 9, 1996 (the Seveso Directive II has only been applicable in France since February 3, 1999), it is necessary to analyse the action taken by the state over the past 10 years.

The Seveso Directive II brings together into a coherent group all the procedures for democratic control of the activities of major hazards facilities, with the participation of the citizens. It defines the active participation of the inhabitants in the fields of prevention and of emergency intervention. The public has to be consulted both when opening new industrial facilities, when deciding upon land-use in their vicinity and when planning emergency procedures.

Our objective is to go further than examining the legal provisions and to evaluate to what extent the policy of informing the public about industrial risks has really promoted the consideration of the citizens' point of view in the debate about the technology. To do so, we systematically evaluated the impact of the policy by sociological surveys of the populations concerned. At the same time, during the practical implementation of the public policy, we directly collaborated by participating in the negotiations with the consultative bodies whose task was to promote the policy.

In France, the public policy of informing the population about technological risks had begun very early, even before the provisions of the European requirements were completely integrated into French law. Indeed, the principle of the public's right to be informed about major risks was acquired in 1987 by legal provisions on the reform of the "Sécurité Civile,"[2] but it was only in January 1993 that an inter-ministerial[3] decree stated the entire list of mandatory information, in appendix VII. However, at that time more than two-thirds of the French companies concerned by the requirements of the European Union had already complied with the "transparency" requirement concerning the dangers of major hazards industries, by publishing brochures. The distribution of

[1] EEC Directive No. 82/501, Section 8.

[2] Law No. 87_565 of July 22 1987, regarding the organisation of the Sécurité Civile, protection against forest fire, and the prevention of major hazard.

[3] Decision of 28 January 1993 stating the technical rules for preventive information for persons likely to be affected by an accident occurring in a plant subject to the legislation applicable to classified installations.

these documents had very often been accompanied by extensive communication campaigns, as in the spring of 1989 in the industrial area of "Etang de Berre." Public discussions, open days at the plants or even guided visits for school pupils had been organised on this occasion.

In order to study the procedure adopted to give the public the information provided by the Seveso Directive, we made sociological surveys at regular intervals: first of all before informing the people living near the sites, then after using these communication procedures and finally in a crisis situation. This research was carried out among the inhabitants of the main industrial sites in France, more particularly in the industrial zone near Marseille, the results of which are submitted in this report. After Haute-Normandy, Provence is the region of France with the largest number of major hazards plants as 37 sites belong to the major hazards category (refineries, chemical factories, gas storage depots) around Etang de Berre in the Martigues, Fos-sur-Mer or Berre l'Etang.

It is not by chance that this political desire to let the citizens take part in the procedure of administrative control of industries came into existence on this site as long as 10 years ago. It was the logical continuation of the strategy of the DRIRE of Provence ("Direction Générale de l'Industrie, de la Recherche et de l'Environnement"). That particular DRIRE was the first in France to organise, as early as 1971, a structure[4] for local dialogue in charge of researching solutions for industrial environment problems through collaboration among Government inspectors, industrialists and local elected representatives, rather than by reactive or coercive measures.

The aim of this investigation is to evaluate the real efficiency of the information given to the inhabitants of "Etang de Berre," in the spring 1989. The Seveso Directive was based on the principle that informing people about the protective measures to be taken in disaster situations was a sufficient condition for modifying their behaviour in crisis situations. However, the research we made, following the disaster of November 9, 1992 at the Total refinery in La Mède, showed that the reactions of people who had previously been informed on this topic and those who had not were not as unlike as we would have expected. Our hypothesis on this matter is that being aware of safety instructions does not induce a reflex reaction and that the instructions only make sense when given within the specific context of the disaster. This is especially true, when the a priori information does not correspond unambiguously to the actual situation.

However previous information on possible accidents helped people to avoid panic and to loose confidence on industry and administration.

2. The evolution of public policy of informing the population about major technological risks

2.1. The political agenda

Before a public information policy is decided upon and put into practice, it is preceded by a period where a strong social problem develops within the public sphere,

[4] The Secrétariat Permanent de Prévention des Pollutions Industrielles (SPPPI)— The Permanent Office for the Prevention of Industrial Pollution.

to the extent that it becomes a political issue. Braud [2] analysed at what moment a problem of society becomes a political issue and discovered that only a small part of the multiple conflicting interests, social difficulties and collective aspirations of all kinds become a topic for the public scene. According to Cobb and Elder [3], Padioleau [4] uses the concept of "political agenda scheduling" to define "all the problems perceived as requiring public debate or the intervention of legitimate public authorities."

The information policy, concerning the major technological risks, passed through four stages, each showing significant progress in legislation: the first law of July 1976 on equipment categories and environmental protection and the three following in 1982, 1988 and 1996 with the successive modifications of the Seveso Directive [5].

This legal evolution of a public transparency policy concerning the dangers of industry confirms a progressive development from the citizens' passive contribution to active participation. In the first stage, which is strictly technical and administrative, the citizens have no access to information concerning the plants' internal functioning; the control of the production is exclusively carried out by inspectors of the categorised equipment. Later, after the first edition of the European Directive, the knowledge of the safety instructions became part of the emergency plans, but the citizens living near the plants only played a passive role in the safety plan and had no information on the real dangers of the industrial activity. In the third stage, public awareness turned into the public's right to be properly informed (as a result of appendix VII, referred to above), not only concerning the dangerous substances used in plants but also of the safety and emergency intervention plans. The legal "transparency" requirement grants ordinary neighbours the power to live as citizens within the prevention procedures, as the law now provides for information as a right. The last stage does not only provide for the citizens' information, but also for their participation in administrative decisions concerning land use and emergency plans.

Among the elements which have an influence placing a problem of society on the political agenda, Cobb et al. [6] distinguish three models: the outside initiative model, the mobilisation model and the inside initiative model. In the first case, the state is not in a position to apply pressure and a problem of society is put on the formal agenda (by means of institutional scheduling) after being incited by the public agenda (public opinion). In the second case, the initiative comes from mobilisation within parliamentary or administrative organisations, which try to obtain joint validation with public opinion. In the third case, the source of mobilisation comes from the government and avoids any public debate on the matter.

Scheduling the prevention of major technological risks on the political agenda was mainly motivated, for the first steps of legislation, by the accidents, which occurred. Even if it is difficult to completely dissociate the sudden public awareness caused by the disasters of Seveso, Basel, Bhopal or Chernobyl from an already existing movement of progressive mobilisation of ecological or intellectual associations, requesting more social control of industries using dangerous substances for their production, it cannot be denied that these events directly influenced public decisions (see Lagadec [7]). Moreover, the current name of "Seveso Directive" clearly refers to the determining importance of the chemical disaster which happened in 1976 in the outskirts of Milan, at least as a trigger for politicians to take into consideration the public control of major hazards industries.

However, the recent improvements in legislation, finalised by the Seveso Directive II, are not directly the consequences of a major disaster, but rather the result of action in this field and the evaluation that is drawn from it. In France during the 90's, for instance, the public policy of making the inhabitants on sites with major hazards industries in the surroundings more aware led to voluntarist steps being taken by the state based on a mobilization model. With the support of public opinion, the Department of Industrial Environment (a part of the Ministry of the Environment) responsible for the inspection of major hazards sites, vigorously engaged the citizens in these information procedures by putting pressure on industrialists to inform the public of the risks their plants' present.

2.2. The system of reference of the public information policy for technological risks

It is first when institutional obligations are placed on the agenda that a public policy actually is introduced. After Jones [8], Meny and Thoenig [9] distinguish four steps for putting it effectively into practice: first of all, the problem must be defined and the institutions designed, secondly the priorities must be established and then the programme of public action which has been decided must be carried out on the field. Finally, its influence must be evaluated in order to decide if it is preferable to continue applying it, to modify it or to put an end to it.

For Muller [10], the first step of any public policy is to define its "system of reference." To do so, the institutions that will put it into practice must be identified and, by means of pertinent indicators, data for initial information on the social difficulties must be collected. This author distinguishes the level of social reality that is studied and the level of public management. Concerning the first level of the social phenomenon or problem which is at the origin of the public policy, the sector concerned must be identified (environment, health, etc.), then the territorial level within which it is to be applied (global society or local level). Concerning the level of the public action programme, a distinction must be made between the institutional means themselves, i.e. the missions and the organisation of the institutions concerned, and the procedures to be applied [10].

The main hypothesis of our research is that the choice of these four themes is far from haphazard and that its aim is to consolidate the strategic orientations of the inspection of major hazards installations, differentiating clearly from the "crisis management" philosophy specific to the Ministry of the Interior concerning civil safety. First of all, the inspectors task is based upon an "integrated" conception of all the unpleasantness caused by the industrial activity and the very local requirement to protect the neighbourhood from them. With this method the chronic and diffused risks, like pollution, are not artificially dissociated from accidental risks. Therefore, instead of pointing out the potential disaster of industry's danger by placing the technological risks in the same category as other major risks, such as natural disasters (earthquakes, floods, etc.), this conception of industrial environment places them, on the contrary, in the more general context of sustainable economic production.

Moreover, administrative control does not only rely on punitive measures and police enforcement, or on evaluation of risks in negative terms of damage, but rather on the

existing balance between the costs and benefits of industrial activity. For this reason, the proposed solutions are very often a compromise and the result of subtle arbitration between the defence of the environment and economic interests. These policies of motivation and persuasion became possible by the creation of structures for dialogue (the abovementioned SPPPI). Finally, the principle of consulting the local inhabitants — already applied in public inquiry ("enquête publique") to obtain the population's opinion before opening of industrial site — was extended to the procedure of preventive information.

To summarise, the technical risk sector is part of the industrial environment. The territorial level concerned is local, as it involves the inhabitants living in the immediate neighbourhood of dangerous plants. The institutional plan for preventive information is set up within SPPPI's, which are structures for consultation acting under the authority of the Ministry of Environment. The inhabitants take part in the administrative decisions by means of a public debate instead of limiting the proceedings to a technical expertise carried out behind closed doors by the industrialists and the state inspectors, without any public information (see Table 1).

The first survey in Provence was made to see if the regulations' requirements corresponded to the populations' expectations. Its aim was to make the industrialists and local elected representatives aware of the very specific social and local demand of the inhabitants. Following Foucault's [11] methodology of "discursive formations" or the "analysis of discourse" recommended by Mainguenneau [12], our objective was not to interpret the hidden sense of the answers collected, but to take into consideration their literal meaning like declarations made in the context of oral discussion in order to situate the populations' opinion compared to that of the industrialists and public authorities.

2.3. The strategic stage of choosing conceivable solutions

According to Jones [8], the second stage is the strategic one, which consists of choosing conceivable solutions. Experts compare different possible scenarios by confronting the expected performance, the restrictions to be complied with and the costs to be taken into consideration. This analysis is based on the valuation of the issues at stake and must anticipate possible conflicts, but also the resources capable of giving the action a positive turn. For the authors of Ref. [9], the principal issue is a "problem in the centre of debates and controversy, which are the object of contrasted value systems." An issue

Table 1
The system of reference of public policy of informing the population about technological risks — an analysis of the problem

THE SECTOR	THE TERRITORY
Technological risk	Nearby dangerous industrial facilities
Industrial environment / catastrophe	Local issue/national issue
The state's programme of action	
THE PROCEDURE	THE INSTITUTIONS
Informing the public	Prevention and emergency systems
Open debate / secret decision	Structures for consultation/technical expertise

does not appear on its own and is subject to the opinion of the specific actors who, very often, have different priorities. In the presence of industrialists and local elected representatives in Provence, we have negotiated closely along with state inspectors within the SPPPI in order to choose the form and the content of the detailed information to be printed in the brochures given to the population.

2.4. The operational stage of the public action

The third stage is when the decisions taken are put into practice. This means allocating the necessary budgets, appointing the administrative services concerned and defining their missions. It also requires operational remarks concerning the organisation, which corresponds the most to the goals to be reached. In Provence, we contributed to putting into practice the active information phase. It consisted of public discussions, educational action in schools, visiting the plants on site, etc., which took place in the spring of 1989 in the Etang de Berre communities.

2.5. The evaluation stage of public policy

Finally, the last phase is the evaluation of the public policy carried out. Meny and Thoenig [9] distinguish two possibilities: (1) collecting the opinions of those organisations that assume a role of evaluation in society — such as newspapers, pressure groups, control institutions within the public sector, etc.; (2) acquiring an experimental know-how with appropriate methods, allowing judging governmental action in a scientific manner.

In the latter case, the variation between a situation t and a situation $t + n$ must be shown and requires that indicators are established and their information collected from the start, before the action takes effect. In Provence, we led a survey at two intervals: the first under normal conditions to note the impact of the information campaign, and the second after an incident in order to assess its influence.

3. The results of the experiment

3.1. The initial phase of data collection, "before" informing the public

In order to confront the law's objectives with the needs of the inhabitants living near the plants, we tried to find out if the participation expected of the populations in the emergency plans was compatible with the behaviour they might show within such a context. The postulate of the Seveso Directive in this matter is that the people's inappropriate behaviour during disasters is due to a lack of knowledge about the safety measures to be adopted when confronted with such situations and to the absence of safeguarding reflexes. This theory is based on the principle that people would spontaneously follow their instinct and try to escape when confronted with danger instead of taking shelter and confining themselves for protection.

The survey we carried out in the Bouches du Rhône in 1988 shows that nearly all of the people interviewed, i.e. nine out of 10, declare that they were not aware of the safety

measures to adopt when confronted with industrial disaster. The people living near plants (experimental group of 500 subjects) agree on this topic with the inhabitants of the region who live outside the industrial site of Etang de Berre (a control group of 1000 participants) as 94% and 97% of them confirm that in case of industrial disaster, the population does not know the instructions to be followed (see Table 2).

The empirical data collected does not allow us to validate the hypothesis of fleeing when confronted with danger. From a list of 12 "spontaneous reactions in case of disaster in a plant," fleeing is hardly ever mentioned: only one person in two living nearby acknowledges that he might try to "get as far away as possible," one in three says that "he might take his car" and one out of 10 might wish to "go to the sea." Fewer people than we would have hoped stated they would stay indoors: 51% of the people interviewed think of "sealing windows and doors," 43% "hiding in the nearest building" if they are outside when the accident happens and 34% only think of "locking themselves in where they are" if they are already indoors (see Table 3).

More than being an attack on the individual's integrity, major disasters are perceived as a threat for the unity of the social group. For instance, people's priority reactions tend to be to preserve this unity at all costs by "picking up the children from school" and running "to meet their relatives." Considering the risk of breaking up of social links, the inhabitants think first of all of appealing to authorities in order to know the safety measures to adopt or to obtain information on the events by listening to the radio and by calling the firemen or the police (see Table 3).

Table 2
Awareness of the emergency instructions

1 — Before the information campaign ($n = 1500$): Do you agree with the following: "If a catastrophe happened, the population would not know how to behave."

	Totally (%)	Mainly (%)	Perhaps (%)	Not really (%)	Not at all (%)
Site $n = 500$	71	18	5	4	2
Reference sample $n = 1000$	64	25	8	2	1

2 — After the information campaign ($n = 425$): Do you know how to behave if an industrial catastrophe were to happen?

Yes, very well	Yes, quite well	More or less	No, not really	No, not at all
10%	29%	30%	14%	17%

3 — After the La Mède accident ($n = 508$)

	Yes (%)	No (%)
Informed persons	74.5	25.5
Uninformed persons	30.5	69.5

Table 3
"Presumed" reactions in the event of an industrial catastrophe
"No" and "perhaps" replies are not shown in this table.

If a catastrophe happened at a nearby facility, what would be your spontaneous reaction? Before the information campaign ($n = 500$); after the campaign ($n = 450$)

Yes			Yes		
	Before (%)	After (%)		Before (%)	After (%)
If you have children, pick them up from school	82	39	If you were outside, take refuge in the nearest building	43	69
Run back to the family	68	42	Phone the factory for information	37	22
Listen to the radio	66	82	If you are indoors, shut yourself in where you are	34	64
Call the fire brigade or the police	59	40	Take to your car	32	21
Seal doors and windows	51	71	Go to the seaside	11	6
Run away as far as possible	50	27	Go to the scene of the accident	9	2

Therefore, when no voluntary measures are taken by the authorities to explain the nature of technological risks and the necessary safety measures to be taken, this unawareness confirms the lack of a "cultural tradition" in this matter. Moreover, the analysis of the "supposed" reactions in crisis situations shows that the inhabitants are more sensitive to matters collectively at stake than to individual consequences of industrial disasters, and they rely more on the help of the emergency services to rescue them than on their own impulsive flight.

3.2. The stage of evaluating public policy, "after" informing the inhabitants

Based on a sample of 425 people, we carried out a sociological survey after the information campaign, which took place in the spring of 1989 in the communities situated around the Etang de Berre. It shows the efficiency of the public action put into practice. Nearly four people out of 10 now declared to be well informed about the emergency instructions and, if the hesitant opinions are added, there is a total of nearly seven out of 10 people (see Table 2). It must be pointed out, however, that these results cannot directly be compared to those of the preliminary survey, as the question headings are not exactly the same.

This survey ended with an "open" question in order to check if the people who had given an affirmative answer were capable of quoting them correctly. The answers showed that the safety measures were well understood. Staying indoors comes first, as 65% of the people say that you "must lock yourself in at home, not go out" and "seal doors and windows." Then follow those, which were mentioned in the information

Table 4
Awareness of the means of alert
If an industrial catastrophe were to happen in your area, do you know how you would be alerted?

After the information campaign ($n = 425$)		After the accident of La Mède ($n = 508$)		
			Informed persons	Uninformed persons
Yes	55%	Yes	78.5%	62%
No	45%	No	21.5%	38%

brochure distributed to the inhabitants: “listen to the radio,” “do not go to pick up your children from school,” “do not telephone” and “go home.”

In order to check the impact of the public information procedures with more precision, we also used the title of the “closed” question used in the initial survey. From the answers to the question “in case of disaster in a nearby plant, what would be your spontaneous reactions?” a very clear evolution of the results can be noted. All inappropriate behaviour diminished and the appropriate reactions increased. The difference is very significant. The inhabitants near the plants understood that they were not to pick up their children from school nor to go to their relatives, call the firemen, flee, take their car, go to the place of the disaster nor call the plant for information. However, everybody understood the advice on staying indoors very well, such as “to seal doors and windows, to shelter in the nearest building when outdoors or to stay where you are when you are already indoors.” As for the advice “listen to the radio,” which had already been the proper behaviour mentioned in the preliminary survey, it was now quoted even more frequently than before (see Table 3).

It can be noted that the preventive information procedure was not really successful concerning the identification of the alarm systems. One out of two declared being completely ignorant of how they would be informed in case of industrial disaster and only one out of three thought themselves capable of recognising the alarm signal (see Tables 4 and 5). These results show that the information campaign only had a “cognitive” impact as a contribution to the knowledge of the emergency plans’ organisation, but did not reach its goal on the “practical” side.

Table 5
Identification of the alert siren

Do you think you would recognise the alert siren announcing an industrial catastrophe in a nearby facility? After the information campaign ($n = 425$)		If the siren had sounded, would you have been able to recognise it?		
		After the accident of La Mède ($n = 508$)		
			Informed persons	Uninformed persons
Yes	35%	Yes	35%	23%
No	65%	Perhaps	36.5%	33.5%
		No	28.5%	43.5%

At any rate, this empirical data only corresponds to "presumed" behaviours and not to real ones. Apart from having evidence on these facts due to a real disaster, it was impossible to know whether these declarations would be followed by acts reflecting the given intentions. We were able to measure the pertinence on May 30, 1991, when an explosion in the Shell plant in Berre l'Etang occurred, and later with the disaster in the Total plant in La Mède.

3.3. Evaluation of the impact of public information policy during a crisis

Three years after the information campaign led in the towns of the Etang de Berre, there was a very serious explosion on November 9, 1992 in the Total refinery situated in La Mède, a neighbourhood of Châteauneuf-lès-Martigues. The municipality and the factory director had actively joined sides with the State to inform the citizens concerned of the risks of the refinery and the measures to be taken in case of disaster. A more in-depth action in schools had mobilised the entire teaching staff. It was the ideal occasion to assess the relevance of the public policy as, in this case, the authorities had made a maximum effort.

The explosion happened at 5:16 a.m. Six workers died in this accident. The damage was very serious (FRF2.4 billion). Taking into consideration the definition of disaster in the Seveso Directive, the accident in the Total plant definitely corresponds to these criteria as was shown by the expert's appraisal carried out by the Ministry of Environment. Since this regulation became effective, it is the most serious industrial disaster that ever happened in France. In spite of this being a major accident, it must be pointed out that the procedure of alerting the population was not used. The alarm was not switched on (which, by the way, would have been quite useless considering the size of the explosion) and the first information on the radio was only given three hours after the first explosion. The argument given to justify this silence was that the inhabitants were no longer in real danger as the explosion had happened and that it was useless to worry them by requesting them to take the appropriate safety measures.

Just after the accident, we made about 100 qualitative interviews in order to find out how the inhabitants perceived the event. On this basis, we elaborated a questionnaire consisting of closed questions that was given to 508 people living within a distance of 100 to 300 m around the La Mède plant, in Châteauneuf-lès-Martigues and in Martigues within a distance of 1 to 2 km (see Fig. 1).

The serious damage caused by this explosion was not limited to the plant. The neighbours were particularly concerned, as 84% of the La Mède inhabitants declare having suffered significant damages: shattered windows, collapsed ceilings, torn-off shutters (see Table 6). The data collected in the survey is comparable to the actual complaints registered by the insurance companies. An article of the Martigues municipal bulletin reported the incident as follows: "On the main road in La Mède, countless shop windows exploded. That is just the outside. Inside, entire apartments were blown out, ceilings had collapsed, houses moved. Both schools were fully exposed to the explosion's blast which was heard at a distance of up to 50 km."

After the explosion, the people living near the plant got up despite the early hour (5:16 a.m.), and went out to go to the place where the accident happened. Within the

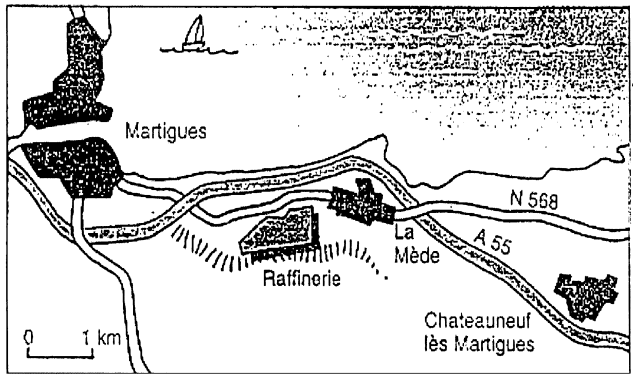

Fig. 1. Plan of the scene of the accident of November 9, 1992 in La Mède.

first seconds following the explosion, 64% of the people interviewed in La Mède confirm having gone out and 10% acknowledge having fled. Those who did not go out immediately after the explosion did so within the following quarter of an hour. However, in Martigues and Châteauneuf-lès-Martigues the majority stayed at home (see Table 7).

And yet, the brochures, which had been distributed in the spring of 1989 during the information campaign, specified that the best protection in case of disaster is to stay inside. It seems that the place where people were living was a decisive factor to explain the different behaviour when this explosion happened. However, the reaction of the "informed" people, i.e. those who declare having received the information brochure in 1989, and the "uninformed" people was not as different as we might have expected.

People's reactions seem to have mainly been conditioned by the proximity of their home to the plant. In any case, there was no panic and the inhabitants' reactions were not due to helplessness or the loss of self-control. Certainly, the fact that they went out

Table 6
Damage caused by the accident of November 9, 1992 ($n = 508$)

Have you suffered damage as a result of this explosion?			
	La Mède	Martigues	Chateauneuf
Yes (%)	84	7	26
No (%)	16	93	74

If yes, what kind of damage? (several replies are possible)	
Broken windows	76.5%
Cracked walls	24%
Broken doors or furniture	22%
Roofs or shutters ripped off	12.5%
Collapsed ceilings	8%
Others	8.5%

Table 7
Actual reactions following the La Mède accident ($n = 508$)

In the first seconds, what were your first reactions? (open question)					
	La Mède	Martigues	Chateauneuf	Informed persons	Uninformed persons
I went outside (%)	64	33	20.5	31.5	35.5
I got up, but I stayed shut in at home (%)	20.5	34.5	16.5	26	28.5
I did nothing in particular, I stayed in bed (%)	8.5	28	50.5	35	29.5
I listened to the radio (%)	11	21	18.5	16	19
I made a phone call (%)	1	3.5	2	2.5	3
I fled (%)	9.5	0.5	0.5	2	2
Others (%)	–	1	2	1	1

cannot theoretically be considered as inadequate behaviour, as no instructions had been given in this sense by the authorities. In theory, nothing forbade people to go out, as the alarm had not been switched on. However, taking into consideration that the information campaign in the spring 1989 strongly recommended staying inside, not only in the case of an alarm, but also as an elementary precaution when confronted with danger, these results are rather astonishing, especially for the people living near the plants, i.e. the inhabitants of La Mède, who left their homes.

As the panic hypothesis is not appropriate, the second possible explanation is the lack of knowledge concerning the safety measures to be taken in such a situation. The results, however, certify that that the alarm modes are well known even if the tone of the alarm is not yet well identified. There was a clear improvement compared to the results of the preliminary survey and the research carried out after the campaign, where 79% of those who were informed on this occasion confirmed they now they know how they would be informed in the event of an industrial disaster. However, it can be stated that only a minority (35%) think that they are able to recognise the alarm tone (see Tables 4 and 5). In any case, there is a significant difference between the preliminary informed group and those who were not aware. The violence of the explosions on that day was such that any alarm would not have changed anything, as its function is to inform people of a danger. It seems clear that the efficiency of the preventive information campaign cannot be doubted.

Apart from the alarm identification, the influence of this campaign is even more obvious as far as learning the safety measures is concerned. Among the people who had received the information brochure, 74% said that they know the instructions compared to 30% of the people who did not get this document. In comparison with the September 1989 survey, carried out just after the campaign, the figures show the same progression. Moreover, a detailed analysis of the knowledge about the safety instructions (stay inside the house, listen to the radio, not pick up children from school) shows they were very well remembered (see Table 2). However, good knowledge of the instructions does not seem to have had the expected influence on the inhabitant's behaviour at the time of the accident.

Table 8
Applicability of security instructions in an emergency ($n = 508$)

Do you think that the instructions should have been applied in that particular situation?					
	La Mède	Martigues	Chateauneuf	Informed persons	Uninformed persons
Yes (%)	15	50	38.5	46	37
No (%)	27	15.5	30.5	23.5	19.5
Don't know (%)	58	34.5	31	30.5	43.5

Do you think that these instructions are efficient in the event of a very serious explosion, likely to affect the population?

	La Mède	Martigues	Chateauneuf	Informed persons	Uninformed persons
Yes (%)	17	62.5	56	60	43
No (%)	83	37.5	44	40	57

The hypothesis of a lack of knowledge of the alarm procedure or of the safety measures does not explain the inhabitants' reactions. The impact of preventive information is obvious. There is not only statistically a higher number of the people amongst those who received the brochure who declare being informed about the instructions and who know how they would be informed in case of an alert, but also it is clear that qualitatively their answers are much more precise. However, even if this knowledge is necessary, it is not a sufficient requirement to change the populations' behaviour in case of major disasters. This fact must be explained otherwise the preventive information

Table 9
Search for information during the accident ($n = 508$)

When the explosion happened, did you try to obtain any information?

	La Mède	Martigues	Chateauneuf
Yes (%)	83	68	38.5
No (%)	17	32	61.5

If so, how?

	La Mède	Martigues	Chateauneuf
By going out and asking people in the street or at the plant (%)	63.5	13.5	19
Via the media (radio, TV) (%)	41	83.5	82.5
On the telephone (%)	1.5	14.5	11.5

(The total is over 100% because more that one reply was possible.)

If you listened to the radio, which station(s)? (Open question)

Radio Maritima	Radio Monte Carlo	France Info	France Inter	Sky Rock
61%	10.5%	9.5%	8%	3%

Table 10
Evaluation of the sincerity of the reports during the accident ($n = 508$)

Do you think you were told the truth at the beginning of the accident? …during the accident? … after the accident?	La Mède			Martigues			Chateauneuf		
	Beginning (%)	During (%)	After (%)	Beginning (%)	During (%)	After (%)	Beginning (%)	During (%)	After (%)
Yes, very much so	2.5	4	5	6	6	10.5	6.5	5.5	10
Yes, fairly	6.5	6.5	18	12.5	16	17	12.5	11.5	11
More or less	12	22.5	23.5	21.5	21.5	26.5	23.5	25.5	27
No, not really	8	10.5	13	31	30.5	27.5	27.5	30	34
No, not at all	71	56.5	40.5	29	26	18.5	30	27.5	18

campaigns could be discredited. Before concluding, the reasons must be analysed to understand why this knowledge was not applied during the crisis.

Our explanation is that this knowledge was not situated in its context. Indeed, the main objective of the preventive information is to prepare the inhabitants for protection in extreme catastrophe situations, which are a real threat for the populations. Therefore, it is important to determine the dividing lines between this and other types of accident. Our research showed that the people concerned had a lot of difficulty discussing this, as no connection was made between the preventive information and the crisis. The inhabitants wondered if the particular context they were faced with was indeed to be considered as a major accident. This hesitation is more particularly true for the those who live near the plant in La Mède, as 58% of them confess their doubt and say that they do not know if the instructions were to be applied in this specific situation. As they were uncertain, they thought this was not useful; as their windows had shattered, it was useless to stay inside. Thus, 83% concluded that the instructions were not efficient in case of serious explosions which can affect the population (see Table 8).

So it does not seem to be the lack of knowledge of the safety instructions that can explain the behaviour of the inhabitants of La Mède but the fact that it was impossible to put them into practice in the case of an explosion. People went out, because staying inside the house without windows and with ceiling, which could cave in at any moment,

Table 11
Feeling of fear at the time of the accident ($n = 508$)

When you heard the explosion, were you afraid?	Yes, terribly (%)	Yes, a lot (%)	Yes, fairly (%)	More or less (%)	No, not really (%)	No, not at all (%)
La Mède	43	20.5	14.5	5	8.5	8.5
Martigues	18	28	24	12.5	9	8.5
Chateauneuf	4.5	15.5	17	17.5	24	21.5

Table 12
Perception of the seriousness of the accident ($n = 508$)

At the time, did you think that the accident was minor, serious, very serious…? After the incident, did you think the accident was minor, serious…?						
At the time				After the accident		
	La Mède	Martigues	Chateauneuf	La Mède	Martigues	Chateauneuf
Minor (%)	0	1	7	0	0	0
Fairly serious (%)	6	5.5	15	2.5	1	1
Serious (%)	12	46.5	37.5	6	26.5	15.5
Very serious (%)	61.5	39.5	36.5	60	56	61
Major (%)	20.5	7.5	4	31.5	16.5	22.5

they felt more in danger than outside. If instructions to stay indoors had been given at that moment, it is not sure that they would have followed them, as they were convinced that they made no sense in this context.

In order to overcome this uncertainty, their reaction was to try to understand what happened by searching for information. The inhabitants think that they were not informed well enough by the authorities. The missing contact made them feel that they were not told the truth about the situation. Therefore, they tried to find out on their own, more particularly by listening to the radio, as is confirmed by the statements of the inhabitants of Châteauneuf and Martigues. Here again, empirical data shows the importance of local and contextual information as they listened to local radios (Radio Maritima and Monte Carlo), whereas the brochures they had received suggested listening to a national radio station (France Inter 1852 m on the long wave), which did not give any information on the event, contrary to the local radios (see Tables 9 and 10).

The inhabitants of La Mède said that they tried to gather information by questioning people in the street (63%). When there was discussion near the factory, they spontaneously opened an informal public debate. The result is that their perception of the situation's evolution differs greatly from the comprehension of those who stayed at

Table 13
Perception of the consequences of the accident ($n = 508$)

At any time during the accident, did you think that it could have turned into a real catastrophe?			
	La Mède	Martigues	Chateauneuf
Yes (%)	52	72	73.5
No (%)	48	28	26.5

Did you ever think that the population close to the accident could have been killed?			
	La Mède	Martigues	Chateauneuf
Yes (%)	42	86.5	83.5
No (%)	58	13.5	16.5

home. Although they were the most frightened at the time of the explosion, they showed themselves to be the calmest after the incident. Immediately after the accident, 82% thought it was a "major" or "very serious" one, whereas only 40% in Châteauneuf and 47% in Martigues respectively thought this. Forty-two percent said they had been "terribly frightened" when hearing the explosion compared to 5% and 18% in the other towns. However, their opinion on the possible consequences are much less pessimistic: 52% against 74% and 72% on the other sites thought that this "might become a real disaster" and the difference is even greater when they were asked if they thought "that the lives of neighbouring populations were in danger" (42% thought this in La Mède compared to 83% and 86% anywhere else) (see Tables 11–13).

4. Discussion and conclusion

Despite the impact of the accident of November 9, 1992, the authorities neither warned nor informed the immediate neighbours of the Total plant because they thought that it was not necessary, as they were no longer in real danger after the explosion. However, the inhabitants felt otherwise about it. In their opinion, the seriousness of this event should have given rise to immediate information. The confirmed gap between the populations' expectations and perception on the one hand and the authorities' analysis on the other hand does indeed represent a problem. However, there was no panic and no particular feeling against the director of the plant or the Total Group. The fact that people had not lost confidence despite the dramatic situation they had been through is, without doubt, deemed to be the real benefit of the prior information campaign.

The accident in La Mède clearly showed a misunderstanding: in the mind of the state representatives, the "public information" simply meant the alarm stage and its aim was to condition people in such a way that they associate appropriate safety measures with the alarm, like staying at home, whereas in people's mind, this first stage necessarily should have been followed by more detailed information on the nature of the risks they were exposed to. The results of our research reveal indeed that the alarm period, where the people living near the plant site are ready to comply with the authorities' instructions without discussion, is followed by another period during which they wish to compare their views with others in a public debate and more particularly with those of the authorities in order to understand their pertinence.

The measures for the public's information in case of major industrial accidents were made to comply with the logistic measures for emergency intervention, whereas the public's expectations cannot simply be reduced to the authorities' main concern for efficiency. On one side, the main requirements are technical and operational, on the other side they are psychological. Referring to Habermas's [13] theory of public debate, the misunderstanding between authorities and the public can here be explained by the confrontation of two different modes of reasoning: the instrumental reasoning, adopted by the authorities, implies using means that are most adapted to the goal, i.e. a strategy primarily aiming at making the action succeed, and a reasoning through dialogue, adopted by the population, which is a behaviour centred on communicational exchanges,

which attempts to find harmony between the opinions held by them and the other participants.

Thus, the authorities only considered the "real risk" and neglected the "perceived risk." This experience shows, like many others before it, that the excesses which can create trouble in such a situation, for example panic, dramatisation or rumours, are the result of "perceptions" and not only of the objective view and actual seriousness of the disaster. The aim of informing the neighbouring populations is first of all to guarantee their safety by reminding them of the elementary safety measures and secondly to prevent this type of excesses, which may, in the long run, be more harmful than the actual danger. However, the authorities seem to decide only on the basis of the actual danger if the populations must be informed and not according to their "perceived risk," which means their subjective understanding of the event, or their emotions or imagination.

The possible distortions between "real risk" and "perceived risk" may strongly be increased in the case of technological danger, as with the disasters concerned by the Seveso Directive. Some fires or explosions are spectacular, but not very dangerous for the inhabitants, whereas the spreading of a toxic cloud can be lethal without being perceptible. Therefore, there is no relation of cause and effect between the actual danger of a disaster and the "indicators" or "signs" suggesting such an extent of the danger. The current operating schemes of cognitive understanding of danger are ineffective to correctly understand this type of risk. One of the main particularities of technological accidents compared to other major danger such as natural disasters is precisely this lack of a link between the "actual seriousness" of the event and the "perceptive understanding" of the danger.

This result of our research shows the importance of distinguishing the procedure used to master the "actual seriousness" of an accident from the one related to its "perceptibility" by the inhabitants. In other words, the public information methods must also be elaborated based on the "understanding" of the incident and not only in respect of its real danger. So we can ask here if it is actually useful to apply the same alarm and information procedures for fires (or explosions) and toxic clouds.

We now understand the determining importance of information, which restores the link between observable reality and the actual danger of the accident. The survey carried out after the La Mède explosion clarified the essential role of having factual references. Thus, the elaboration of exact contextual indications in space and time contributed to a better understanding of the facts, making it easier to master the origin of anxiety. These results emphasize the importance of public debate on the cognitive interpretation of the disaster situation. They suggest that the people who had been able to confront their initial opinion with others and, at the same time, understand directly on site how the evolution of the situation may have influenced their own judgements, became calmer and more lucid over time. Those, however, who did not have the occasion to discuss with others, showed a tendency to dramatise and worry more and more about the evolution of things. The result of a direct dialogue on site was to make the possible consequences of the disaster less dramatic, whereas the simple fact of listening to the media had the opposite effect. Thus it seems that the possibility of understanding the pragmatic importance of theoretical safety standards is a decisive factor.

As the crisis situations are moments, which reveal the appropriateness of the rules governing public action, they represent privileged moments to engage public discussions on the current standard principles (Gilbert [14]). The German philosopher Habermas [15,16] thinks that the essentials of this type of discursive exchange are a moral reasoning aiming at confronting standards with facts. As the legitimacy of the established order in modern political systems has its foundation in the capacity of a normative system to resist to rational counter-arguments on the basis of facts, the public discussion and the confrontation of opinions between civil society and public power within the public sphere are essential to maintain democratic balance [17].

By tradition and necessity, the state attempts to overcome industrial disasters without making "publicity" about its action. Entirely oriented towards the success of emergency measures and by the wish to prevent any excesses in emergency plans, the authorities neglect public communication. By trying to avoid public debate in crisis situations, public authorities not only risk being confronted with a rationality crisis of the civil safety measures, but also to a legitimacy crisis following the suspicion that their silence could cause in public opinion, as Lagadec [18] extensively analysed. If the successive disasters during the last 20 years were such potential sources of political destabilisation, the reason is not only that they clearly showed the weakness of the public safety means for the public control of industrial disasters, but also because they openly highlighted the state's readiness or hesitation to publicly and frankly account for the manner in which it carried out its mission (Salomon, [19,20]).

The accident in La Mède showed the limits of a strictly administrative concept of emergency plans, limited to technicians and experts only. Under the pretext of making things technically operational, the public authorities did not find necessary to inform the populations about the dangers, whereas the explosion had killed six workers and caused damage within a distance of 50 km. The Seveso Directive II aims to repair this shortfall by now providing for the direct participation of citizens in the elaboration of the plans. However, it should be mentioned how such participation can be a factor of progress in relation to a concept that is purely technical and how it could contribute to improve the emergency intervention plan.

The citizens' contribution might first of all integrate the local dimension in the emergency plan's elaboration. Without leading to ad hoc plans specific to each plant, a local study of the plants could integrate specific points related to the type of products used as well as to the possible damage, to specific geographic factors of the environment and to the participants concerned. In our survey, we pointed out the harmful influence of a lack of exchange between preventive information and the accident so the inhabitants were not able to relate the security instructions — which had been set up in an abstract manner — to the particular situation they were confronted with. On the other hand, we have been able to see how the fact that the populations' request had been taken into consideration had, for example, led to appropriate action in the schools or made people switch over to local radio stations instead of national ones during the alarm period.

The other item for which the citizens' participation could be an advantage for the civil safety experts is when taking into consideration the psychological and sociological parameters and not only merely technical criteria. As was extensively explained by Quarantelli's analysis [21] of disaster carried out by the American Disaster Centre, major

disasters can cause a weakening of social unity, bringing victims closer to others in crisis situations. According to Slovic [22], this is the reason why the information procedure in itself is an element that builds confidence between citizens and authorities. On the other hand, the authorities' silence generates suspicion, as our own empirical results show. These conclusions confirm also Habermas's thesis [23,24] according to which the procedural methods of public debate create a consensus by themselves.

If we admit that the fact of communicating with the population in the context of industrial disasters makes the event less dramatic, it would then be desirable to provide for systematic public information within the emergency plans without waiting to see if, technically, the accident with which people are confronted, is "very serious," "minor" or "catastrophic." In France, the "Collège de la Prévention des Risques Technologiques," a consulting institution under the Prime Minister's orders, communicated a recommendation in this sense which specifies more particularly the need to clarify the respective responsibilities of the mayors and prefects (avis No. 20 of June 20, 1995, on public information in case of serious industrial accidents). It also requests that the public is systematically provided with information without waiting for the Plan Particulier d'Intervention — Specific Intervention Plan (PPI) to be declared and that this responsibility is clearly stated in local legislation. The recommendation finally concludes, with some humour, that it is important to set up training programmes for the responsible authorities, i.e. mayors and prefects, in order to come to an efficient collaboration of the authorities in charge of emergency management and an effective public information in crisis situations.

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