RISK COMMUNICATION
AND PUBLIC PERCEPTION OF TECHNOLOGICAL HAZARDS

Second Volume

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CONTENTS

INTRODUCTION

Risk communication can be improved only knowing how risk perception is determined and by which factors it is influenced. Going deeper into the study, the researcher discovered how the first questions become dilemmas, the actors involved increase in number, the managerial aspects drown in a sea of theory. This is why a large number of variables needed to be included in one only framework. For this purpose a synthetic table was elaborated in order to find out how a category of the variable could influence towards an overestimation of risk, a balanced perception, or even an underestimation. How to use this information? Just identifying in each specific case which factors lead to an overerestimation, and trying to obtain an accurate perception with "complementary" factors.
Finally, another "risk" has been faced: the one of drawing recommendations with too much generic proposals. Many tools belong to risk communication. They are used by many companies as public relations instruments, just to "cosmetically" improve their image. The recommendations outlined at the end of this project give a picture of "which" are the first objectives to be pursued, "who" - in a stakeholder system - can better achieve them, "how" - in the European framework - those actors can improve the effectiveness of the communication process.

The report is divided into the following chapters.

Part One:

- Chapter 2 describes the project design, with its subject matter, objectives, questions, methodology, results.
- Chapter 3 describes the links between risk communication, risk perception and risk management both in an historical, in a theoretical and in a managerial perspective.
- Chapter 4 reviews the main findings coming from the available risk perception literature, ordered by stakeholder.
- Chapter 5 outlines a framework (divided into the "First Table" and the "Second Table"), in order to analyse specific cases where the risk communication strategy is necessary.

Part Two:

- Chapter 6 describes the company to which the technique has been applied. This company embodies a case of risk communication problems, with an history of fights between the stakeholders involved and the untied knots.
- Chapter 7 presents the results of the case analyses. The "First Table" is used to find out a statistic description of some risk perception variables appeared in the local newspapers. The "Second Table" is used to discover in a qualitative way which and how some other risk perception variables influence the process.
- Chapter 8 outlines the recommendations as they come out from the previous Chapters. The recommendations are drawn as for companies in general, but particularly referring to the case study. The context is that of the European legislative framework (new Seveso Directive 96/82/EC, EIA Directive 97/11/EC), the existing environmental management systems (EMAS and ISO 14001), the "non regulated" communication tools.
- Chapter 9 presents the conclusions and the achievements, the problems faced in the course of the research, the ways in which the methodology can be improved.

6) CASE DESCRIPTION: PORTO PETROLI OR OIL HARBOUR

6.1) Introduction

In this Chapter it is briefly described the Oil Harbour case in some aspects which are relevant for this project. It is outlined the Oil Harbour activity; it is provided a description of some events which have been relevant in the conflicts arose about the industrial system in the area of Multedo (see Figure 6.1); finally, they are presented the results of some studies of risk analysis about the plant. This Section is linked to the importance of an integration between risk assessment and communication (Chapters 3 and 8).

For synthesis exigency some information is provided in a so succinct form that it will seem generic: it is opportune to underline that the following information is aimed to provide a global picture and a background to the following Chapters (in particular Chapter 7).

6.2) Company description

The oil terminal of Genoa Multedo is one of the most important in Italy and Europe. With Trieste and Marseilles, it holds a relevant position in the Mediterranean oil traffic. Within the Italian harbours contends with Trieste for the primacy and is more important than Augusta and Melilli in Sicily and Saroch in Sardinia, for the oil products quantity moving and transferring through its stock and distribution system.

The terminal handles crude oil, final products (petrol, gasoline, fuel oil), semi-manufactured, and basic petrochemical product, for a maximum total capacity of 30 million tonnes per year.

The terminal function is that of transferring the product from the boats to the land deposits, and it is lacking in stock tanks in the harbour area. It stretches for a total area of 345 000 m^2 (134 000 m^2 on the land) and it has been realised since ‘60s.

It is formed by an inside port where 10 oil-tankers as maximum can moor and by two structures for mooring offshore, reserved to the boats of big tonnage: one platform fixed and one boa mono-mooring, both sit at 1.5 miles from the coast and outrun from about one mile. The inside port has got available: one quay with two wharves for petrochemical boats and four wharves where 8 oil tankers of 130 000 tonnes of burden as maximum can moor.

The cargo is transferred from the ships to the pumping stations of the petroleum companies holders of the harbour (Colisa, Continentale Italiana/Shell Group, Iplom/Olgesa, Pràoil) and thus to the deposits and to the pipelines net. The petrochemical products are handled through pipes which link directly the proper quay for discharging and charging to the Carmagnani and Superba plants.

The platform, fixed at a 50 metres depth, has been installed in the ‘70s, allows the mooring of oil tankers till 500000 tonnes of burden and is linked to the land by a 48” diameter submarine pipe.

The mono-mooring boa is a floating structure riding at anchor on a 60 metres depth. It has been completed in 1982 year, after the petroleum crisis and the subsequent Suez channel closure, and it is fit for oil tankers till 270 000 tonnes; linked to the land by a 42” diameter pipe..

The whole port of Genova Multedo - no more a Port Authority property – is now managed by the Porto Petroli Spa, now company with a private majority (Snam) in which participate all the port users.

From the Porto Petroli 7 big pipelines branch off: Pràoil (2), Erg (1), Continentale (1), Iplom (1), Superba (1) e Carmagnani (1), and a net of minor pipelines and gas-lines for a total of 35 different pipes (data Province of Genoa). The most important plants are the first four which, with their branches, serve a stock_net for a total burden of 1 978 000 m^3 of oil products (crude and refined) leading to three major groups: Erg, Shell and Pràoil (Eni Group).

6.3) Brief case history

The environmental problems in the Multedo area (see Figure 6.1: Polytecna Harris, 1993) are determined by the "medley" between an industrial system and the urban structures. The civil protest started about twenty years ago, by the "Multedo committee" and some environmental associations. Through the years, a dramatic event followed another, provoking the citizens protest. Between the explosion of the super oil-tanker "Hakuyoh Maru" (1981: see Table 6.1) and that of the "Haven" ten years later a series of accidents in the area caused a continuous tension. Another cause of worries is about the toxic emissions of xylene and benzene.

The fights received an answer when in the 1990 the Municipality, the Province and the Region asked to the government to declare the West Coast of Genoa "high risk area" (they obtained the declaration in the 1993).

Nowadays WWF and the citizens committee have a number of proposals that they hope will be satisfied (see Section 7.4). The other stakeholders have other contrasting and not always clear positions that are described in Section 7.4. Here it is important to put in evidence that the actual risk perception has been in some ways influenced by these events through the years, and the company has to take into account some factors which are related to them (see Chapter 7).

Table 6.1: Accidents at Multedo (adapted from WWF, 1996)

Year	Porto Petroli involvement	Accident	Consequences
1979	Indirect	Fire at a tank in the Superba plant	Evacuation of the adjacent houses
1981	Direct	Explosion of the super oil-tanker "Hakuyoh Maru"	6 deaths in the crew; relevant damages to the buildings
1983	Indirect	Urban fire	The flames arrive to lap the wall around the Snam plant
1985	Direct	Explosion of an oil-tanker mooring at the A quay	No one
1985	Indirect	Fire of a tanker in the Carmagnani plant	No one
1986	Indirect	Fire of a tanker in the Carmagnani plant	No one
1986	Indirect	Explosion of the pumping room in the Carmagnani	No one
1987	Indirect	Explosion of a tank in the Carmagnani plant	4 deaths between the workers, 7 firemen injured
1991	Direct	Fire of the super oil-tanker Haven	5 deaths in the crew; environmental damage estimated from ENI Group equal to 650 millions ECU

1992	Indirect	Break of a piping in the Colisa-ERG plant	50 t of oil spill in Valpolcevera
1994	Direct	Hydrocarbons spill from a non-identified oil-tanker, probably after the tanks cleaning operations, near Pegli	Oil spills over all the coastal of pegli
1994	Indirect	Break of a piping Colisa-ERG at the Polcevera mouth	100 000 litres spilled in the Polcevera torrent
1995	Indirect	Oil fuel leak from the pumping station of Morigallo of the Colisa-ERG plant	Oil fuel between 50 and 100 cubic metres spilled in the torrents of Secca and Polcevera

6.4) Risk assessment of the Oil-Harbour activity

Risk within Porto Petroli has been analysed by many studies; the three risk analyses considered in this Chapter are regarded as the most accurate of the last years. From each of them they are taken out some different aspects of the risk, as it follows:

1) risk analysis related to the dockyard activity, by Snamprogetti, 1987: explosion, fire.

2) risk analysis related to the off-shore activity, by Polytecna Harris, 1993: accidents, fire and pollution.

3) risk assessment related to the dockyard activity, by Filse, 1997: sanitary risk due to emissions.

1) The study made by **Snamprogetti** points out more than the other two studies the risk of explosion and of fire:

a) An explosion could be mostly caused by the forming of an explosive mixture in a bound environment, such as a ship tank. It is negligible an explosion into the atmosphere, since it requires particular weather conditions, absent at Multedo. The dangerous radius for the persons is of 400 metres (see Figure 6.2: Polytecna Harris, 1993).

b) A fire could be caused by a product spill due to the break of one of the handling components. The maximum distances (beyond which they are excludible damages, even in the worst conditions) are:

- 100 metres in case of fire at the wharves
- 160 metres in case of fire after sea spills (see Figure 6.2).

2) The study made by **Polytecna Harris** points out that the risk of incident related to the off-shore activity is higher than the risk related to the dockyard activity (see above: “Haven” case). This higher risk regards two aspects:

a) probability
- more difficult controls
- more difficult operations

b) consequences
- less timely interventions
- difficulties in getting under control the damages
- minor availability of personnel and rescue crafts
- great relevance of the marine weather conditions

The risk of explosion would be high if there where many off-shore platforms and so it was probable the approaching of two oil-tanks with inflammable products. Thus, the main risk is that of oil-spill due to an incident.

The risk index contains the spill on the beach probability and relative time. This risk index shows the following results:

- high risk (index = 14.5) for the Voltri Port (see Figure 6.2)
- significant risk (index = 3-6) for the area between Voltri and Savona
- negligible risk (index <1) for the Multedo area.

3) The risk assessment made by **Filse** (1997) focuses on the sanitary risk due to chronic emissions, relating it to the replacement of Porto Petroli beyond the breakwater, near the Airport. This study found in the "zero" scenario two causes of chronic emissions into the atmosphere:
a) the ballast water loading operations, after the discharge (unloading) of the petroleum products;
b) the oil-tankers presence/transit in the port.
This emission is due to evaporation and it regards the volatile fraction of the oil products.

The chronic emissions into the sea water have other sources:
a) accidents of minimum entity, but of high frequency, which happen during the unloading operations;
b) accidental discharges from oil-tankers in transit.
In this case the emissions mostly regard the non-volatile compounds.

Thus the assessment concerns:
1) the "volatile organic compounds not including methane" (NM-VOC), since to them they belong the toxic emissions from oil products;
2) the "polycyclic aromatic hydrocarbons" (PAH), since they constitute the principle toxic components of the non-volatile fraction.

As exposition channels they are considered:
- inhalation
- epidermis contact (also during the bathing)
- accidental ingestion (during the bathing)
- ingestion of contaminate fish

As "exposed population" is considered the actual residential population, but within the following requisites:
- living in the urban unit for at least one year;
- being in the urban unit for at least 6 hours a day;
- being in the urban unit for at least 180 days a year.

Concerning the emission factors due to the ballast loading operations, they are used those suggested by US EPA (*Compilation of Air Pollution Emission Factors*, Vol. 1, 1995), which respectively are:
Crude oil: 0.038 kg/t discharged crude oil
Petrol: 0.040 kg/t discharged petrol

Since data relative to other products are not available, in the calculations it is assimilated the emission factor of the black products to that of the crude oil, and the emission factor of the white products to that of the petrol. This assumption certainly determines an overestimation of the emissions.

Following the calculation methodology proposed by the World Health organisation (*WHO-Management and Control of the Environment*, 1989), for the emission factor relative to the ships presence, it is assumed a value equal to 12.2 kg/day of presence.

The values show how actually (0 option) the benzene expected concentrations result equal to 3.2 μg/m3: 1/5 of the guide value actually given by the DM 25/11/94.
By the obtained results, the medium content of IPA along the coastal area due to the Porto Petroli activity is equal to 2.5 μg/m3. This value corresponds to 38% of the present IPA.

To quantify the sanitary risk they were calculated the "available doses" of the NM-VOC and of IPA, using their typical profiles.

NM-VOC

Compound	weight percentage
Benzene	0.7
Toluene	1.0
Xylene	0.4

POLYCYCLIC AROMATIC HYDROCARBONS (PAH)

Compound	weight percentage
Fluorantene	30
Pyrene	22
Benzo(a)anthracene	15
Benzo(a)fluorantene	9
Benzo(k)fluorantene	4
Benzo(a)pyrene	9

TOXICITY EVALUATION

For the toxicity evaluation of the substances analysed the reference is to the data contained in the data bank IRIS (Integrated Risk Information System) of the US EPA.

The toxicity datum contained in IRIS is expressed as "Reference Chronic Dose" (mg/kg of body weight for day) and so it is homogenous with the "Available Dose". The "Reference Chronic Dose" is defined as the rating of the daily exposition level retained being without risk of harmful effects to the human population (comprehensive of the sensitive segments) along all the life time.

Non carcinogenic risk

By the EPA methodology, the Risk Quotient derives from the ratio between Available Chronic Dose and Reference Chronic Dose. If the Risk Quotient is <1 it is very improbable that they will manifest harmful consequences, even for the sensitive segments. If the Risk Quotient is >1, there is the possibility that they will manifest negative effects on human health. The more the Quotient is high respectively to the unit, the major it is the possibility of negative effects, even if the relation is not linear. Thus the Risk Quotient is not the probability of negative health effect, but as superior limit of the probability of the effects manifestation. To assess the total sanitary risk, the different risk quotients are combined into a Risk Index. By this approach it is assumed that the simultaneous exposition to different toxic substances – each behind the threshold level – can lead to the manifestation of harmful health effects.

This Total Risk Index for the Multedo area is calculated as 1.7.

Carcinogenic risk

The carcinogenic risk is calculated as the incremental probability that an individual has to catch a cancer. The risk ratio is an evaluation of the superior limit of the risk: the real risk is not superior and likely inferior. The Total Risk Index (corresponding to the risk due to benzene) for the Multedo area is equal to 5.2×10^{-5}. Since US EPA considers acceptable risks equal to 10^{-5} and 10^{-4}, the chronic carcinogenic risk due to the port activity is not negligible, but anyway largely acceptable. Moreover, in Italy acceptability values for carcinogenic risk are not fixed, thus it is anyway opportune to minimise it.

Results

The sanitary risk due to the Porto Petroli activity is exclusively caused by the toxic substances inhalation; thus, the mitigation measures must focus on the abatement of atmospheric emissions, especially those of benzene.

Controls on the unloading operations of oil product and in general a major rationalisation of the whole connected activities could reduce the sanitary risk. Nevertheless, these improvements cannot change the total assessment of the sanitary risk. In fact, to reduce the non carcinogenic risk index behind the unit, in the actual configuration, it is necessary to abate the benzene emissions of more than 50%.

This drastic abatement can be obtained by the limitation of the coming alongside to oil-tanks with particular requisites, or allowing the loading by specific procedures. For instance they could be allowed exclusively tank of type SBT (Segregated Ballast Tank), which have segregated systems for the ballast water.
Other possibilities are of course feasible, but they require a deep change of logistic and technological structure. They must be studied and effectively proved, by an Environmental Management System (see Chapter 8).

6.5) Conclusions

As explained in the introduction, this Chapter is aimed at providing a global picture of the case which is more deeply analysed further. In the following Chapter it is reported the content analysis of the press articles published among the case and of the available technical documents. The background information about Porto Petroli is used to corroborate these analyses, but also to outline the recommendations in Chapter 8.

Figure 6.1

Figure 6.2

7) CASE ANALYSIS

7.1) Introduction

The content analysis of the press articles contained in this Chapter is aimed at obtaining a global view of the public risk perception about Porto Petroli, by a descriptive statistics of the categories distribution. First, each variable is considered and analysed individually. Then, a comparative table and some graphs provide a comprehensive picture.
This analysis is completed by a qualitative analysis of: the content of the press articles, the technical documents (see Annexes) and a detailed interview to the spokeswoman of the citizens committee. Some qualitative interviews would complete the research, but the stakeholders contacted by the researcher were not "available", since the situation is now very delicate and since there are a lot of political implications in its development.
Both the quantitative and qualitative analyses are anyway useful to discover which are the most influent variables for the risk perception of the Oil Harbour activity. On this basis, some recommendations are provided in Chapter 8, taking into account the specific stakeholder system described in this Chapter.

7.2) Statistic content analysis of the press articles

According to a research a research mentioned in Chapter 4 respondents were asked to indicate the sources from which they generally received information about environmental risk. Five sources were mentioned: television, newspapers, radio, friends or relatives, and emergency personnel. The mass media dominated, with 98% of the sample mentioning television as source, 91% local newspapers, and 87% citing radio.
Since the local newspapers are one of the most important source of information about the environmental risk, they play a big role in the public risk perception. Therefore, the content analysis of the press articles is considered as a valid technique. The press articles can be useful in two aspects:
- as source of influence;
- as documents which testify the occurrence of some categories more than others.

A) Document sample

The sample of articles for the years 1997 and 1998 (till the end of July) covers the entire universe of articles published during these years and regarding Porto Petroli. The main topic is not necessarily this company, but they contain at least a reference to the company.
The journals that have published news about Porto Petroli are the main local newspapers (especially "Il Secolo XIX" and "Il Lavoro") and some local magazines.
About 77% of the articles published in the two years on Porto Petroli establish a link between the company and the environmental risk (see Graph 7.1a).

B) Categories content

They have been taken out of the variables which influence the risk perception, on the basis of the literature. The categories of each variable have been used as categories for the content analysis.

C) Analysis unit

For the different variables it has been used the same analysis unit: the "sentence". It has been useful both for the articles and for the titles. The different parts of the title ("half-title", title, summary) have been analysed as a whole.

D) Context unit

Different context units have been considered each time, to establish whether the analysis unit belongs to a category or not. It is not useful to specify them.

E) Enumeration system
The number and the percentage of presence has been used as enumeration system for the different categories. The choice is due to the fact that, e.g., the “space quantity” of information has not correlation with risk perception (see Chapter 4).

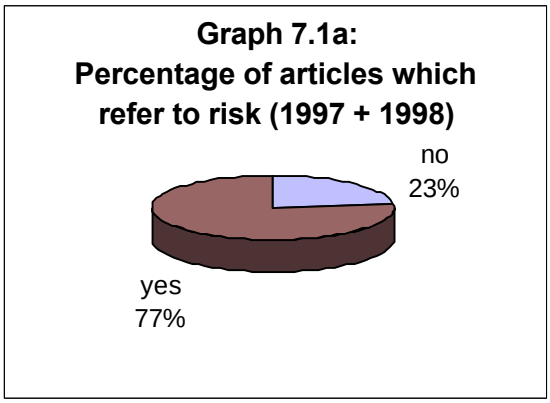
The collected data are reported in Tables (see Annexes). The data refer to the whole year 1997 and the first 7 months of the year 1998. The values about the 7 months of the year 1997 are calculated on the basis of the whole year data, extracting the average “representative” month, and multiplying it for 7.

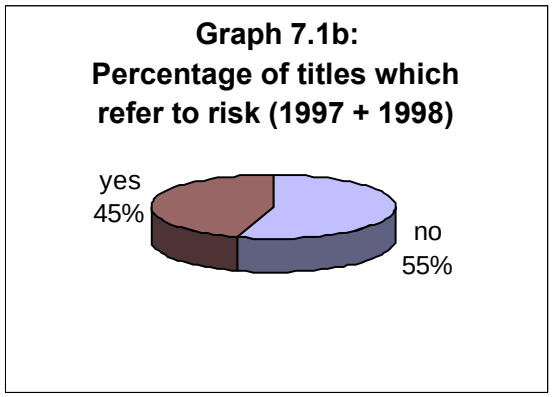
The number assigned to each variable corresponds to the code reported in the literature review (Chapter 4) and in the “First Table” and “Second Table” (Chapter 5). This is useful, since the order is different, for treatment reasons.
The number assigned to the Graphs follow another order: that of their presentation.

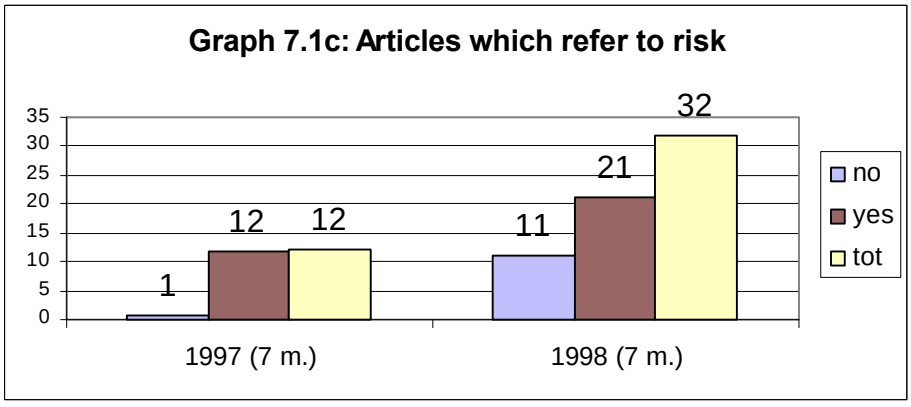
Variable 11) Frequency of received information about risk

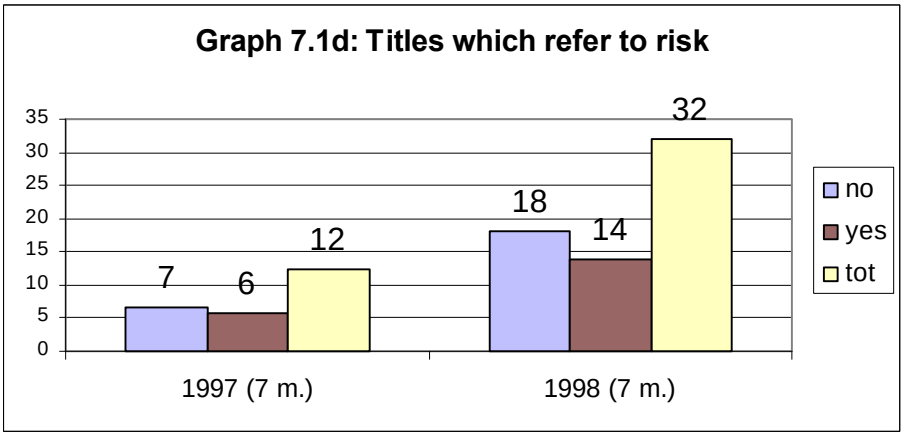
In absolute terms, the number of articles which contain some reference to risk concerning the Porto Petroli activity shows that there is an increase from 1997 to 1998, passing from 11,7 in seven months of the 1997 to 21 in seven months of the 1998. Nevertheless, the percentage scores show that the articles which contain references to risk are relatively more in the year 1997 than in the year 1998 (respectively 95% and 65%). This is due to the fact that in the year 1998 a lot of articles regarding Porto Petroli focus attention more to the economic events (new shareholding order) than to the environmental ones.
The frequency of received information about the risk regarding Porto Petroli is high for the year 1997 (1 every 18 days), but it increases, becoming very high for the year 1998 (1 every 10 days). The fact that the frequency of received information is higher in the year 1998 influences risk perception toward an overestimation in this period.

Frequency of articles which refer to risk:
1997: 1 every 18 days
1998: 1 every 10 days







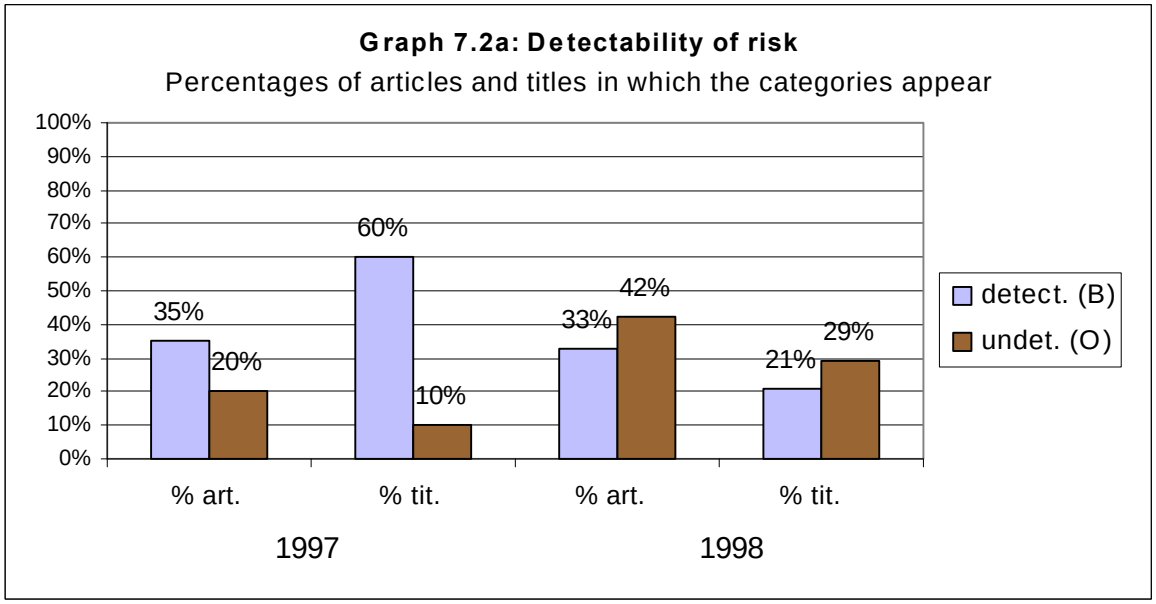


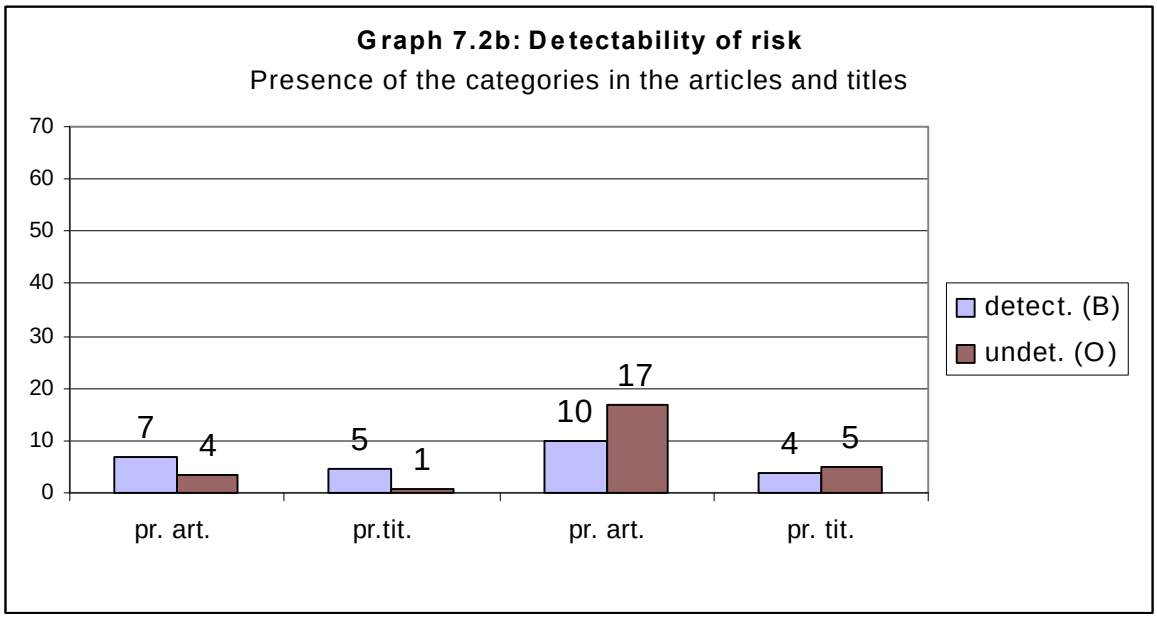
Legenda for the next graphs

ref. risk = total articles or titles chosen as sample (which contain references to risk issues)
art. = number of articles which contain the category (first column)
% art. = percentage of articles which contain the category
pr. art. = presence of the category in the articles
tit. = number of titles which contain the category
% tit. = percentage of titles which contain the category
pr. tit. = presence of the category in the articles
(O) = overestimation
(B) = balanced perception
(U) = underestimation

Variable 1) Detectability of risk

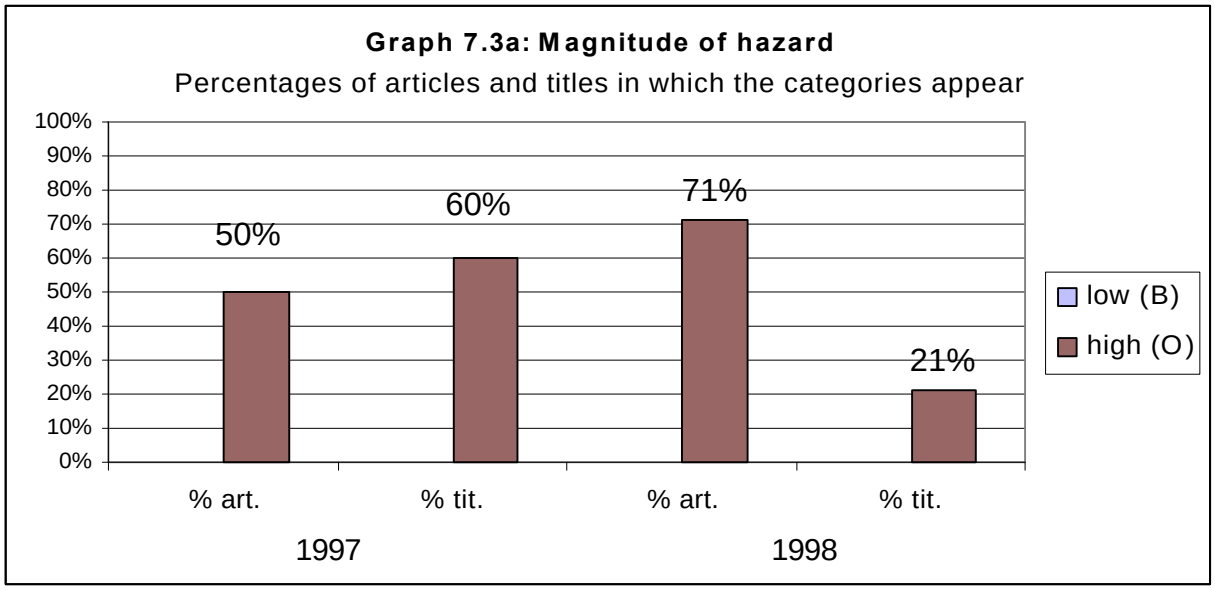
The percentages scores show that the risk involved in the Porto Petroli activity is mostly presented as "detectable" in the year 1997: in fact, the most mentioned risk is that of accident. This could lead to think that there is a balanced perception. Nevertheless, wherever the risk appears as "detectable" it also appears as "highly memorable" and "with high magnitude". This means that two other very important variables are linked to this and influence perception towards an overestimation: the "memorability" of the accidents (see further) and the "magnitude" of them. Moreover, it must not be undervalued another aspect: in the articles where the risk is mentioned more accurately (citing the Filse study) the undetectable risk – even the "non carcinogen" – is more mentioned than the detectable one.
Finally, while in the year 1997 the category "detectable" prevails over the category "undetectable", in the year 1998 the category "undetactable" prevails, passing from 20% of the articles to 42% and from 6 presences to 17 in the articles (see Graphs 7.2a and 7.2b).

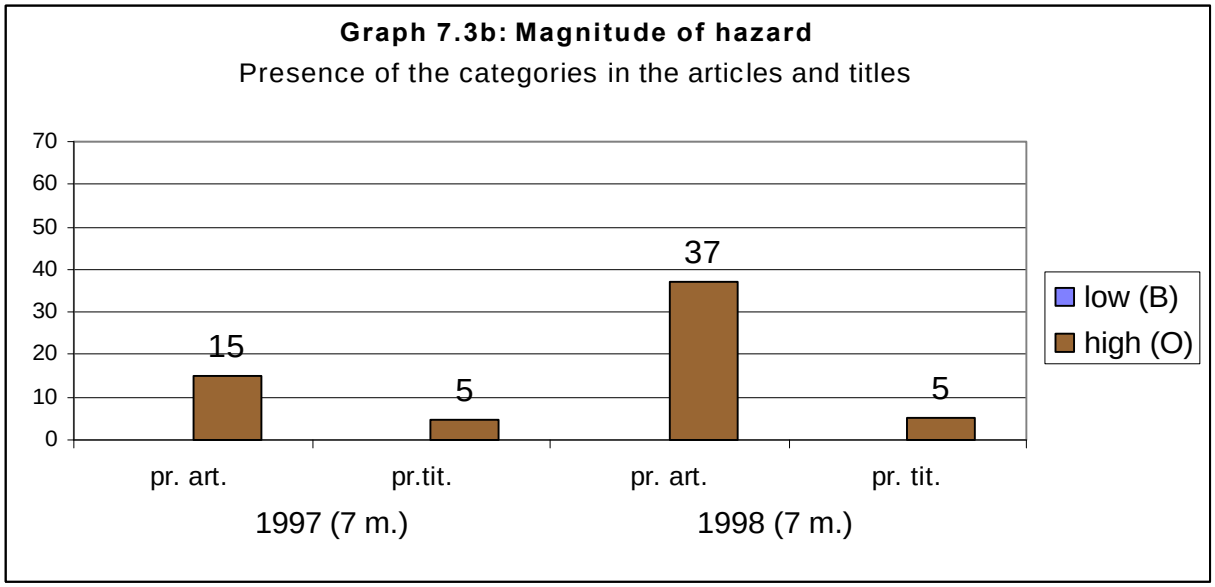




Variable 2) Magnitude of the hazard

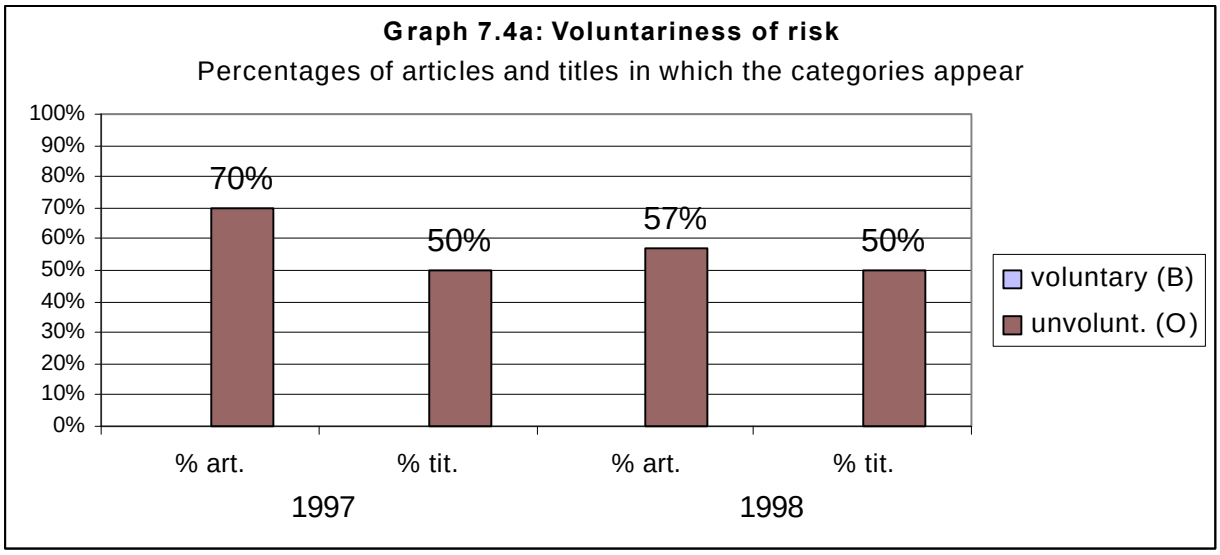
An interesting consideration concerning the "magnitude of the hazard" is that in the articles the risk never appears "mitigated" as "low". No one of the actors declare that the risk is low, neither the company itself. The risk is very frequently represented as "high" during the year 1997 (50% of the articles, 60% of the titles: Graph 7.3a), but the percentage is even higher for the year 1998 when considering the articles (71% of the articles), but not considering the titles (21%). Even the number of its apparitions in the articles is very high (37 presences: Graph 7.3b). This influences the risk perception towards an overestimation.

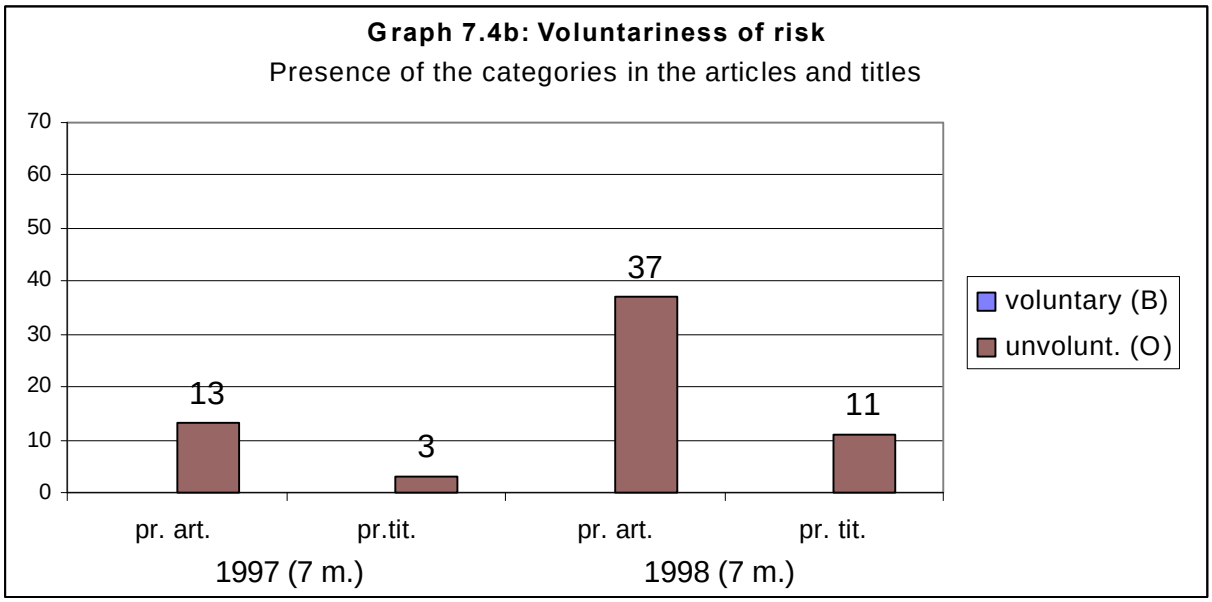




Variable 3) Voluntariness of risk

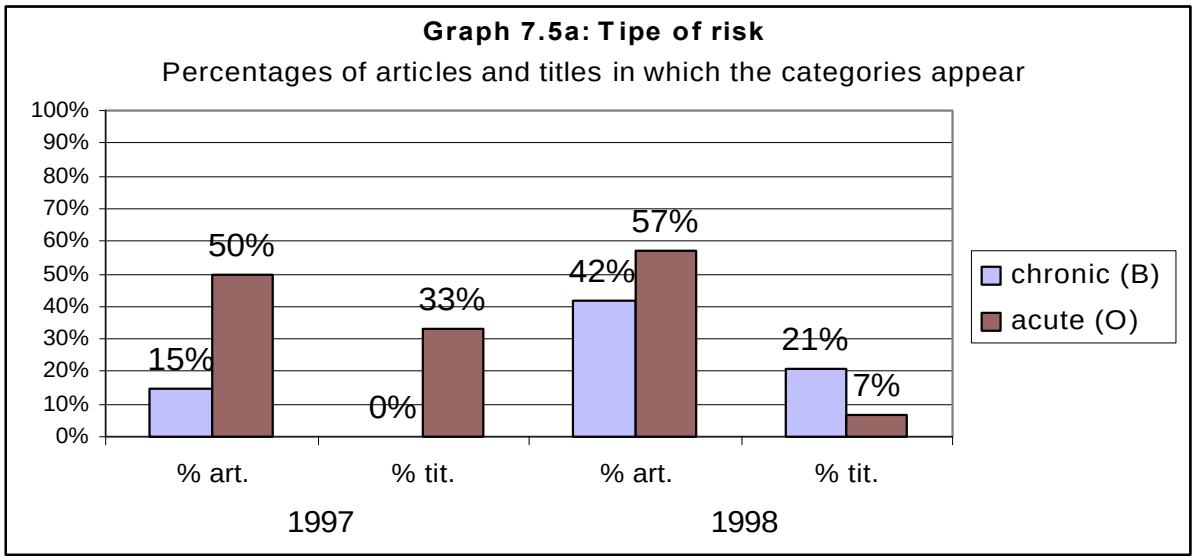
Another interesting category which does not appear at all is the "voluntary risk". Never in the articles the risk deriving from the "Porto Petroli" activity is represented as "voluntary" for the local community, neither for past decisions. The rate for the category "un-voluntary" is very high for the year 1997 (70% of the articles: Graph 7.4a), and it remains high even when decreases for the year 1998 (57% of the articles). The absolute values for the presences of the category "un-voluntary" increase a lot in the year 1998 (Graph 7.4b). The probable overestimation of risk deriving from this category is never compensated for.

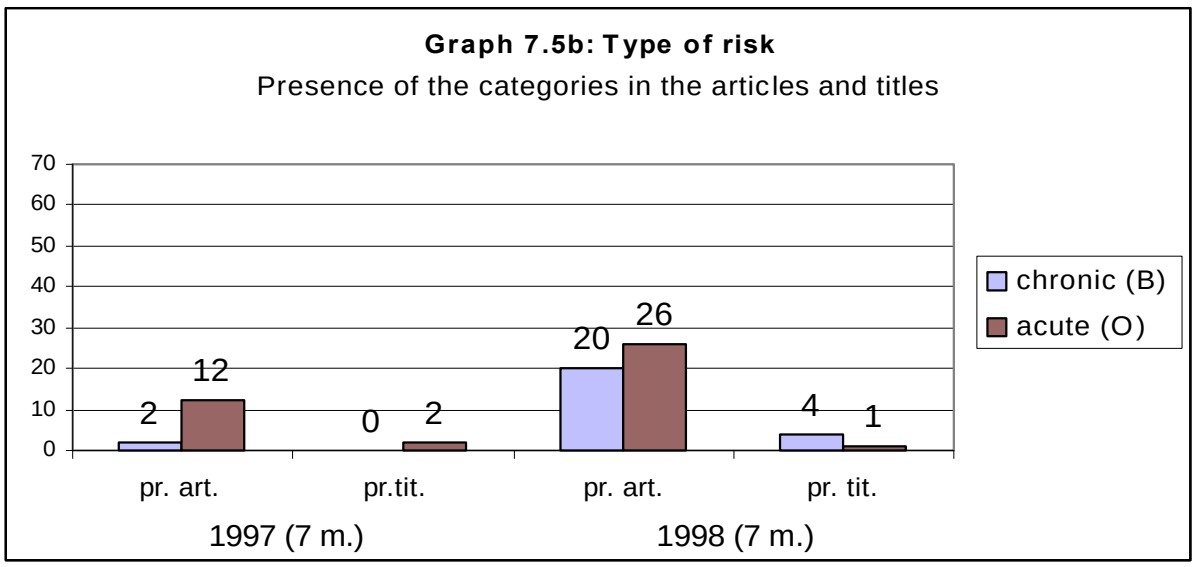




Variable 4) Type of risk

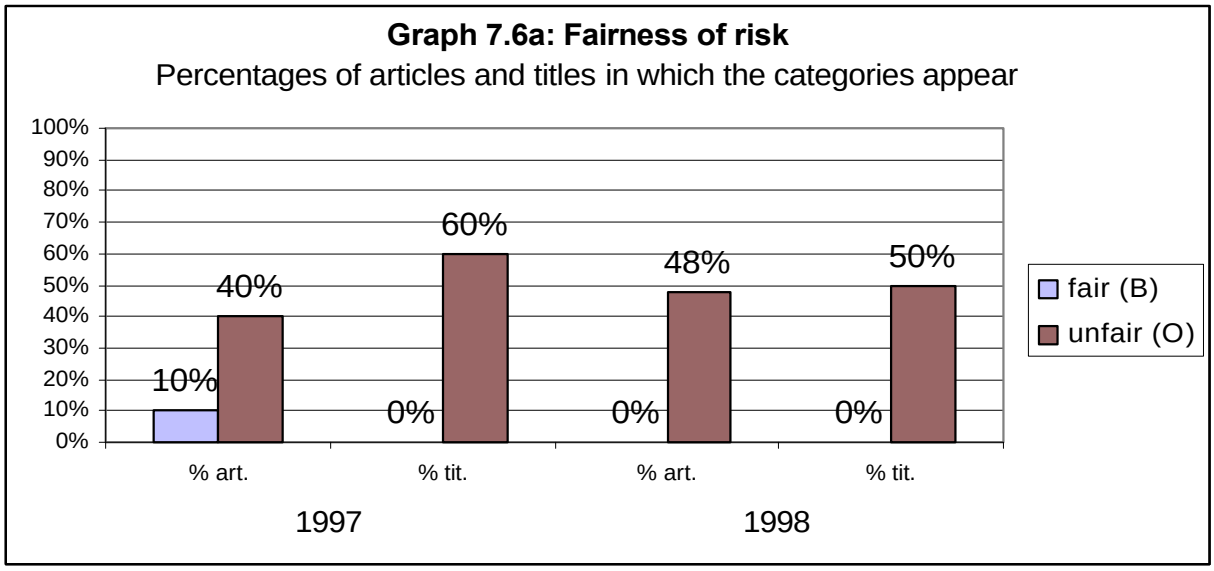
The percentage scores show that the risk involved in the Porto Petroli activity is represented mostly as "acute" (or catastrophic) both in the year 1997 and in the year 1998 (Graph 7.5a). This factor influences the public perception (especially of the local community) towards an overestimation of the risk. The representation of the risk as "chronic" increases in the year 1998 (42% of the articles: Graph 7.5b). Probably it is due to the publicity of the study made by Filse (see Chapter 6), which focuses its analysis on the chronic aspects ("carcinogenic" and "not carcinogenic") of the risk caused by low but constant emissions.

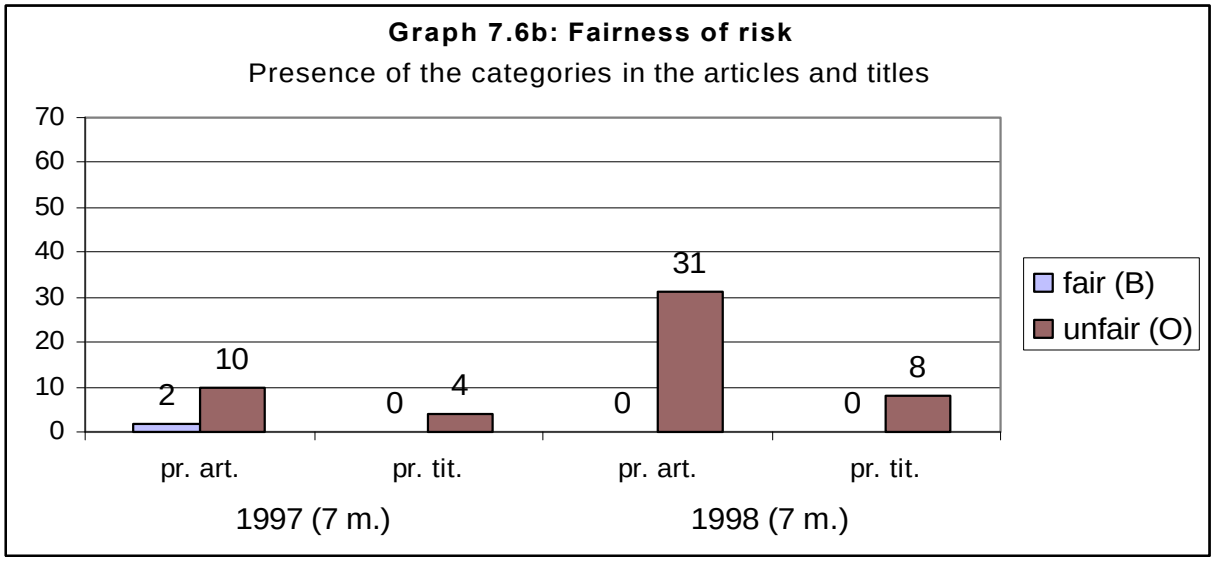




Variable 5) Fairness of risk

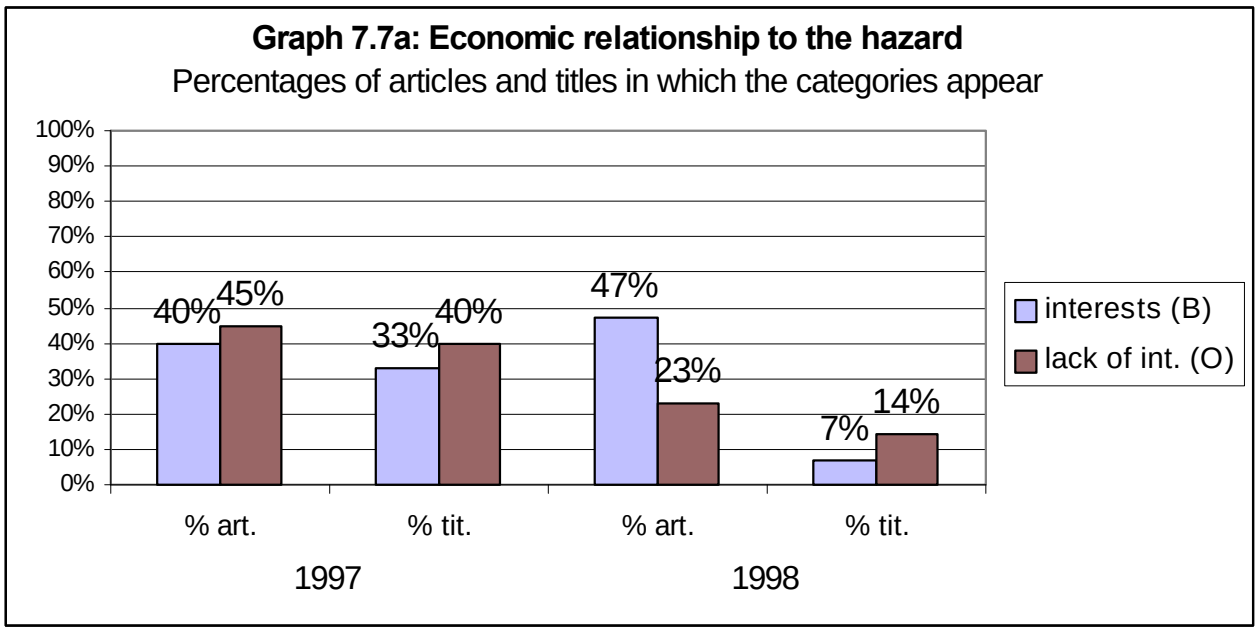
The risk is represented by the press mostly as "unfair" both in the year 1997 and in the year 1998. The scores of the titles result very high (respectively 60% and 50%: Graph 7.6a). It is probably due to the attention that the newspapers try to capture by the titles. The category "fair" is almost totally absent (only two articles in the year 1997: Graph 7.6b). This is a very important variable which influence the local community in perceiving the risk higher, by the fact that very often they are much more angry than scared.

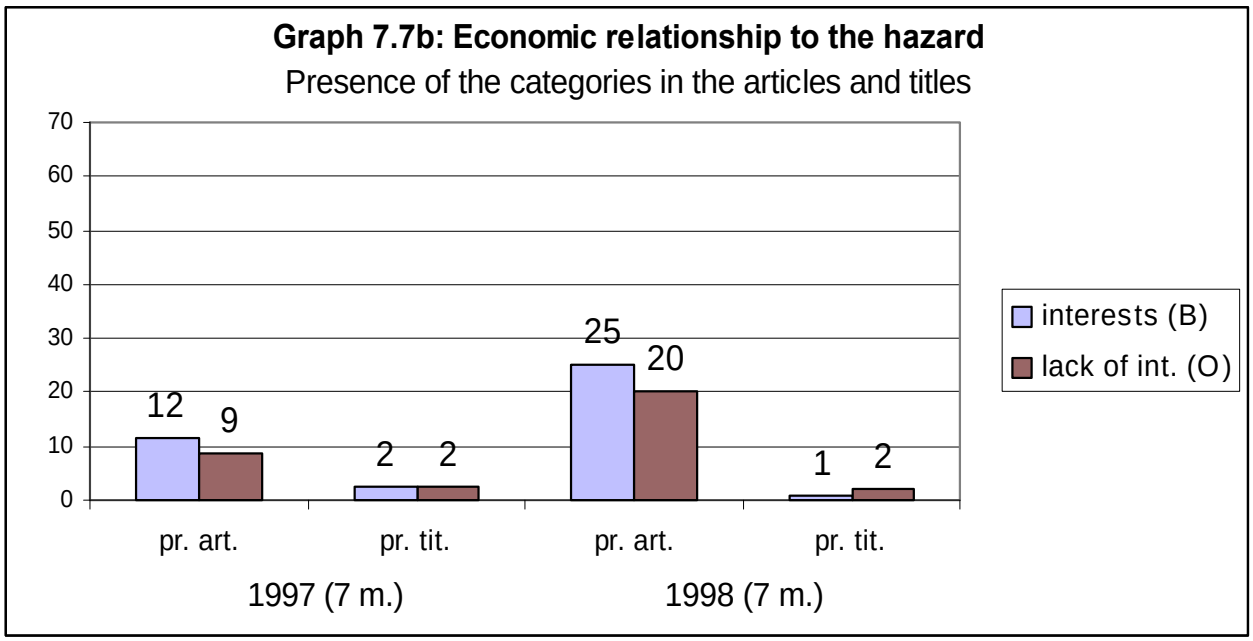




Variable 6) Economic relationship to the hazard

The percentages given for the two categories do not differ so much in the year 1997 (Graph 7.7a). Nevertheless, the "lack of economic interests" decreases in the year 1998, while the importance of the hazard to "income or location interests" increases in the year 1998. Probably this is due to the participation to the debate by the labour parties, which are interested in underlining the occupational and economic aspects involved in the Oil Harbour activity. Another reason is the programmatic objectives for the entire port expressed more recently by the public authorities. Moreover, it has to be noted that the two categories almost compensate each other in both the years.

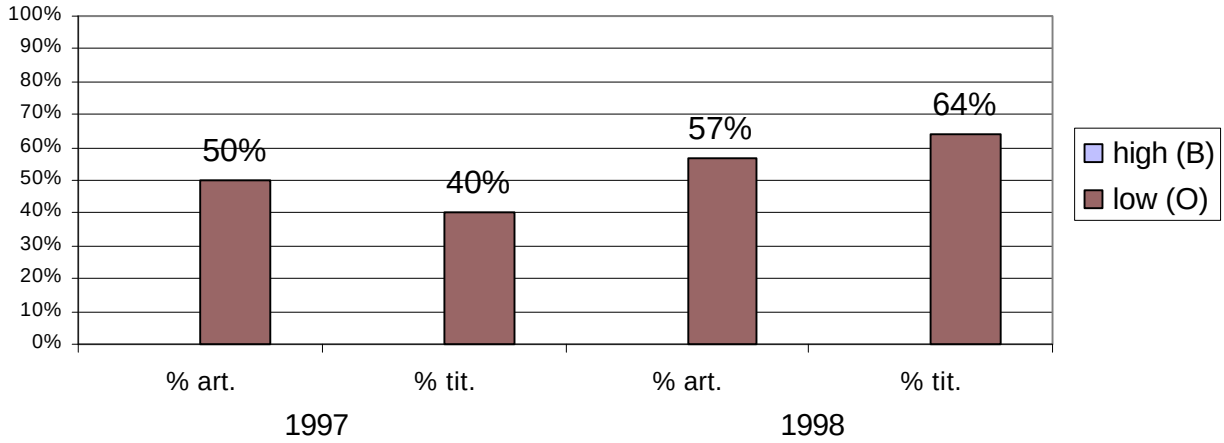




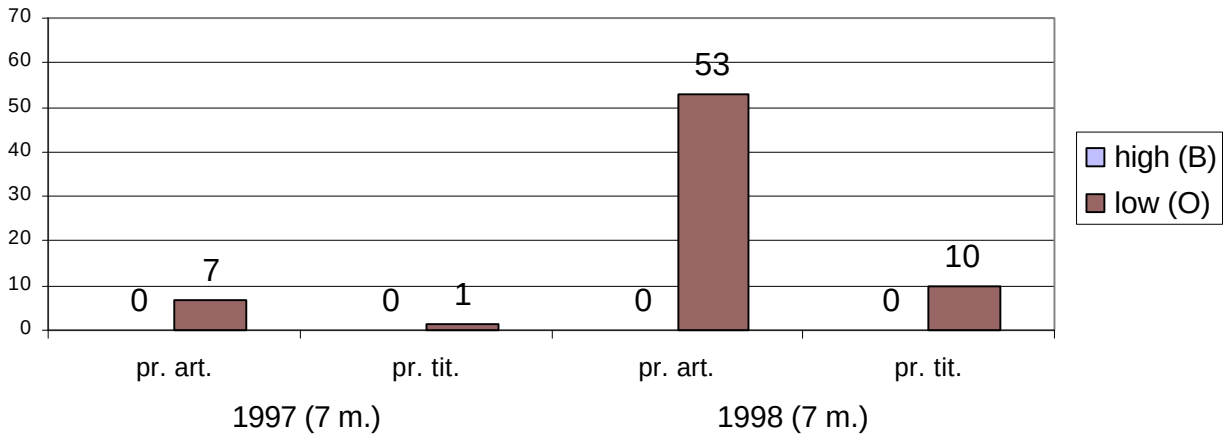
Variable 7) Trust in responsible actors

"Responsible" actors are mostly intended to be the local authorities, since citizens believe that is normal that industry defends its own interests and that these interests do not coincide with the public requirements.
The interesting figure that comes up is that the low trust increases in the year 1998, especially in the titles, which pass from 40% to 64% (Graph 7.8a). This percentage is extremely high for the titles and also considering that the other category (medium high trust) does never compensate it.

Graph 7.8a: Trust in responsible actors
Percentages of articles in which the categories appear

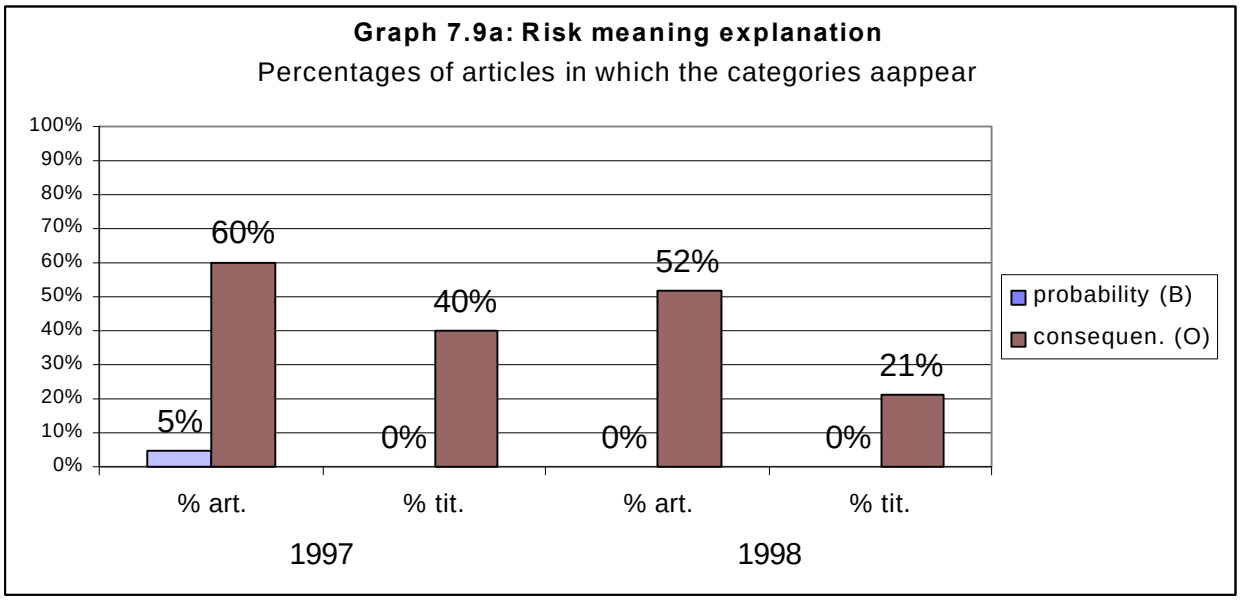


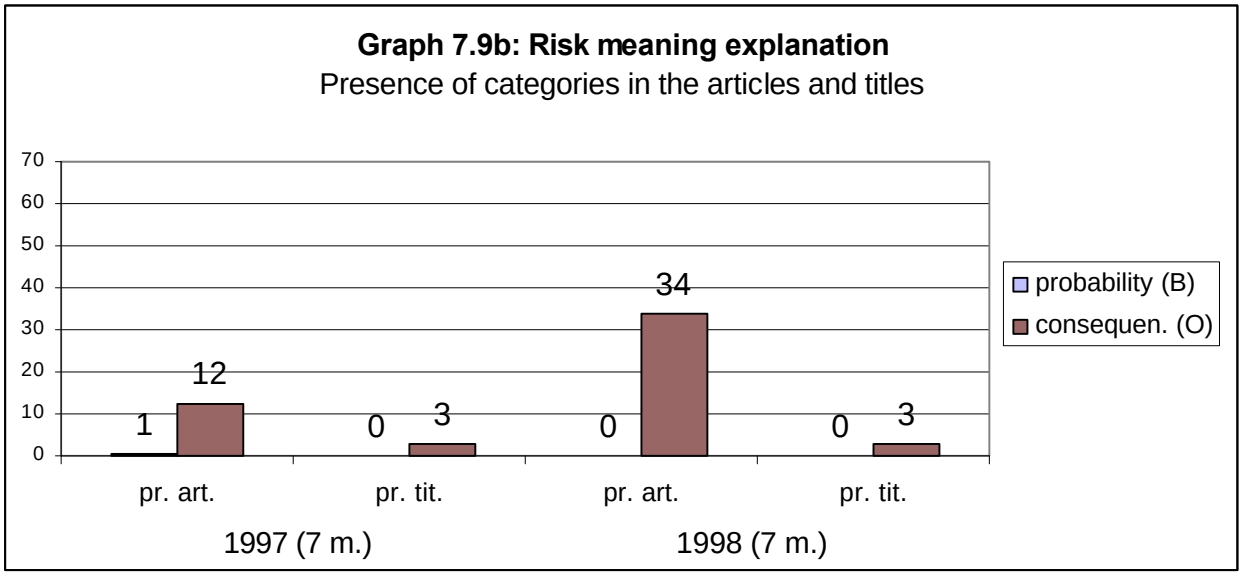
Graph 7.8b: Trust in responsible actors
Presence of the categories in the articles and titles



Variable 8) Risk meaning explanation

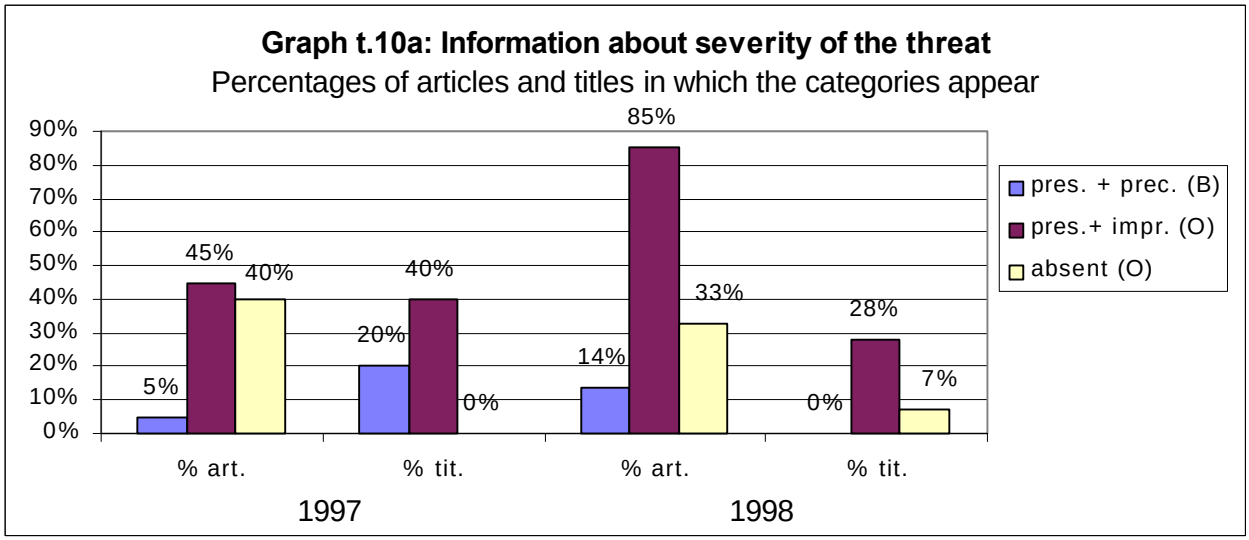
Where an explanation (even if not explicitly) is given of what is intended as risk, the focus is always on consequences (60% of the articles and 40% of the titles in the year 1997: Graph 7.9a), except in one article during the year 1997. The category "consequences" decreases in percentage in the year 1998, but it increases in absolute value (from 12,3 to 32 apparitions in the articles: graph 7.9b). This is because there are few but very sensational articles reporting about the Filse study, which doesn't focus at all on risk probability, but draws a lot of scenarios which describe consequences.

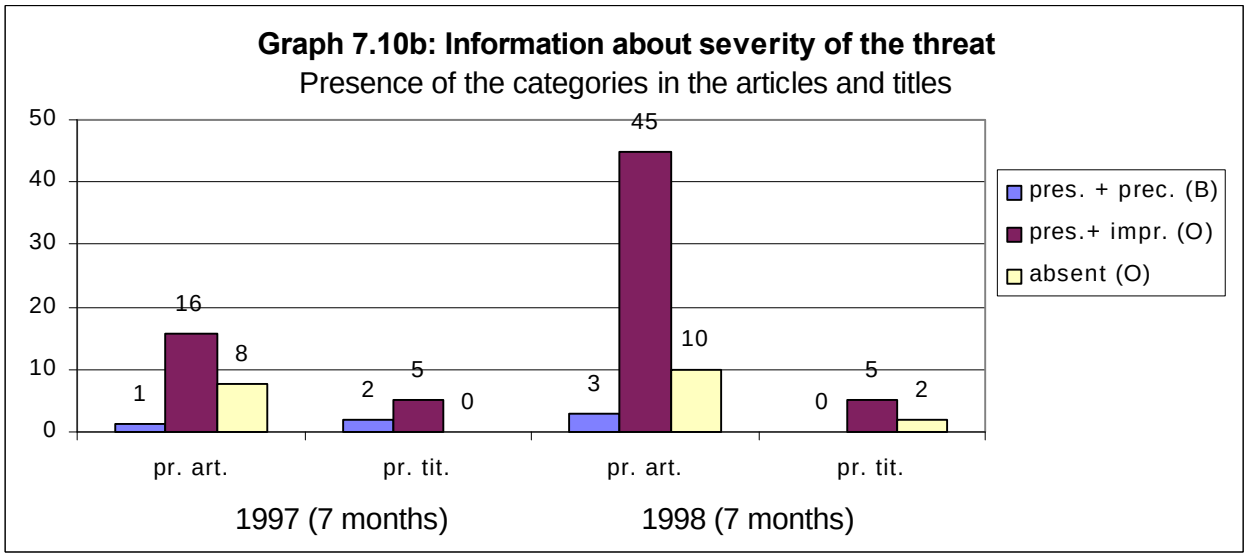




Variable 9) Information about severity of the threat

The "severity of the threat" coincides almost with the "magnitude of the risk", but it is more generic. The most important difference between the two variables is that through the variable 9) the presence and the accuracy of this kind of information are measured. The category "absent" is gathered wherever "threat" is mentioned without giving any information about its severity.
The most impressive value is that of the category "present but imprecise": it appears in the 85% of the articles in the year 1998 (Graph 7.10a). The percentage is even higher if added to the category "absent" (40% of the articles in the year 1997 and 33% in the year 1998). These are important factors which produce an overestimation of the risk..



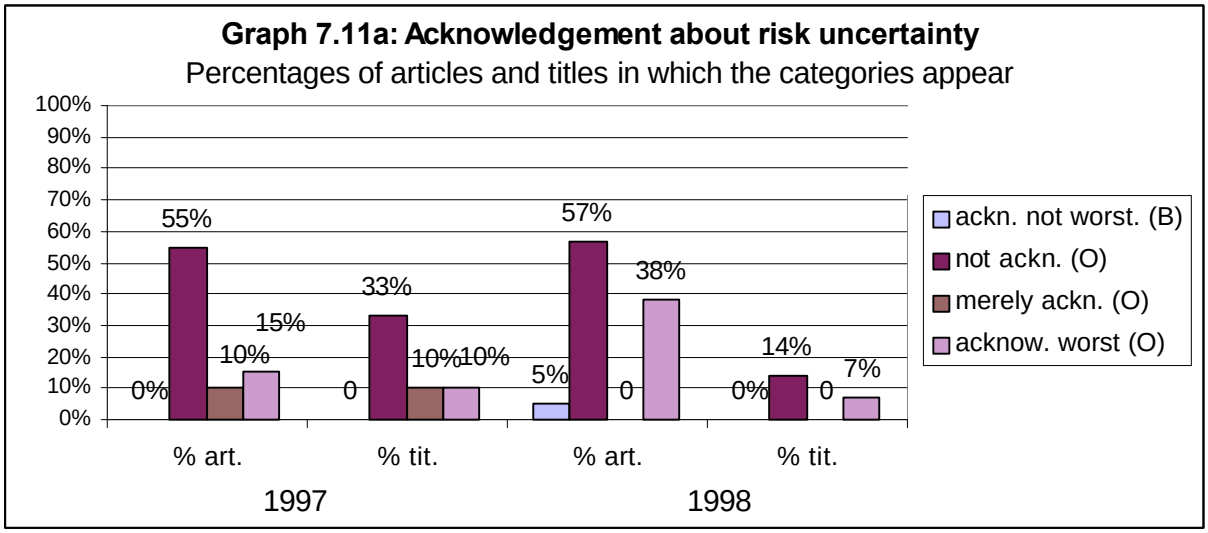


Variable 10) Acknowledgement about the risk uncertainty

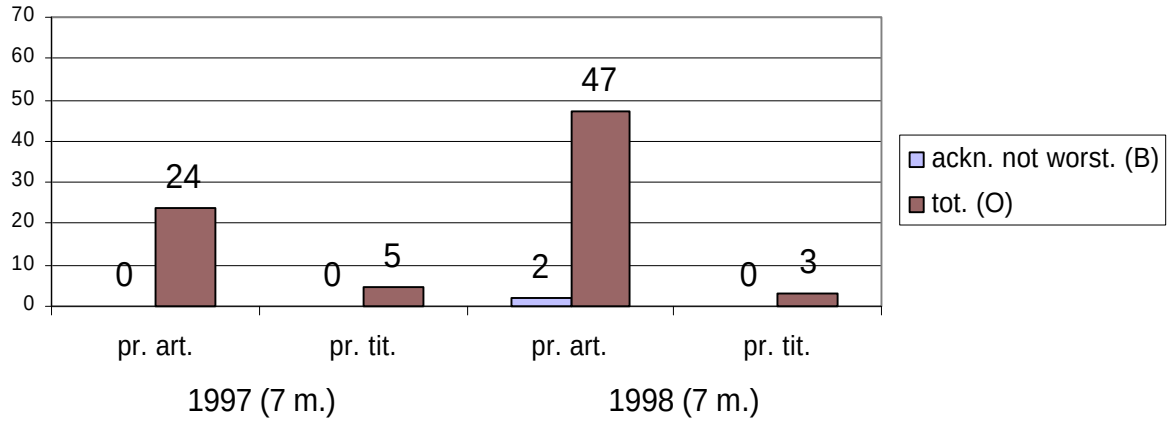
Since this variable includes complex categories, it will help have a look to the original table. Acknowledging that the risk extent is uncertain leads to a balanced perception only in the case that the assessment does not focus on the worst case scenarios. This influence is due to the fact that people have difficulties in thinking about risk "probabilistically": it is extremely hard to present worst-case scenarios explaining that there are few probabilities to happen; the memory will retain anyway the message of the "worst". Moreover, since newspaper information is very synthetic, the whole correct message would be too much long.

C	10	AKNOWLEDGEMENT ABOUT THE NATURE OF RISK IN GENERAL	Merely acknowledging about the uncertainty of the assessment	+		√		
			Not acknowledging about the uncertainty of the assessment	+		√		
			Acknowledging that the risk extent is uncertain, considering the worst-case scenarios	+		√		
			Acknowledging that the risk extent is uncertain, not focusing on the worst-case scenarios	+			√	

The higher scores regard "not acknowledging about the risk uncertainty" as nature of risk in general (55% of the 1997 articles, 57% of the 1998: Graph 7.11a). This means that wherever risk is mentioned, it is very often presented as something certain both in magnitude and in probability. Another interesting result is that even when (15% of the 1997 articles, 38% of the 1998 articles) risk is presented as "uncertain" the focus is about worst-case scenarios, mostly not clarifying that they are "the worst".

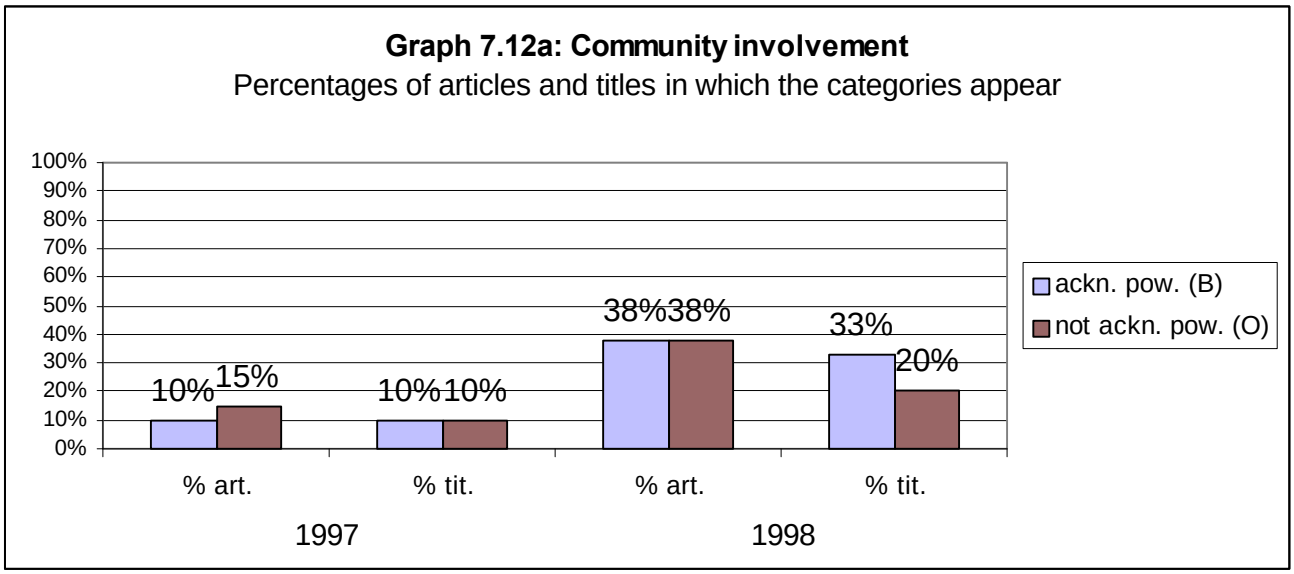


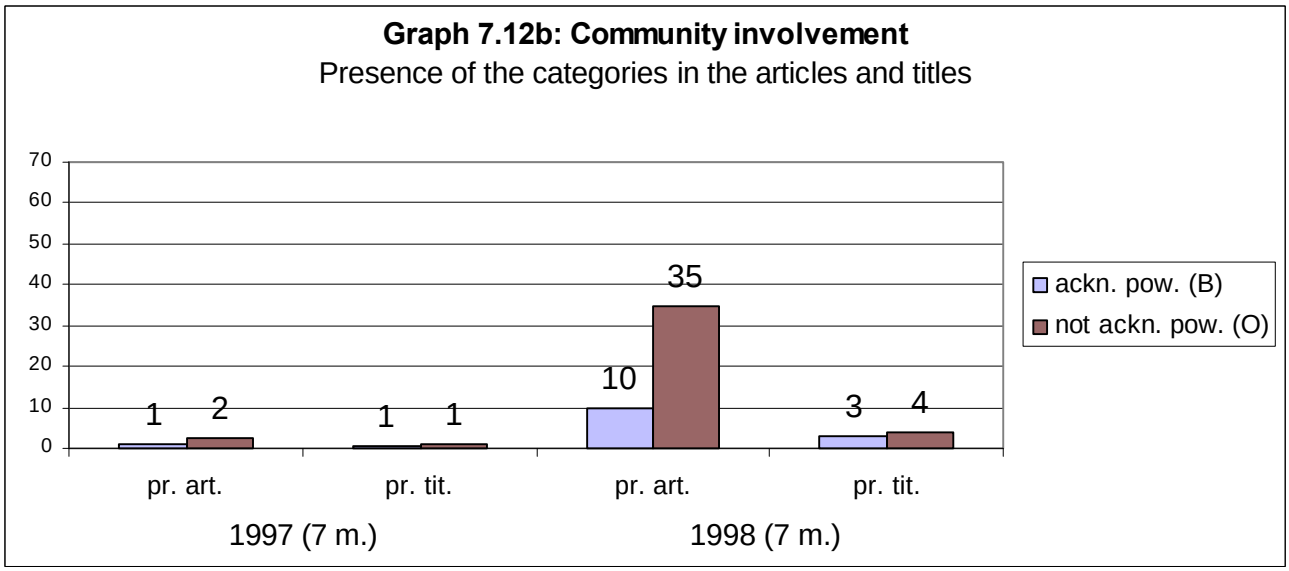
Graph 7.11: Acknowledgement about risk uncertainty
Presence of the categories in the articles and titles



Variable 12) Community involvement

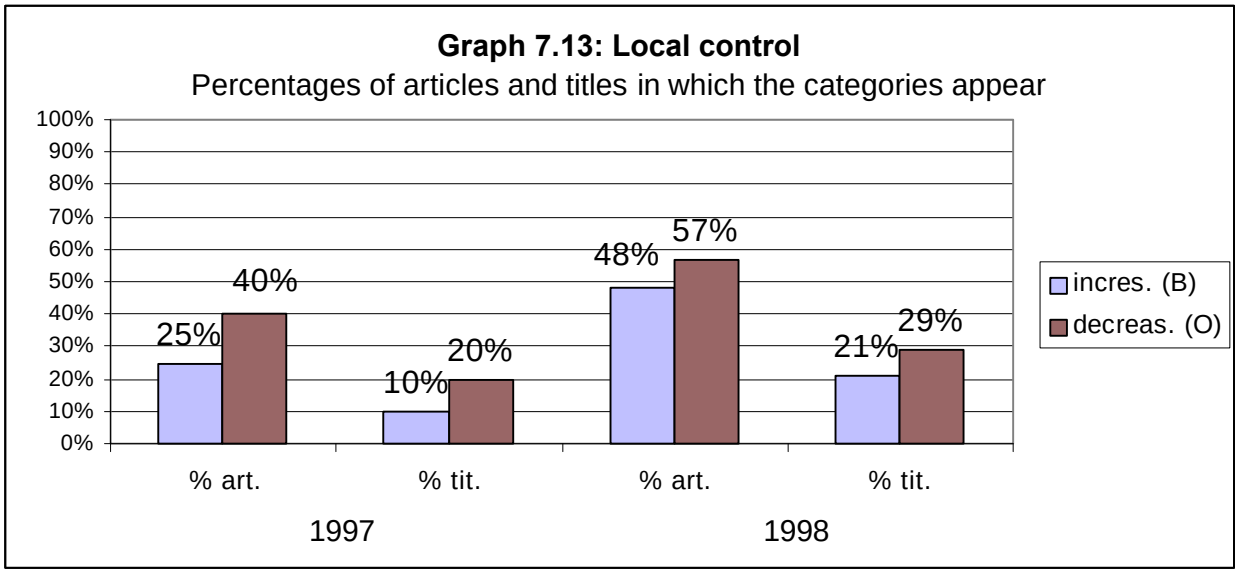
This variable presents contrasting aspects: the values of the two categories (see Chapter 5) are almost the same. There are efforts in involving the local community, giving to this stakeholder a power over the sitting or transformation of the facility. But on the other side there are also actions which do not acknowledge this power. This "wave process" erodes public trust in responsible, thereby favouring an overestimation of risk.
Moreover, the two contrasting forces both increase in the year 1998 (from 10-15 % of the articles to 38%: Graph 7.12a), with the increasing of public attention about the case. The highest increase is in the absolute values of the presences in the articles in the year 1998 (Graph 7.12b).

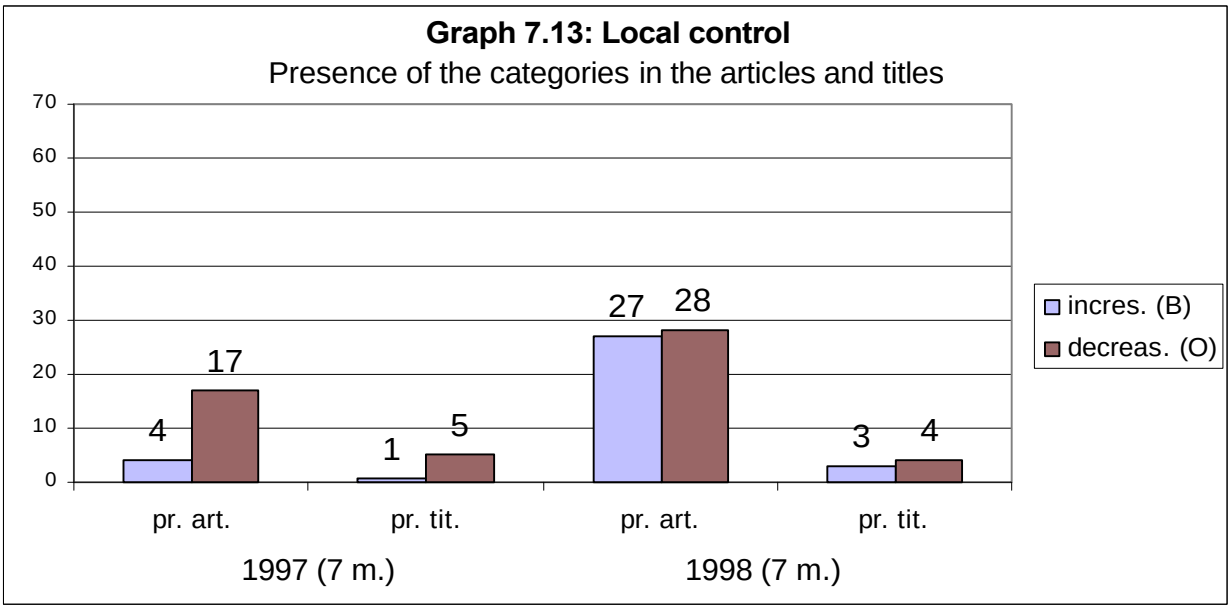




Variable 13) Local control

Even this variable presents its categories as two contrasting forces in a "wave-motion". There are efforts in increasing the local control, giving credible assurances over monitoring and regulation. But very often this local control is neglected by facts and alarming news. These contrasting information produces an overestimation of risk (see further, variable 23: information coherency).
The values of these two forces raise in the year 1998 (Graphs 7.13a and 7.13b).

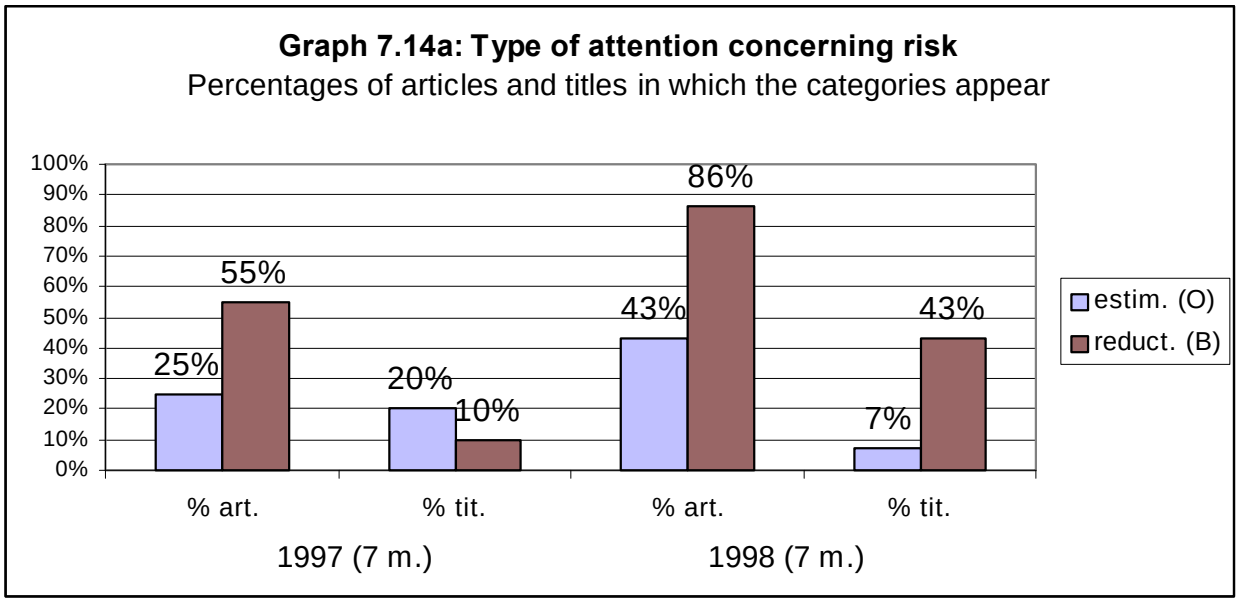


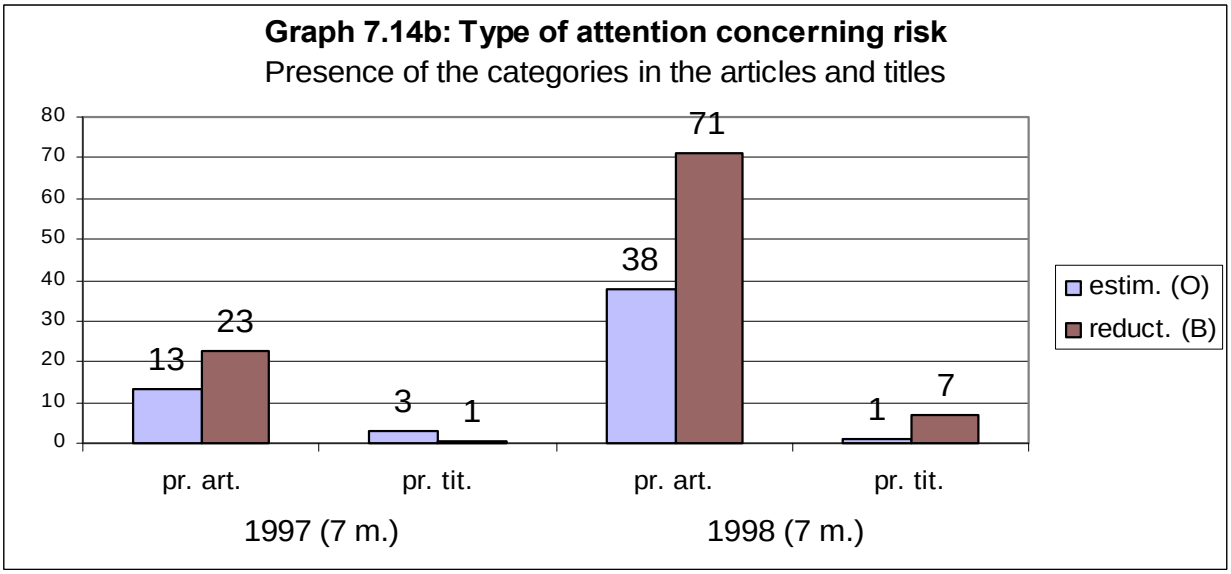


Variable 14) Type of attention concerning risk

The most impressive value concerns the attention to risk reduction in the year 1998 (86% of the articles, and 71 apparitions in the articles: Graphs 7.14a and 7.14b). This element probably leads to a balanced perception of the risk. Nevertheless, there are two considerations that mitigate the value:

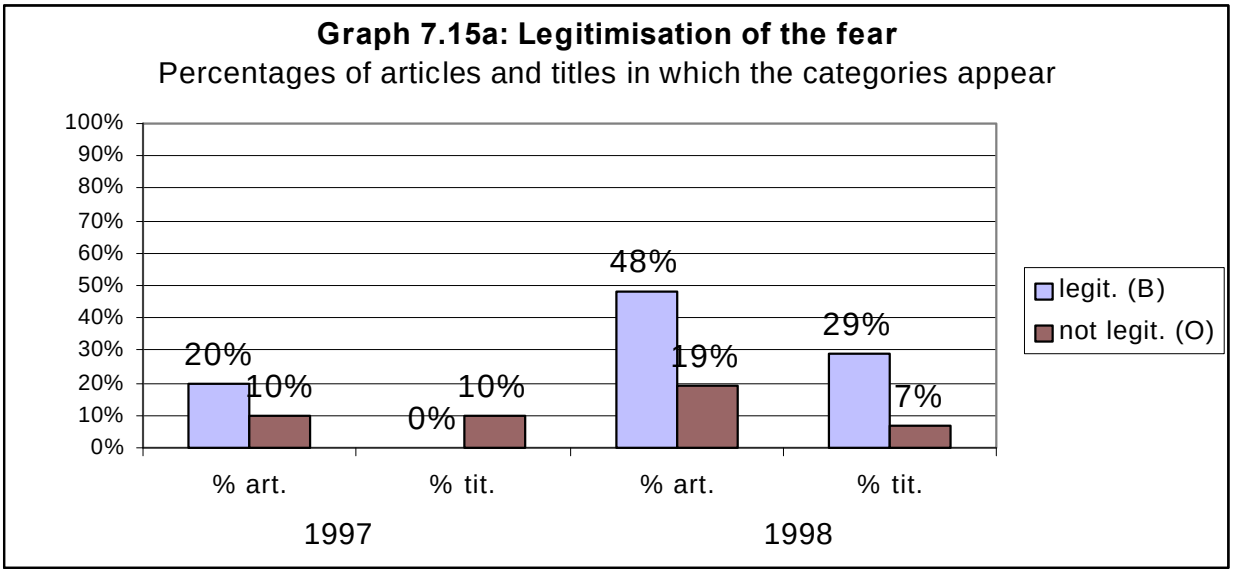
a) when in the articles the attention is for "risk reduction", it refers to future developments of the facility; there are a lot of promises for the future, and few facts about the past: very often in the articles there is an attention to what in the past has not been done to "reduce risk";
b) the values relative to "risk estimation" are also high for the year 1998 (43% of articles, 38 apparitions).

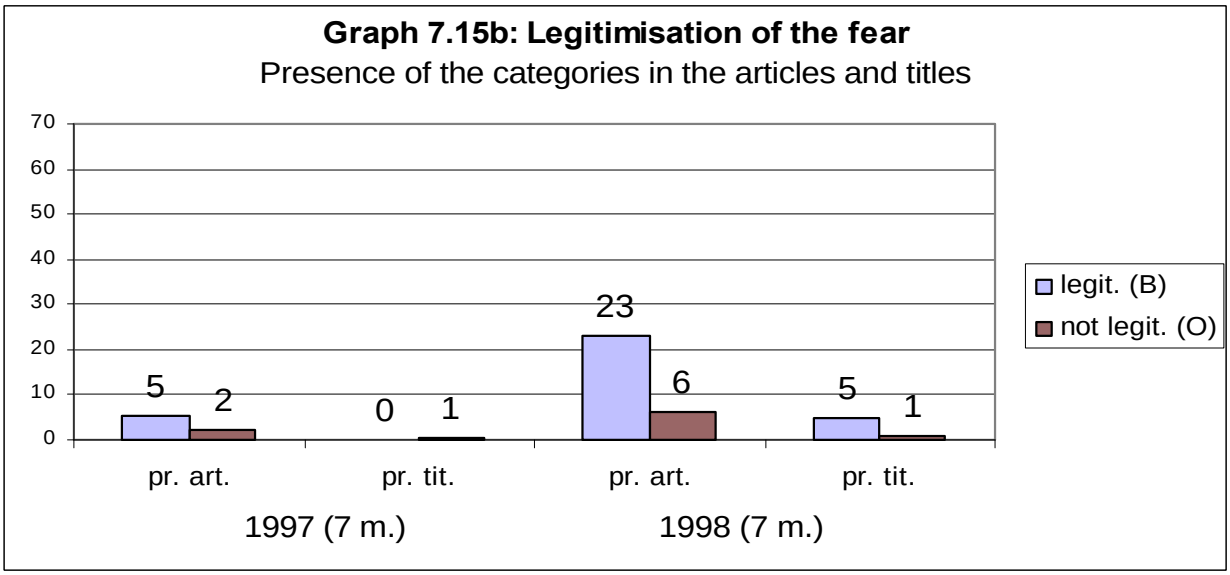




Variable 15) Legitimisation of the fear

Another surprising result of the analysis comes from this variable. The "legitimisation of the fear" has higher scores than the opposite category (20% to 10% in the 1997, 48% to 19% in the 1998: Graphs 7.15a and 7.15b). This element which favours a balanced perception even increases in the year 1998, both for articles and titles. Nevertheless three considerations can mitigate the values:
a) Within a stakeholder system it is of fundamental importance to understand who provides the legitimisation. Mostly (especially in the 1998) they are the actors which have some interest in providing this legitimisation: the labour party, the citizens committee, some political parties.
b) Very often, it is legitimised a too much generic fear, without clarifying the causes.
c) It increases also the explicit "not legitimisation of the fear", which creates contrasting information with respect to the first category. This produces an overestimation of risk (see further).





Variables comparison

From the analysis of each variable and its categories it results difficult to check which of them are more "influent" for the risk perception about the Oil Harbour activity. In order to achieve this comparative perspective it is necessary to construct an index. The index built for this aim is "raw", since it is anyway to much complex (especially for the goals of this analysis) to construct an index that comprehends all the measurements made. Thus, it appears opportune to obtain an index by a simple difference: the categories which influence towards an overestimation of risk (O) minus the categories which influence towards a balanced perception (B). The comparison is made on the basis of the whole period analysed (19 months: 12 months in 1997 + 7 months in 1998). The measurements considered are the following:
art. = number of articles which contain the category (first column)
pr. art. = presence of the category in the articles
% tit. = percentage of titles which contain the category
pr. tit. = presence of the category in the articles

The comparative Tables are contained in the Annexes. The Graph 7.18 contains the indexes for each variable. As the Graph shows, the most influent variables are:

- variable 2: Magnitude of the hazard
- variable 3: Voluntariness of risk
- variable 5: Fairness of risk
- variable 7: Trust in responsible
- variable 8: Risk meaning explanation
- variable 9: Information about severity of the threat
- variable 10: Acknowledgement about the risk uncertainty

The relative relevance attributed to each of them is indicated in the recommendations (Chapter 8); it takes into account the comparison on the basis of the index, but also the previous comments made for each of them.

Graph 7.18

7.3) Qualitative content analysis of the available documents

The following variables have been used for the qualitative analysis of the available documents (see Annexes containing the complete list of them) and some of the press articles. They are taken out from the II Table (the Chapter 5).

		Macro: RISK						
C	16	*CERTAINTY OF THE RISK ASSESS,MENT*	Uncertain risk	+		√		
			Certain risk	+			√	

In order to establish to which category it belongs the risk involved in the oil-harbour activity, it is necessary distinguishing between:

a) chronic risk: this is the type of risk considered by the Filse study, which calculated it for carcinogenic and not carcinogenic consequences. This study makes risk more certain, even if it is precautionary for the parameters used. Nevertheless, it is ongoing a study by the Province to establish some data which will help the certainty of the risk.

b) acute risk: it is more uncertain. The Polytecna Harris calculates its probability relating it only to few possibilities; WWF noticed that in those scenarios it is not included, e.g., the possibility related to the "Haven" case (WWF, 1996).

Thus, globally, the risk is uncertain, and this produces an overestimation of it.

C	17	*FREQUENCY OF ACCIDENTS*	High	-	Lc, Cz		√	
			Medium	+		√		
			Low	+	Lc, Cz			√

Here as accidents are considered those of relevant importance, excluding all those little accidents which daily happen within Porto Petroli. Considering the accidents that involved directly the Oil-Harbour activity, they are four since 1981 (about one every four years). This frequency is very high, considered that two of them were very important: the "Hakuyoh Maru" explosion (1981) and the super-tanker "Haven" fire (1991), seen nowadays as the worst in the Mediterranian history).

The frequency is even higher, considering the "petrol-chemical system" in which Porto Petroli is seen as included by the local community (WWF, 1996). The total accidents are 13 since 1979 (about one every 1,5 years). This globally leads to an overestimation of the risk.

C	18	*FAMILIARITY OF THE RISK*	Familiar risks: that people have faced for long periods without experiencing the undesired event	+	Lc			√
			Unfamiliar risks	+	Lc	√		

The risk is familiar by the fact that the local community has faced it for a long time. Nevertheless, it is unfamiliar since they experienced the undesired events, even with an high frequency. This leads to an overestimation of the risk.

	19	*ENGAGEMENT IN HAZARDOUS OCCUPATIONS*	Present -> greater awareness and scepticism among the threat	+			√	
			Absent	+		√		

The Multedo inhabitants are mostly engaged in hazardous occupations, since all the petroleum industrial system in the area employs 1500 workers in total and they live mostly at Multedo. This factor enhances a greater awareness and scepticism about the threat, which leads to a balanced perception of the risk.

	20	CONFIDENCE	Overconfidence of lay people	+	Cz			√
			Lack of confidence of not lay people	+		√		

The frequency of accidents produces an overconfidence in lay people. This is one of the rare elements which in this specific case leads to an underestimation of the risk.

C	21	*AWARENESS*	high (men)	+			√	
			low (women)	+		√		

Awareness, generally higher for men than for women, is probably very low for this specific risk. This datum comes from the analysis of the articles but also of the technical documents available. Usually awareness is improved by coherent, precise and targeted information. Regarding Porto Petroli the local community but also the citizens as whole have never received information with these characteristics. Moreover, they asked for information required by Seveso law, but they have not yet received it.

The following are more precisely the variables which enclose the type of information required for an accurate perception of the risk.

		Macro: INFORMATION						
C	22	*INFORMATION ABOUT THE FACILITY*	Making manifest the proper/improper operation of the facility	+	Lc		√	
			Not giving information about the proper/improper operation of the facility	+	Lc	√		

Information about the proper/improper operation of the facility is never given. This factor influence the local community to have an overestimation of the risk.

C	23	*INFORMATION COHERENCY*	Non contradictory information	+			√	
			Contradictory information	+		√		

The information about risk is generally contradictory. The incoherence is present especially in the press articles; it can be noticed not only comparing different news, but also in the same article. This incoherence could be one of the most heavy causes of overestimation of the risk.

	24	*THRESHOLD LEVEL OF SAFETY*	Assuring a threshold level of safety by precise information	+			√	
			Assuring a threshold level of safety, but with imprecise information	+		√		
			Not assuring a threshold level of safety	+		√		
			Absent information	+		√		

The information to assure a threshold level of safety is generally absent. The assessment made through the Filse study includes these data in a relatively precise version. Nevertheless, the newspapers report these data saying that the threshold level of safety is not assured. This leads to an overestimation of the risk.

C	25	*INFORMATION ON THE EFFECTS OF TECHNOLOGY*	Present but imprecise	+		√		
			Present and precise	+			√	
			Absent	+		√		√ boo mer

Information on the effects of the technology contained in the facility is never given at the beginning. This produced an underestimation of the risk that – after the accidents – has been evolved in an overestimation, by a "boomerang effect" typical in cases of lack of essential information. Moreover, now this kind of information is present but imprecise.

	26	*AVAILABILITY EURHISTIC*	Dramatic and memorable risks: extensive media treatment + certainty of death + multiple lives involved	+	Lc	√		
			Uninteresting and forgettable risks	+	Lc			√

The "availability eurhistic" is a variable which indicates how a risk is dramatic and memorable. Its indicators are: the extensive media treatment (which for petroleum spills is very high, and is high also for the specific facility); the certainty of death and the multiple lives involved (which are present in specific kind of accidents that happened in the past). This factor leads to an overestimation of the risk.

C	27	*COMMUNICATOR SENSITIVITY*	Listening and acknowledging the concerns of the audience	+			√	
			Ignoring the concerns of the audience	+		√		

The qualitative evaluation relative to this variable refer to the newspapers journalists as communicators. They acknowledge only some of the audience concerns: e.g. over the risk of accidents and carcinogenity. On the other side, they seem to ignore a large part of information that the target need. This factor may produce an overestimation of the risk. Moreover, even the company can become a communicator, listening and meeting the concerns of the audience.

C	28	*TYPE OF APPEALS*	Broadly based, non-focused appeals	No correl			√	
			Narrowly based, focused appeals	+			√	

These variable until now did not regard the company, since only the environmental organisations and the citizens committee made the information campaigns. Nevertheless, these variables must be considered in case of a communication strategy by the company.

C	29	*INFORMATION ABOUT INDIVIDUAL PROTECTIVE MEASURES*	Present but imprecise	+		√		
			Present and precise	+			√	
			Absent	+		√		

The information about individual protective measures is one of the most important and usually it is a part of the "emergency plan". This kind of information is totally absent, not only in the articles, but also in the technical documents. Only in the *Marine Terminal Regulation and Information of the Oil-Harbour of Genova/Multedo* (1997) it is cited the "emergency plan" (see Annexes) that the company has drawn up in the year 1997.
Nevertheless, this kind of information should be made not only for technicians (especially firemen and workers), but also for the local community in an appropriate version.

C	30	*COMPARISONS*	Cross-hazard comparisons	+		√		
			Stressing the similarity of the unfamiliar facilities to more familiar facilities	+			√	

In one article there is a cross-hazard comparison which is not acceptable: they compare the risk connected to the Porto Petroli activity and the airport together to a "meteorite risk". This probably produced an overestimation of the risk.

		Macro: DECISION MAKING						
C	31	*CONSIDERING THE HUMAN ELEMENT*	Calculating risk (technical view)	+		√		
			"Thinking about risk" (sociological view)	+			√	

During the decision making process along the years, public authorities and experts have been focused attention on risk calculations, instead of thinking about risk in a "human" way. This element is mostly considered by the environmental organisations and the citizens committee in a lot of press articles, but also in some popular documents that they drew up. All the technical studies ordered by the local authorities have as objective the calculation of the risks.

C	32	*DECISION PROBLEM DEFINITION*	Taking into account that people want the safest decision: "out"	+			√	
			Ignoring that people want the safest decision	+		√		

Even concerning this variable, public authorities, industry and also labour party has been ignored that people want the safest decision. This element is mostly considered by the environmental organisations and the citizens committee.

C	33	*AGREEMENT*	Disagreements among experts about probabilities	+		√		
			Agreement among experts about probabilities	-		√		

The experts agreed until now about risk probabilities, in the studies made by Snamprogetti, Polytecna Harris, Filse. In each study they start from the previous results to provide new data. Nevertheless, it is clear that no one of these studies tries to calculate again with the same method or even another method the same part of the total risk. Of course, this aspect does not influence differently the public perception. Thus, this agreement among experts leads the overestimation of risk to diminish.

C	34	*ASSESSMENT ABOUT THE PAST*	Assessing the quality of the past decisions and adjustments	+			√	
			Assessing the quality of the past decisions, but without adjustments	+		√		
			Assessing the quality of the past decisions, but with contradictory judgements and adjustments	+		√		
			Not assessing the quality of the past decisions	+		√		

By the press articles it appears that the quality of the past decisions is assessed, but with contradictory judgements and even more contradictory adjustments. This factor leads to an overestimation of the risk. Nevertheless, the technical studies assess the quality of the past decisions and also propose some adjustments. This could favourite an accurate perception of the risk if they were diffuse in a popular version among the local community.

7.4) Stakeholder system

The following paragraphs contain the main position taken by the several stakeholders about the Oil Harbour activity and eventual replacement. The stakeholder categories follow almost the same criteria provided in Chapter 4, but adapting them to the specific case and providing sub-categories.

7.4.1) Industry

- **Shareholders**

- Snam (Eni Group): 40,5%
- «private users joint ownership» (Carmagnani, Superba): 35,79%
- Colisa (Erg Group): 8,98%
- Porto Petroli maritime agents: 8%
- Santa Barbara Cooperative: 6,73%

They want to expand the actual traffic. In fact the economic health of the company allow to lower the tariffs, and so to catch new clients and traffics. Moreover, they want to add the foodstuffss and the bunkers.

- **Customers**

Eni Group, Erg Group, Shell, Superba, Carmagnani. They in some cases correspond to the shareholders.

- **Competitors**

Port terminal enterprises: Saar Port Deposits and Silomar. They want to transfer their foodstuffs in the Porto Petroli area.

- **Industry Association**

It do not want the splitting in two of the Oil Harbour: adding the foodstuffs (until now in the ancient port) to the oil.

7.4.2) Workers

- **Workers** within Porto Petroli

They worry about their work, and so not support the citizens committee. Moreover, when somebody ask to them for environmental information (e.g. the daily alarms within Oil Harbour) they deny it.

- **Trade Unions** (Filcea Cgil, Uilcer Uil, Flerica Cisl)

They criticise (A = Article 6.7.98) the environmental organisations and the port regulatory plan (Prp). Against the environmentalists they say that their attacks are often instrumental and unrelated to environmental problems. Against the port regulatory plan they say that its aim is to enlarge the waterfront of the ancient port to the detriment of the productive activities of Multedo. So the de-localisation of some activities from the ancient port would damage the actual production of Multedo port: closing the sea view, increasing traffic and air pollution. That is why the trade unions think that the ecological fight against petrol is instrumental. Until now, the only one road transportation is that to carry away the material from Carmagnani and Superba. If they were located within the Oil Harbour, even this problem would be solved.

Moreover, they denounce that the Prp voluntarily lacks some important information: e.g. where will be located the activities that now are at Calata Olii Minerali.

The oil sector in Multedo employs 1500 people, and eliminating them is a nonsense for the Genoa port. In fact, it is a door not only for Italy but also for a large part of Europe.

Thus, the trade unions propose that the citizens stop to fight and collaborate to stipulate an agreement. Until now, the administrators ran after emergencies and problems never solved. The agreement (A 16.03.97) should be a comprehensive view of the town development; a view in which identifying ourselves and believing. The aim is to avoid difficult situations for the employees and the territory living.

7.4.3) Public authorities

LOCAL AUTHORITIES

• **Port Authority of Genoa** (S. George Palace)

It was the major shareholder until January. It did not declare its position until now, but it is working to the Prp, which favourite an enlargement of the slip-way, by quays for the vegetal oils and fruits handling. But also the security and environmental management must give some results, during the last years 100 billions lire were spent for this objective.

• **Prefecture**

It must prepare the emergency plans in case of accidents (new Seveso Directive), after the companies at risk (which are Porto Petroli, Superba and Prà-Oil) have notified the substances used and stocked. But they did not notify the substances.

• **Municipality**

It must furnish the necessary information to the citizens, after the emergency plan made by the prefecture (new Seveso Directive). The environmental councillor Chiara Malagoli denounces that the companies did not notify the substances and the terms expired. The municipality cannot do nothing than speeding up these notifications.

- *Regulatory Plan* (1980) appoints to different use the Oil harbour area, since it is considered as incompatible with the urban area nearby.

- *New Regulatory Plan* recently approved by the municipality, also appoints to different use the Oil harbour area, since it is considered as incompatible with the urban area nearby.

• **Mayor of Genoa**

If somebody asked to him to build up nowadays the Oil Harbour he would answer «no», since the town is paying a lot for that. The solution is the progressive realising from the oil activities (about this future perspective the mayor is far from the Port authority).

The Oil Harbour cannot be moved beyond the outer breakwater, near the airport, since it is too much expensive. Nevertheless, it must be decreased the actual traffic (A 27.03.98).

• **West District**

It has the same position of the Multedo Committee (see further), and threaten to mobilise half the town if the previous agreement will not be respected. On April, it threaten to open a national litigation with the Ministries of Transports, Environment and Industry, to move the oil terminal. This reaction is related to the publicity of the latest Filse study.

• **Province of Genoa**

It is not against the actual privatisation (which may be in the interest of the town), but Porto Petroli as it is now must not exist in the future. By the Co-ordination Territorial Plan (Ctp), all the oil activities must be moved, and this plan is the only one urban instrument which is operative. Neither the Port Regulatory Plan is satisfying (A 07.02.98).

Thus, the Province undertakes to defend the employment and the environmental reclaiming at Multedo, even after the privatisation of the Oil Harbour. The Province bought the equipment to monitor pollution and to locate the sources of this pollution, being them Porto Petroli or others. This process follows that begun with the *Mattioli Decree* (see further).

• **Liguria Region** (urban councillor Fabio Morchio: A 27.03.98)

- *Region Coordinatory Territory Plan* (1992) It makes provision for eliminating the actual oil terminal and using it for other functions (e.g. as great international nautical centre). This Plan must be changed, if the oil will remain at Multedo. But there must be a drastic change of the actual conditions to allow its retraction.

The fact that the Oil Harbour did not move until now, in spite of the Filse study, must make you reflect: it is not feasible, since the costs would be at least 1000 billions. It is the same position of the mayor. If money was available, it would mean that the oil traffic would increase. It is better to reduce the most dangerous traffics, favouring non pollutant activities. The idea is the same of the Port Authority: to enlarge the slip-way by quays for the vegetal oils and fruits handling.

NATIONAL AUTHORITIES

• **Ministry of Environment**

The Ministry emitted the Decree 22.09.95 or *Mattioli Decree*, which assigns to Genoa 34 billions to reclaim highly industrial areas, and 3 in particular to the Oil Harbour.

• **Ministry of Transport and Navigation**

It ordered a *study about the «Minimisation of the environmental and security risks»* of the marine plants in the slip-ways. The study – which examines 41 Italian ports – points out that within the 11 situations «objects of maximum attention for the latent dangerousness» – and for which must be do the de-localisation – Multedo results the first.

7.4.4) Experts

EXPERTS AT INDUSTRY

• **Snamprogetti**

The study made in the 1987 by this company (which belongs to Eni Group) points out the risk of explosion and of fire: in case of explosion, the dangerous radius for the persons is of 400 metres; in case of fire, the maximum distances are between 100 and 160 metres (see section 6.1).

EXTERNAL EXPERTS

• **Polytecna Harris**

The study made in the 1993 (see section 6.1) points out that the risk related to the off-shore activity is higher than the risk related to the dockyard activity (see Haven case), especially for the Voltri Port (risk index = high = 14.5).

• **Filse** (region financial institute)

The Region ordered two important studies:

- *Preliminary proposal of reclaiming plan* of area with high industrial concentration: for order of the Region to Filse Institute (1996). The objective is the research of prior interventions on which it is possible receiving government financing. These interventions must regards situations at risk in the port area of Genoa (DM 22.09.95, Decreto Mattioli). This Plan was disputed by the citizens, since it ignores the «serious situation of the Oil Harbour» and makes provision for the conveying of the stocks now present at Calata Olii Minerali and at the mouth of Polcevera. The hypothesis was speedily retracted by Region, Province and Municipality. Nevertheless, it was defended by the Filse director as an intermediate draft, largely modifiable. (A 7.7)

- *Feasibility study to minimise the environmental impact of the Oil Harbour by moving it.* (A 7.7) The projects regards the building up of the new port near (seaside) the outer breakwater of the airport. By this study it results feasible realise there also a stocks area. This would permit to demolish all the Prà-Oil (ex Snam) tanks, now on the Pegli hills (Southern Fondega and Northern Fondega). The cost (without the equipment) is about 650 billions lire.

7.4.5) Citizens

• **Citizens of Genoa**

The citizens of Genoa are probably more interested in the Ancient Port future. Nevertheless, some considerations made about the press articles regard them as they regard the local community.

• **Multedo Committee** (Mara Michelini, spokeswoman: interview)

The latest opposition (25th of July) regards the Port Regulatory Plan. In the first version it was written after an agreement that the quays would diminish from 4 to 2 and the 2 unuseful would serve the foodstuff handling. But in the latest version of the Plan the quays were 3: the situation would remain the same, since one is already closed. They fear that the fourth would be used to allocate the petrochemical pole of Carmagnani and Superba. The draft of the Ptc will be sent to the local authorities and approved within the 1998.

Thus, the Multedo Committee declares itself against the Oil Harbour president but also against the trade unions.

• **Local community**

Specific data about the local community position (such as surveys) do not exist. It is supposed that it is the same position of the Multedo Committee, but some hypothesis are contained in the content analysis of the press articles. It is probable that they suffer the NIMBY syndrome for a lot of reasons.

7.4.6) Environmental organisations

- **Legambiente or «environment league»**

It has been always brought back the Oil Harbour case to more general problems, regarding sea pollution. (A 16.05.92) In fact, it points out:
a) the double hull for the oil tanks as compulsory;
b) the removal of every port such as the Oil Harbour from the urban area;
c) the obligement that the cleaning operations must be done inside equiped ports nd never off the coast (as the case Haven demonstrated).

- **WWF**

Substantially, it has been maintained the same position of the Multedo Committee. Recently the WWF did not appear in press articles. The latest document edited by WWF was made in the 1996 (Beyond Porto Petroli. The urban and environmental reclaiming of Genoa/Multedo). By this study some important proposals came out:
a) de-localisation of the petrochemical pole: it must be independent from the localisation in an other area (as Calata Olii Minerali), since after the accident at Carmagnani (1987) it was fixed the year 1992 as term for the end of the activity in the urban area.
b) de-localisation of the Oil Harbour: this is considered the knot point of 20 years of battles by WWF. Nevertheless a study about the impact of different scenarios (including the «zero option») is seen as important. Moreover, the local authorities are seen as absent, and the oil companies as opponents.
c) realisation of the Urban Plans: the Coordination Territorial Plans contains already all the points above, but it is unrealised.
d) reclaiming of the Multedo coast: the aim is the transformation of Multedo in a luxury residential area, with a tourism harbour and a nautical centre. In this way the local community would be compensated for the social and environmental costs of the oil activity.

7.5) Conclusions

This Chapter is complete in providing analytical information among the risk perception related to the Oil Harbour. This risk perception is carefully described by the content analysis among the general public (see Chapter 4); nevertheless, some more information has been found among the other stakeholders and their relative positions. The relevance attributed to some recommendations for Porto Petroli (see the following Chapter) take into account all these aspects.

8) RECOMMENDATIONS: IMPROVING THE EFFECTIVENESS OF RISK COMMUNICATION

1) Introduction

The literature consulted in the course of this research has revealed a number of different variables which influence the risk perception of the various stakeholders. The following recommendations are only some feasible responses to the question of "how can companies improve the effectiveness of risk communication". They regard the relationship between companies and "general public" and/or local communities, but integrating this relationship with the role of the other stakeholders.
The outline contains, in fact, each variable which has to be addressed, the actors which can influence or control the variable, the instruments that can be used. The tools considered belongs to the European and international context, going from the legislative tools to the voluntary but regulated tools to the completely "non regulated" tools. Not all of them are "communication" tools, but they all contain some communication aspects. They are the following:

1) New Seveso Directive 96/82/EC ("New Seveso Directive 82/96/EC"; 1997)
2) EIA, Directive 97/11/EC
3) Emas and ISO 14001-14004 (ISO/International Standard Organisation, 1996)

It is considered opportune not distinguishing between the two systems, since the future of the Environmental Management Systems is in a convergence of policies, programmes, obligations required (it is in course of definition the "Emas 2"). The only one difference meaningful for this analysis is the presence of the "environmental statement" in Emas. The references provided further are to ISO, even if it is indicated when it is better making an environmental statement.

4) "Non regulated" communication (Bartolomeo and Longo, 1998):

- environmental reporting
- "Open Doors"
- "Community Advisory Panels"
- consultation
- negotiation.

As the instruments suggested belong to a so wide range, they would require a further development in a risk communication strategy. Nevertheless, they can be useful to individuate the important communication targets that should be addressed by their usage, and the link between them and the available communication tools.

2) Recommendations

In the following outline it is also indicated how much each variable is important to be addressed by the Oil Harbour risk communication targets, on the basis of the previous analysis (Chapter 7). The variables are taken out from both the First Table and the Second Table (Chapter 5); those variables which are get out from the Second Table are indicated by the "Italic bold".
The score for the Oil Harbour is given differently: on the basis of the comparative analysis of the statistics, and on the basis of the qualitative analysis.
The score goes from * to ***.

Some of the following are recommendations which do not refer directly to risk communication; nevertheless, a risk communication strategy should consider them with the purpose of avoiding an overestimation of the risk.

	Macro: RISK	**WHO**	**HOW**	**Oil Harbour**
2	MAGNITUDE OF THE HAZARD: reducing the magnitude of the hazard	- company - public authorities - experts	- new Seveso Directive 96/82/EC	***
		- company	- ISO 14004	
3	VOLUNTARINESS OF RISK: making risk "voluntary" for the local community	- public authorities - experts - company - environmental organisations - citizens committee - local community	- EIA	***
		- company - public authorities - trade unions	- negotiations of costs and benefits	
5	FAIRNESS OF RISK: making risk "fair" for the local community	- public authorities - experts - company - environmental organisations - citizens committee - local community	- EIA	**
		- company - public authorities - trade unions	- negotiations of costs and benefits	
16	*CERTAINTY OF RISK ASSESSMENT:* raising the risk assessment certainty	- company	- risk assessment and management	***
		- company	- ISO 14004	
17	*FREQUENCY OF ACCIDENTS:* *lowering the frequency of accidents*	- company - public authorities	- new Seveso Directive 96/82/EC	***
		- company - experts	- risk assessment and management	
		- company	- ISO 14004	

18	*FAMILIARITY OF RISK:* *making risk less unfamiliar for the local community*	- company	- "open doors", environmental report, "community advisory panels"	**
		- company	- environmental statement trough Emas	
		- company - public authorities	- new Seveso Directive 96/82/EC	

Macro: Risk

In this first group of recommendations, independently from the results regarding the Oil Harbour, there are some which should be considered more relevant for a risk communication strategy drawn by the company. The magnitude of the hazard should be reduced as a consistent basis of risk communication. The voluntariness of risk by the local community is one of the most important objective to achieve by a risk communication strategy: it is a basic effort as well, since probably every other communication tactics would fail without improving this aspect.

The other variables are in some way related to these two.

	Macro: *SOCIO-PSYCHOLOGICAL*	**WHO**	**HOW**	**Oil Harbour**
6	ECONOMIC RELATIONSHIP TO THE HAZARD: increasing the economic interests for the local community	- company - public authorities - trade unions	- negotiations - consultations	*
7	TRUST IN RESPONSIBLE: increasing trust in responsible	- public authorities - experts - company - environmental organisations - citizens committee - local community	- EIA	***
		- company - public authorities	- new Seveso Directive 96/82/EC	
21	*AWARENESS:* *increasing public awareness toward risk*	- company - local community - workers	- "open doors", environmental report, "community advisory panels"	***
		- company - public authorities	- new Seveso Directive 96/82/EC	

Macro: Psycho-sociological variables

This second group of variables is "by definition" very hardly controllable only by the company's communication strategy. Nevertheless, they should be taken into account as relevant to achieve considerable results. In this perspective, the company should have the role of favouring the use of the instruments recommended above, by a collaboration with other key stakeholders.

Other socio-psychological variables can be very important for a risk communication strategy. They are listed in the First Table (Chapter 5) and are, for instance: the personality orientation, the socio-economic profile, the risk taking propensity, the experience. These variables are not taken into consideration in these recommendations, since the data regarding them are not usually available. Nevertheless, it is possible to gather them by questionnaires or surveys. The importance of these variables does not derive from their "controllability", but from the fact that it is possible through them to identify the "target groups" that have to be reached and how to communicate with them.

	Macro: INFORMATION	**WHO**	**HOW**	**Oil Harbour**
8	RISK MEANING EXPLANATION: focusing more on probabilities than on consequences in explaining the risk meaning	- company - public authorities - experts - environmental organisations - citizens committee - media - trade unions	- "community advisory panels" - "open doors"	***
		- company	- environmental report	
9	INFORMATION ABOUT SEVERITY OF THE THREAT: giving extensive but precise information about severity of the threat	- company - public authorities - environmental organisations - citizens committee - trade unions - experts - media	- "community advisory panels" - "open doors"	***
10	AKNOWLEDGEMENT ABOUT THE NATURE OF RISK IN GENERAL: acknowledging that the risk extent is uncertain, not focusing on the worst-case scenarios	- company - public authorities - experts	- new Seveso Dir. 96/82/EC	***
		- company	- Emas statement	
11	FREQUENCY OF RECEIPT INFORMATION ABOUT RISK: decreasing the frequency of information about risk	- media - public authorities - environmental organisations - citizens committee - trade unions - company		**

22	*INFORMATION ABOUT THE FACILITY: making manifest the proper/improper operation of the facility*	- company - public authorities - experts	- new Seveso Dir. 96/82/EC	**
		- company - experts	- ISO 14001-4	
23	*INFORMATION COHERENCY: decreasing the contradictory information*	- company	- Emas statemet	***
		- media - environmental organisations - company - public authorities - citizens committee	- in all the non-regulated communication	
24	*THRESHOLD LEVEL OF SAFETY: assuring a threshold level of safety*	- company - experts	- risk assessment and management	***
		- company	- Emas statement	
		- company - public authorities - experts	- new Seveso Dir. 96/82/EC	
25	*INFORMATION ON THE EFFECTS OF THE TECHNOLOGY: giving precise information about the effects of the technology, to avoid boomerang reactions*	- company - public authorities - experts	- new Seveso Dir. 96/82/EC	*
27	*COMMUNICATOR SENSITIVITY: listening and acknowledging the concerns of the audience*	- company - media	- "Community Advisory Panels" - "Open Doors" - environmental reporting	***
28	*TYPE OF APPEALS: increasing the narrowly based and focused appeals*	- company - media	- "Community Advisory Panels" - targeted messages and channels	**
29	*INFORMATION ABOUT INDIVIDUAL PROTECTIVE MEASURES: increasing precise information about individual protective measures*	- company - public authorities - experts - media	- new Seveso Dir. 96/82/EC	***

30	*COMPARISONS: avoiding cross-hazard comparisons, if not appropriate*	- company - public authorities - experts - media - citizens committee - environmental organisations	- in all the "non regulated" communication	*

Macro: Information

This third group of variables should be those specifically addressed by a risk communication strategy. Not all of them are controllable just by the company, but an accurate risk communication strategy holds all the instruments to improve the desired achievements. The most part of these proposals regard the contents of information; nevertheless, for some of them, it is recommended also the preciseness; moreover, the "coherency" of information is considered as an important variable itself.

	Macro: **DECISION MAKING**	WHO	HOW	PP
12	COMMUNITY INVOLVEMENT: acknowledging the community's power over the siting decision	- public authorities - experts - company - environmental organisations - citizens committee - local community	- EIA	***
13	LOCAL CONTROL: increasing the local control over the facility	- company - public authorities - experts	- new Seveso Dir. 96/82/EC	***
		- public authorities - experts - company - environmental organisations - citizens committee - local community	- EIA	
		- company - citizens committee - local community - public authorities	- Community Advisory Panels - environmental reporting - "Open Doors"	
14	TYPE OF ATTENTION CONCERNING RISK: increasing the attention to risk reduction more than to risk estimation	- company - public authorities - experts	- new Seveso Dir. 96/82/EC	**
		- company - experts	- risk assessment and management	
		- company	- Emas statement	
15	LEGITIMISATION OF THE FEAR: legitimising the community's fear	- company	- "Community Advisory Panels"	**
31	*CONSIDERING THE HUMAN ELEMENT : thinking about risk more than calculating it, during the decision making*	- public authorities - experts - company - environmental organisations - citizens committee - local community	- EIA	**
		- company	- "Community Advisory Panels"	

32	*DECISION PROBLEM DEFINITION:* *taking into account that people want the safest decision: out*	- public authorities - experts - company - environmental organisations - citizens committee - local community	- EIA	**
33	*AGREEMENT:* *achieving agreement among experts about risk probabilities*	- company - experts	- risk assessment and management - ISO 14001-4	***
		- company - public authorities - experts	- new Seveso Dir. 96/82/EC	
34	*ASSESSMENT ABOUT THE PAST:* *assessing the quality of the past decisions and making adjustments*	- company - experts	- risk assessment and management	***
		- company - public authorities - environmental organisations - citizens committee - trade unions	- consultations - negotiations	

Macro: Decision making

This fourth group of variables are emblematic in showing how closely the decision making process and the risk communication strategy are related. Many communication tools, in fact, are part of the decision making process, influencing it and depending on it at the same time. As the Table evidences, to control this group of variables the company should co-operate with many of the other stakeholders, especially public authorities, citizens committee and environmental organisations. The most important of these variables are: the community involvement, the local control over the facility, the agreement among experts, the assessment about past decisions. The last variable is closely related to the coherency and preciseness of information.

9) CONCLUSIONS

The objective of this project has been searching for ways in which the effectiveness of a risk communication strategy can be improved. First, this study focused on the existing literature about risk perception, then on a technique which allows to use the main findings in a managerial perspective. In order to test this approach, it was examined a specific company reality, for which risk was a critical issue vis-à-vis the public opinion. The iterative procedure undertaken has been to:

- establish a definition of risk perception, with respect to risk analysis and management; define how risk communication is based on risk perception research with the purpose of achieving consensus and decision making goals;
- create a framework which contains variables for analysing and improving risk communication effectiveness;
- analyse a specific case according to these variables, through a content analysis of several press articles and documents;
- combine the advice drawn for the case together with more general perspective, in order to pinpoint recommendation for a risk communication strategy.

Some difficulties have been encountered, but it is possible to mention just a few of them. At the starting point, the matter of risk communication seemed vague and unknown for "experts" themselves. Then it became clearer that, even if it is a new discipline, it follows the achievement of another less recent discipline - risk perception. However, the findings remain "unstructured" and spread. Thus, the effort made by the researcher has been in trying to give a structure to this matter, even if not according to a strictly "scientific" way but rather a managerial way. Again, a lot of problems were found in defining a structure where to put all the categories of the variables.

Finally, referring to the case study itself, it was a considerable problem to collect information in a highly conflictual contingency. The only available materials resulted the written ones, beside few informal discussions and a deep interview to the citizens committee. The "political" constraints did not permit the access to stakeholders involved in the case, so that finally the researcher could not obtain some programmed interviews.
In order to face these problems, the general approach has been to cross the information coming from the press articles with that from the technical documents and from the informal discussion with some stakeholders representatives. The reader can understand through the terminology, when the writer was unsure about a fact or conclusion. In those cases a certain amount of evidence was provided by reporting sources and data and by using a statistical approach in the analysis of the articles.
The methodology itself, due to the time limit of the research, is not perfect, yet the results are effective. One limitation is due to the fact that the risk perception studies were made - not so recently (in the 80's) - mostly in the US context. Probably some of them, being not tested in other realities, are weak in their application in Europe. Moreover, every effort to put a lot of information in one framework meets its weakness in some "rash" simplifications. The opportunity to improve the approach could consist in paying further attention on the literature review, possibly finding a larger number of studies regarding the European context. The analysis of the specific case could be better supported by a systematic approach for interviewing the actors involved, understanding the cross relationships between their perceptions.

In spite of these problems and limitations, the main achievement of this research has been the creation of a framework of relevant variables which is useful for a risk communication strategy: a link between the "abstract" theory and the managerial practice.
Another achievement is that of relating the risk perception factors to the communication and management tools nowadays available in the European context. These recommendations merit an accurate attention, since it is possible through them to quickly find which are the objectives, the instruments and the stakeholders involved in a wide risk communication strategy. They have not to be necessarily considered as a whole, but each company could attribute more relevance to some of them following the same procedure tested upon the Oil Harbour case.

All the considerations provided above give the idea that the research plant is effective for its flexibility more than for its scientific strictness. Probably the result is not so far from the research objective designed for this project. Probably it is not so far from the risk communication studies themselves. The researcher hopes that it represents “at least” a managerial achievement.

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ANNEXES

The following information is reported in the attached Annexes:

1) tables with data about the 15 variables contained in the “Second Table” (Chapters 5 and 7);
2) comparative tables (Chapter 7);
3) list of the technical documents and of the articles

Legenda for the Tables regarding the 15 variables (Second Table, Chapter 5)
ref. risk = total articles or titles chosen as sample (which contain references to risk issues)
art. = number of articles which contain the category (first column)
% art. = percentage of articles which contain the category
pr. art. = number of presences of the category in the articles
tit. = number of titles which contain the category
% tit. = percentage of titles which contain the category
pr. tit. = number of presences of the category in the articles

The data about the 7 months of the year 1997 are calculated on the basis of the whole year data, extracting the average of “representative” month, and multipling it for 7.

Tables regarding the 15 variables (1 di 5)

Tables regarding the 15 variables (2 di 5)

Tables regarding the 15 variables (3 di 5)

Tables regarding the 15 variables (4 di 5)

Tables regarding the 15 variables (5 di 5)

Table 7.17a

Table 7.17b

Table 7.18

TECHNICAL DOCUMENTS REGARDING THE OIL HARBOUR

Document	Date	Subject
Marine Terminal Regulation and Information of the Oil-Harbour of Genova/Multedo	08.09.1997	Security regulation of Harbour police
Polytecna Harris study, by charge of Liguria Region	03.1993	Study and feasibility analysis for the restructuring and/or replacing of Porto Petroli at Genova Multedo
Internet, Greenpeace Italia	04.1994	Updating on the petroleum traffic problems at Genova and nearby, after three years from the Haven accident
Filse Study – Condensed version	1997	Study and feasibility analysis for the replacing of Porto Petroli beyond the breakwater
WWF, Beyond Porto Petroli	06.1996	The urban and environmental reclamation of the Genova Multedo coastal area
Liguria Region – Identification card for the intervention plan	04.09.1997	High industrial concentration area, Municipality of Genoa
Emergency Plan of Porto Petroli in Genova	01.03.1998	Emergency plan required from the Marine Terminal Regulation (art.7)

LIST OF THE PRESS ARTICLES

YEAR	MONTH, DAY	NEWSPAPER
1987	17.5	Il Secolo XIX
	19.5	Il Secolo XIX
	22.5	Il Secolo XIX
	20.6	Il Lavoro
	19.6	Il Lavoro
1992	10.4	Il Secolo XIX
	16.5	Il Secolo XIX
	17.5	Il Secolo XIX
1997	1. 16.1	Il Secolo XIX
	2. 16.1	Il Lavoro
	3. 6.3	Il Lavoro
	4. 6.3	Il Lavoro
	5. 12.3	Il Lavoro
	6. 13.3	Il Lavoro
	7. 15.3	Il Lavoro
	8. 16.3	Il Lavoro
	9. 11.6	Il Secolo XIX
	10. 25.7	Il Secolo XIX
	11. 27.7	Il Lavoro
	12. 4.9	La Stampa
	13. 11.9	Il Giornale
	14. 2.10	Il Secolo XIX
	15. 4.10	Il Secolo XIX
	16. 17.10	Il Secolo XIX
	17. 18.10	Il Lavoro
	18. 22.10	Il Lavoro
	19. 19.11	Il Secolo XIX
	20. 19.11	Il Secolo XIX
	21. 30.12	Il Secolo XIX
1998	1. 8.1	Il Secolo XIX
	2. 8.1	Il Lavoro
	3. 15.1	Il Secolo XIX
	4. 15.1	Il Lavoro
	5. 20.1	Staffetta quotidiana
	6. 30.1	Il Lavoro
	7. 2.2	Il Lavoro
	8. 4.2	Il Lavoro
	9. 6.2	Il Lavoro
	10. 7.2	Il Lavoro
	11. 11.2	Il Secolo XIX
	12. 11.2	Il Lavoro
	13. 27.3	Il Secolo XIX
	14. 3.4	Il Secolo XIX
	15. 5.4	Il Lavoro
	16. 8.4	Il Secolo XIX

	17. 22.4	Il Lavoro
	18. 10.5	Il Lavoro
	19. 5	Il Ponentino
	20. 5.6	Il Secolo XIX
	21. 5.6	Il Secolo XIX
	22. 6.6	Il Secolo XIX
	23. 10.6	Il Lavoro
	24. 11.6	Il Lavoro
	25. 20.6	Il Secolo XIX
	26. 24.6	Il Lavoro
	27. 24.6	Il Secolo XIX
	28. 26.6	Staffetta quotid.
	29. 6.7	Gazzetta del Lun.
	30. 17.7	Il Secolo XIX
	31. 25.7	La Stampa
	32. 25.7	Il Lavoro