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The Management of Uncertainty
Response and Learning Processes following Chernobyl

Angela Liberatore

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Examining Jury:

Prof. Bruno DENTE (University of Bologna)
Prof. Klaus EDER (EUI) (Co-supervisor)
Prof. Sheila JASANOFF (University of Cornell)
Prof. Giandomenico MAJONE (EUI) (Supervisor)
Prof. Helga NOWOTNY (University of Vienna)
Prof. Brian WYNNE (University of Lancaster)

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Department of Political and Social Sciences
European University Institute

Members of the Jury:

Prof. Giandomenico Majone, EUI, Supervisor
Prof. Klaus Eder, EUI, Co-supervisor
Prof. Bruno Dente, University of Bologna
Prof. Sheila Jasanoff, University of Cornell
Prof. Helga Nowotny, University of Vienna
Prof. Brian Wynne, University of Lancaster

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Introduction

When the first news about the accident at the Chernobyl nuclear plant began circulating in North and West Europe, everybody seemed totally surprised; also those who were supposed (or usually pretended) to be able to keep everything under control as far as nuclear power was concerned. Nuclear physicists repeated on every occasion that the occurrence of such an event was calculated to be extremely unlikely and public authorities of many European Countries tried at first to reassure people by saying that the danger was far away.

In the meantime, the first deaths and illnesses were registered among the rescuers working at Chernobyl and among the inhabitants of some villages near the plant. And the fears and uncertainties already awakened by the increases of radioactivity first detected in Scandinavian Countries started spreading around Europe.

The odyssey of the radioactive cloud showed that scientists and politicians were not only taken by surprise, but were incapable to cope effectively with such a large scale nuclear disaster. The media began spreading news on the moving of the cloud, its composition and the contamination it was causing. But these news resulted to be confusing in spite of the meteorological maps and the scientific sources referred to. Moreover, disagreements between experts emerged regarding the evaluation of the possible health and environmental consequences of the fallout, and different measures were decided (or not decided) by governmental authorities of neighbouring countries to deal with radiation risk.

The problems and controversies caused by the Chernobyl fallout did not remain confined to the short period of its occurring in April and May 1986. They lasted/are lasting for a rather long time and many changes had taken place in the years following the accident with respect to nuclear risk management and perception.

In other words, short-term responses (during the fallout) and medium/long-term changes can be distinguished.

The research which is presented in the following pages seeks to understand why in some neighbouring countries there had been different short-term responses and different medium/long-term changes following the same event.

Particularly it analyses why those in charge were taken by surprise, why different definitions of the situation emerged, why certain limit values for radiation were set and why did they differ, why certain precautionary measures were taken -or not taken- to cope with radiation risk, why different timing in responding to or acknowledging the problems caused by the fallout can be observed. Moreover it inquires why certain changes occurred in the years following the accident, why did they differ or were similar in different countries, and whether they can be interpreted as results of learning processes.

In order to provide some ground and context for answering those questions, empirical work (based on individual interviews and qualitative analysis of documents and newspapers) has been undertaken.

The field of inquiry was defined according to both analytical and practical criteria.

An in depth examination of the events and processes that took place during the last days of April and the month of May 1986 appeared to be necessary to understand why, how and by whom certain decisions were made and why the responses to the same threat varied. Some background information on the main actors involved in nuclear policy and risk management has been gathered and selected to put in context the responses to the Chernobyl fallout. Moreover, a description and an analysis of the main changes that have occurred in the years after Chernobyl with respect to nuclear risk management is offered in the attempt to understand why did such changes had been taking place and to make out whether they may be interpreted as results of learning.

Beside a temporal boundary, a spatial one had to be decided. Many unique "stories" began by the end of April 1986 in each state, region, town or village affected by the fallout. It is probably impossible (certainly it is for one person) to reconstruct all of them; and such an enterprise is also not necessary to approach the above mentioned problems.

A chapter is dedicated to the immediate response to the accident in the former USSR and references are made to some of the changes that occurred in that country in the following years. However my analysis focuses on some Western European countries due to practical reasons, such as my lack of knowledge of the Russian language, and especially due to the kind of issues I decided to address.

Given the crucial role played by governmental organizations (both political and scientific) in defining and managing the situation originated by the Chernobyl accident, three "national" case studies had been conducted. At the same time, given the differences or even conflicts within national borders and the transboundary dimension of the threat, the case studies had been constructed taking into account also local and transnational aspects.

The Italian case was chosen because my initial questions started developing while experiencing and reflecting on the Italian context. The two other cases, regarding the Federal Republic of Germany and France, had been selected to understand why neighbouring countries that belong to a quite strong supranational setting such as the European Community -EC- (beside being members of other international organizations) reacted in different ways to the same unexpected (while foreseeable) threat.

The comparative work is not mainly aimed at "testing" one hypothesis by applying it to different cases, but at finding out which elements "made (and make) a difference" -and why- in reacting to Chernobyl and in managing nuclear risk.

Beside the national cases studies, the EC response and the broader international response (especially the role played by the International Atomic Energy Agency -IAEA-) are investigated. In fact, even if the Chernobyl fallout was initially dealt with as a mainly "national affair", its transboundary dimension showed that nuclear risk do not stop at political borders.

Many readings and fruitful discussions accompanied the development of the research and provided me with analytical and interpretative tools.

In the attempt to find some possible answers to the questions previously mentioned, I chose not to stick to a single theory because I do not think (nor I pretend) there is one able to cover all the aspects to be taken into account. In the analysis presented in the following chapters I rather adopt an interdisciplinary approach and I utilize some concepts developed within different but, in my view, interacting theoretical frameworks; mainly within policy analysis, risk analysis, frame analysis, philosophy and sociology of science, organization theory, theories of learning.

A preliminary discussion of those contributions that help clarifying some basic points and terms addressed/used in the case studies is offered in the first and second chapters. Then the case studies are discussed and analysed. Finally an overall interpretation of response and learning processes based on both the literature and the case studies is suggested and some "opening conclusions" are put forward.

The reader will find through the whole text the references to those authors and theories which offered me the bricks for building my understanding and for contributing some critical reflections.

The argument that has been developing during the research can be summarized in the following terms.

The Chernobyl accident and fallout pointed to serious shortcomings concerning the management of nuclear power both at the national and international level and rekindled scientific disagreements and political controversies over the risks connected with the utilization of such technology. In front of the same event, different responses were given in the affected countries during the fallout and different changes took places in the following years.

In my interpretation, this was due to the way scientific and organizational uncertainties were managed in **defining** the problem and **responding** to it. The **management of scientific uncertainties** was a determing factors since Chernobyl had been a technological accident and called on science ability to identify causes, consequences and possible solution of its own technological products. The **management of organizational uncertainties** was also determinant since an unprecedented, non-routine event like the Chernobyl fallout required the identification and/or negotiation of ill-defined responsibilities. With respect to both these aspects, the production, selection and utilization of information and knowledge by the relevant and interacting actors proved to be crucial.

In turn the reason why these uncertainties had been managed in different ways -and different responses to Chernobyl emerged consequently- can be explained in the light of the **interaction** (in each country and at the international level) between what scientists select as relevant knowledge, what politicians wish to know and to be let known, what pressure social movements and interest groups are able to exert concerning the utilization and diffusion of knowledge, and what information the mass-media have access to, pick out and construct as news. These relations also influenced the changes, and learning processes, that have been taking place since Chernobyl.

This hypothesis, which forms the core of what will be called the "**Policy Communication Model**", points to the link between the ways problems are defined and selected for attention, and the ways actions (including decisions) are taken or not taken. While these two processes had been analysed in depth by several authors, a tendency can be noted to focus either on the first (issue framing) or on the second one (decision making). The present work tries instead to explore the link between the two mentioned processes, building on those contributions that identified such link while still focusing either on the way issues are framed or on the way decisions are made.

Regarding the above mentioned components of my hypothesis some specifications may be useful.

The role of **scientists** in managing uncertain knowledge and defining problems is crucial for various reasons. Nuclear power, like other high risk technologies, is science based, that is it results from scientific research rather than from practical experience. Therefore scientists are regarded as the "experts" who should be able to grasp problems and guide action against the possible side-effects implied by such technologies. However, due to various constraints, uncertainties in scientific knowledge and disagreements between experts emerge.

Uncertain knowledge is referred to and utilized by **policy makers** as an input for defining the issues and deciding about actions to be taken or avoided. Beside that, also uncertainties concerning the behavior of different organizations in face of non-routine events have to be dealt with. Many problems can arise within and between the organizations involved in the various aspects of technology management, from the teams performing routine or emergency tasks to the regulatory bodies. These problems may contribute to the occurring of accidents and can hamper the minimization of the harmful consequences of such events.

In the case of Chernobyl it is also important to stress that scientific and organizational uncertainties became a public issue. The disagreements among experts and politicians about the evaluation of the situation, the distinction of responsibilities and the measures to be taken, could not be kept within scientific and governmental circles nor did they remain confined within national borders. This was due, on the one hand, to the ability of **non governmental organizations** (NGOs) to challenge the statements and actions of governmental officials and experts. And especially it was due to the role of the **mass media** that, in several cases, acted as media in the strict sense of the word, i.e. as means of communication (and debate) between different sectors of society within and across national borders.

This public dimension influenced, on the one hand, politicians' and scientists' management of uncertainty; on the other hand, it contributed to rising the issue of the accountability and credibility of the institutions responsible for the management of nuclear risk. The way scientific and organizational uncertainties are managed, i.e. whether they are taken into consideration or are ignored by experts and policy makers and whether they are communicated or not to the public, proved in fact to make a difference with respect to the issue of the accountability and credibility of institutions.

Learning from experience is assumed to be a widespread characteristic of human beings. And learning from such a major accident as Chernobyl appears to be necessary in order to avoid similar catastrophes and not to make useless the already irreparable sufferings of Chernobyl's victims.

But learning from Chernobyl can mean different things for different people. For somebody it can mean to learn how to deal with specific technical problems, for somebody else it can mean to learn how to improve his/her public image, and others can interpret it in many other ways.

In the following chapters the changes that occurred in the months and years after Chernobyl will be examined, and it will be argued that they can be regarded as results of collective learning processes. Processes where communication about, reflection on and interpretation (framing) of the Chernobyl experience (which differ for different actors and in different places) played a crucial role in fostering certain changes. Even if these changes do not necessarily represent improvements.

1

RISK, UNCERTAINTY AND THEIR MANAGEMENT.

a. Risk in context.

Controversies over the utilization and management of nuclear power were rekindled as a consequence of the Chernobyl accident. Such controversies are focused on the notion of "risk". Risks concerning nuclear weapons proliferation, risk of accidents in nuclear plants or nuclear waste repositories, risks for health and environment due to high or low doses of radiation, and others.

Scientists, politicians, regulatory bodies, industry and anti-nuclear groups disagree about the way and possibility of assessing and managing the risks involved by nuclear power. As in a hopeless dialogue between people speaking different languages, proponents and opponents of nuclear power accuse each other of being "irrational" in addressing the problem of risk. In general terms, the proponents accuse the opponents -and many scientists accuse lay people- of being "irrational" because too "emotional" and incapable of evaluating risk "objectively". In turn they are accused of being only apparently "rational" because of their "vested interests" which make them underestimate the risk connected with nuclear power and to hide the unfair distribution of risk among different social groups and generations.

A sort of interdisciplinary discipline, **risk analysis**, has been developed around the notion of "risk". It seems worthwhile to start with a discussion of risk analysis literature as it sheds some light on the nature of the disagreements and conflicts concerning nuclear and other "high-risk" technologies.

Risk analysis can be regarded as being composed of various branches: risk assessment, risk evaluation, risk perception, risk communication and risk management. The differentiation between these branches corresponds to various stages of development in the definition of the problems at hand; initially they had been defined as being scientific and technical in nature, then they were redefined in economic terms and later as being intrinsically social and political (Otway, 1985). This does not mean that the later developments/branches substituted the previous ones; actually all of them coexist, but in a quite conflictual way.

Although quantitative estimate of risk have been made and utilized by insurance companies starting from the 14th century, the beginning of what is nowadays referred to as risk assessment can be traced back to the fifties. Such beginning is directly linked with the growth of the nuclear industry in the USA and the first attempts to regulate it (Mazuzan and Walker, 1984; Rip, 1986).

Within the framework of risk assessment, "risk" is understood as a measurable phenomenon and is defined as the predicted magnitude of a loss or damage multiplied by the probability of its occurring. The risks usually referred to are risk of accidents and risk for health and environment due to exposure to dangerous substances.

The two key tools elaborated to assess the risk of accidents, as defined above, are fault-tree and event-tree analysis. Each uses a tree structure to show the interrelations between components of the operating system and tries to reconstruct the pathways to disaster. Event trees start from a particular undesired initiating event and project all its possible outcomes. Fault trees start instead with a particular undesired final event and work backward to identify the component failures needed for it to have happened. The major danger in designing fault or event trees is leaving things out and consequently underestimating the risk.

Following Baruch Fischhoff (Fischhoff, 1977), pathways seem to be particularly prone to five kinds of omission; 1. omissions regarding human error or misbehavior; 2. omissions concerning changes in the environment in which the technology functions; 3. omissions arising from overconfidence in scientific and technical knowledge (for example, in the field of safety design); 4. omissions resulting from failure to see how the system functions as a whole; 5. omissions due to the difficulty of taking into consideration all the contingencies that may contribute to "common mode failures". Moreover, designers of fault and event trees must make numerous discretionary decisions regarding how to organize and present the various sources of trouble (Slovich, Fischoff and Lichtenstein, 1982), or in choosing the theory of probability to be used, the methods by which short and long-term effects are combined into a one-dimensional scale, the rules used for selecting the factors to be included in the analysis (Renn, 1985).

Shifting from the assessment of the risk of accident to the assessment of risks for health and environment, it is usually acknowledged that the last one involves serious problems. According to the US National Research Council (1983) such assessment can be divided into four steps: hazard identification, dose-response assessment, exposure assessment and risk characterization. But the first three steps involve large uncertainties, therefore they cannot but result in a far from unquestionable risk characterization, i.e. the summary of what is known about the likelihood and magnitude of adverse consequences.

In fact, hazard identification, dose-response functions (which specify how probabilities of adverse health effects vary with the size of the dose received) and -partially- exposure assessment have to be chosen and estimated on the basis of epidemiological or toxicological studies. However these studies can seldom provide uncontroversial answers regarding dose-effect and, more in general, cause-effect relationships.

Epidemiology requires in fact choices regarding the size and quality of the sample of population to be studied, the time span of the observations, the selection and organization of significant data; and it also implies methodological problems (which are common to all forms of statistical inference) concerning the applicability of the results obtained analyzing one sample of population to the entire population. Toxicology involves intriguing issues like the choice of the extrapolation function and the possibility of obtaining sound results by extrapolating from high to low doses, from animals to humans, from laboratory conditions to uncontrollable, "in the open", conditions (Majone, 1983; Maugh, 1978; Wong, 1986; Wynne, 1989).

Given these problems (beside other political and economic ones), disagreements between experts over the interpretation of epidemiological and toxicological data -and over the corresponding "risk characterization"- are quite widespread (Gillespie et al., 1982; Liberatore, 1989: cap.4; Nowotny and Hirsch, 1980).

It is then worthwhile to emphasize that risk assessment, while starting with an apparently clear and measurable definition of risk, involves less clear assessment procedures and often ends with disputable numbers.

If risk assessment turns out not to be a purely objective matter, one can hardly expect risk evaluation to be grounded on objective -and measurable- "facts".

However some instruments and criteria have been suggested to make risk evaluation as rational (according to an economic model of rationality based on expected utility) and objective (in the sense of being quantifiable) as possible.

The main tool developed in this perspective is **cost-benefit analysis**, firstly put forward -with respect to the evaluation of technological risk- by Chauncey Starr (Starr, 1969).

The declared rationale of cost-benefit analysis is that when considering a proposed technology (or a proposed regulation), we should assess the costs and the benefits involved by the implementation of such technology (or regulation), and we should adopt the technology (or the regulation) only if the expected benefits outweigh the expected costs.

Cost-benefit analysis points to a very important issue, that is the need to acknowledge and deal with the trade-offs involved in deciding whether to carry on, and in which manner, certain risky activities. However that analysis presents some problematic aspects.

First of all, the very definition of what is a "cost" and what is a "benefit" is controversial. On the one hand, costs and benefits can be defined in quantifiable economic terms; the costs being the expenses needed to minimize risk and the benefits being measured in money or other resources which are saved/gained (for instance, by introducing or not introducting certain safety measures). From a different perspective, the "costs" and "benefits" can be defined as not merely economic ones; the "costs" implied by the adoption of a certain technology can be regarded as including the connected risk for health and environment together with elements like fears of accidents or distrust in institutions, while the "benefits" may include the enjoyment of a beautiful landscape or the preservation of endangered species.

The distribution of "costs" and "benefits" among different sectors of society at the local, national and/or international level as well as between different generations is another very problematic issue (Ashford, 1981; Breyer, 1982; Fischhoff, 1977; Reyner and Cantor, 1987; Wilson, 1980). Costs and benefits can be diffused and more or less equally shared; or they can be both concentrated, but unequally distributed; or the costs can be concentrated, and borne only by some social groups, while the benefits are widespread; or the costs can be diffused and the benefits concentrated and enjoyed by few people. Whatever the case, the handling of distributive aspects and the choice between various possible trade-offs involve important issues that cannot be dealt with in purely economic and quantitative terms but require political judgment and decision.

On the basis of the different definitions of costs and benefits and the different emphasis and points of view on distributive (and others) issues, controversies over the evaluation of trade-offs frequently arise in the nuclear debate. At the core of these controversies lies the concept of "acceptable risk".

Studies in the field of <u>risk perception</u> began developing in the seventies and focus on the issue of "risk acceptability". The term "acceptable risk" was introduced by Chauncey Starr in the article (Starr, 1969) where he suggested for the first time the adoption of cost-benefit analysis. Starr tried to answer the question, "how safe is safe enough"? and he concluded that: 1. the public is willing to accept "voluntary" risks roughly 1000 times greater than "involuntary" risks; 2. the statistical risk of death from disease appears to be a psychological yardstick for establishing the level of acceptability of other risks; 3. the acceptability of risks appears to be proportional to the third power of benefits (real or imaginary); 4. the social acceptability of risk is directly influenced by public awareness of the benefits of an activity (Starr 1969, p.1237).

Concerning the considerations that influence safety judgements and the acceptability of risk, William Lowrance (Lowrance, 1976) suggests that other considerations, beside the ones indicated by Starr, play an important role. The list includes: whether the risk is known with certainty or not; whether the effects are immediate or delayed; whether the consequences are reversible or irreversible; whether there are alternatives available or not; whether exposure is an essential or a luxury; whether exposure is encountered occupationally or non-occupationally; whether the hazard is common or "dread"; whether it affects average or especially sensitive people; whether the technology will be used as intended or is likely to be misused (Lowrance 1976, pp.87-94).

Other studies in risk perception (Fischhoff et al., 1981; Kahnemann et al., 1982; Slovich et al., 1984) point out the relevance of other aspects too, like the controllability and observability of risk, their being new or old, their catastrophic dimension and their distribution.

Even if these elements are usually analyzed from a psychological point of view, it is important to stress that they do not merely refer to individual -and, at the same time, common to all human beings- mental features, but to the broader social context. The way people perceive risks cannot be separated from the way people perceive and judge social relations -particularly power relations (Nelkin, 1979)- and institutions (Douglas and Wildawsky, 1982; Rayner and Cantor, 1987; Short, 1984; Schwarz and Thompson, 1990; Wynne, 1987). Consequently different people/social groups perceive risks in different ways and/or pay attention to different kinds of risks (economic, environmental, health, political risks).

To give an example, to regard something as an unacceptable risk because of its unfair distribution among different sectors of society or generations implies judgements (in this case based on the category of fairness) about social relations; judgements which are not necessarily shared by everybody. And perceptions concerning, to give another example, the controllability of risks or the possibility that a technology will be misused involve judgements about the capabilities and the accountability of the institutions involved in risk assessment and management. Also in this case, different judgements and perceptions can emerge.

Following this reasoning, it is not surprising that often a marked difference is found between risk assessors and sections of the public in their perception and evaluation of risk. In fact, as pointed out in several empirical studies (for example, Fischhoff et al., 1981; Slovic et al., 1984; Wynne et al., 1988; Zapponi et al., 1991) while risk assessors try to calculate in probabilistic terms the occurrence and the effects of certain events, most people do not evaluate risks thinking about probabilities but considering the above mentioned characteristics of risks (delayed or immediate effects, etc.), the quality of social relations and the behavior of political, economic and scientific institutions.

These different perspectives are not necessarily incompatible, nor are they exclusively a matter of culture and perception.

On the one hand, risk for health and environment become actual -and partially quantifiable- harm in case of accidents or acute pollution. In this respect they are not only a matter of social relations nor are they only in the eyes of the beholder as some authors seem to argue (see, Douglas and Wildawsky, 1982); thus risk assessment methods can help in determining, for instance, the possible toxicity of certain substances. On the other hand, quantitative/probabilistic risk assessment can be regarded as being only a part of a wider social (not in the sense of being made by "society" as a whole, but in the sense of taking social aspects into account) risk assessment and evaluation where unquantifiable elements such as the credibility and accountability of institutions are taken into account.

The preference for quantitative or social risk assessment and evaluation is partially a matter of culture (such as professional training, pro- or against-quantification "biases", worldviews diffused in different societies and social groups), but it is also a matter of interest. Those who have a specific economic or political interest (even if it can change over time) in promoting the development of a certain technology, will favour a definition of risk which leave out intriguing considerations about social and power relations. On the contrary, those who have no specific interest in the development of such technology -and especially those who are critical about current social and power relations- will evaluate technologies according to a definition of risk that encompasses social and political aspects.

Given these different perspectives, also the terms "rationality" and "irrationality" which are frequently used in controversies about risk cannot be regarded as univocally defined and absolute ones. Risks can be evaluated according to a model of instrumental, economic rationality, as in the case of cost-benefit analysis; or they can be evaluated following a model of social rationality (Perrow, 1984; Wartofsky, 1986) in which social bonding is emphasized. Beside that, risks can be evaluated assuming that rationality is "perfect" or recognizing its intrinsic and external limits (Simon, 1982; March, 1978; Liberatore, 1989b). Furthermore, rationality can be regarded as being opposed to -or detached from- passions or it can be argued that certain passions (fears, for instance) often have a rational ground (Donini, 1986). Finally, on the basis of these remarks it can be argued that there is not such a thing as one "true" rationality, but that there are plural rationalities (Schwarz and Thompson, 1990). In other words a conflict between different models of rationality, rather than a contrast between "rationality" and "irrationality", is at stake in controversies about risk.'

It is generally acknowledged that one of the best ways of dealing with controversies is to find some forms of communication between people holding different views.

Risk communication studies started growing in the mid-eighties and are especially focused on the disagreements and the communication between experts -mainly risk assessors- and the public (Plough and Krimsky, 1987). Channels, forms and contents of communication are explored taking into account that risks are not perceived and evaluated in the same way by experts and lay people, as well as by proponents and opponents of a specific technology.

However the purposes of communication are not seen in the same manner by everybody. In case it is assumed that experts know better than anybody else what the risks really are, risk communication will be regarded as a one-way process (from experts to lay people) aimed at "enlightening" the public. If it is acknowledged instead that different concepts of risk and different rationalities have to be taken into account, risk communication will be considered a multi-way, while asymmetrical due to power relations, process. A process where each part (experts holding dissimilar opinions, political and regulatory authorities, industry, various social groups and the media) can learn from the others and must consider their points of view.

In this respect some studies in the field of risk communication are quite ambiguous. An article of Paul Slovic (Slovic, 1987), for instance, emphasizes the need to educate the public, in this way implicitly assuming that experts have the proper information/knowledge and that the aim of communication is to instruct lay people. On the other hand, the author recognizes that risk communication is doomed to failure unless it is structured as a two-way process, and this involves an idea of exchange between the parties involved rather than a more or less enlightened imposition of (some) experts' point of view.

Such ambiguity may be explained by the fact that much risk communication work is linked with the problem of risk acceptability. Risk communication can be in fact regarded as an instrument to make acceptable (or simply accepted) otherwise unacceptable (unaccepted) risks, technologies and policies, or it can be regarded as a pluralistic process where all the parties give and receive information and form their opinion about the acceptability or unacceptability of risk.

But the attempts to make risk accepted by finding a "nicer" way of telling things can contrast with the need to take action to avoid risk. Such different aims -encourage risk acceptance or risk avoidance- embedded in different social contexts, results in some paradoxes that have been pointed out by Harry Otway and Brian Wynne (Otway and Wynne, 1989). Taking the case of major hazard communication, the authors argue that the reassurance-arousal paradox arises from the contradiction between siting and emergency plan communication, the first one being aimed at reassuring people that they can forget about risk and the second one being effective only if risks are considered not negligible and are remembered. The information targeting paradox is due instead, to give another example, to the perceived need (mainly by business and certain political authorities) to restrict information to avoid public overreaction and the suspicion of a cover up, and the consequent reaction that such restriction can give rise to.

What is important to stress at this point is that risk communication can be regarded as an important element not only to impose or discuss the acceptance/acceptability of risks, but also to effectively manage risk (at least when the mentioned paradoxes do not prevent this). For example, if people living near hazardous plants are given the information they need, trust the sources of information about emergency measures and therefore comply with these measures, it will be easier (in case measures are appropriate) to cope with the risks for health in case of accidents.

From the point of view of <u>risk management</u>, various problems arise due to the conflicting, and differently rational, definitions and evaluations of risk, and to other aspects like the interpretation of laws or the problems concerning the implementation of regulations.

Various definitions of the term "risk management" has been suggested. It seems worthwhile to mention some of them to give an idea of the different and complex issues involved in the use of such term.

The US National Academy of Sciences defines risk management as the complex of judgement and analysis that uses the results of risk assessment to produce a decision about environmental action (quoted in EPA, 1984; p.23). The US Environmental Protection Agency advances a similar definition of risk management but takes into account the specific Agency's tasks; risk management is then defined as the determination and accomplishment of those actions that will reduce risk to the greatest degree given any particular level of resources, meaning Agency's resources and those of society in general (EPA, 1984; p.23). From a broader perspective, Timothy O' Riordan proposes to regard risk management as a political scientific process that is constantly adapting as scientific understanding improves, as the political priorities alter and as the public mood modulates (O'Riordan, 1982; p.99).

It can be noticed that, according to the first two definitions, risk management follows risk assessment and is regarded as both an analytical process (in the definition of the National Academy of Sciences) and a practical one (as emerges by the emphasis of EPA on the accomplishment -beside the determination- of actions). The sequence from risk assessment to risk management is explicitly or implicitly assumed in many studies; the underlying logic being that in order to manage risks it is necessary to know them first. From this point of view a separation can be drawn between risk assessment, belonging to the pure realm of science, and risk management, referring to the prosaic world of politics.

This apparently clear picture is however simplistic and even misleading. As it was already pointed out, risk assessment is a quite controversial process and its results cannot be taken as "purely scientific". Beside that, risk assessment and risk management are not to be seen as sequential steps but as interacting processes: the (more or less controversial) results of risk assessment influence decisions concerning the priorities for action and the measures to be adopted to manage risk; on the other hand, the way risk are managed influence the probability of occurrence of certain accidental events and/or the seriousness of their consequences.

The formulation, choice and implementation of methods for managing risks (mainly direct regulation, use of economic instruments, emergency planning, information and communication) are also matters of controversy. And this cannot but be expected if one takes O'Riordan's broad definition of risk management and links such definition with the problems discussed in these pages about the assessment, evaluation, perception and communication of risk.

In the next two paragraphs an analysis will be put forward concerning two aspects that are particularly important when addressing the problem of risk management, that is the management of scientific and organizational uncertainties.

Such aspects are very intriguing and difficult to handle, especially in face of non-routine and catastrophic events like Chernobyl. During and following the Chernobyl fallout, scientific uncertainties (especially regarding the risks for health due to low doses of radiation) and organizational uncertainties (regarding the definition and distribution of responsibilities and institutions' ability to cope with such unprecedented event) had to be dealt with. In order to understand the short-term responses and long-term changes that occurred after Chernobyl, it is then necessary to explore the main features of scientific and organizational uncertainties and the main problems characterizing their management

b. <u>Uncertain knowledge and its utilization</u>.

Scientific knowledge went through alternate vicissitudes in the course of time, often running into the opposition of some sectors of society while attracting at the same time the support of others. Well-known are the attacks launched in the past centuries by the Catholic Church against science labelled as an instrument of the evil, and the defences made, for instance, by Enlightenment philosophers who celebrated science as a vehicle of those lights of reason needed to fight the darkness of ignorance and superstition and to foster progress.

Nowadays not only conflicting views (opposition or support) held by different people, but also mixed attitudes toward science can be found. While being generally praised as a sort of cornucopia thanks to its important achievements, science is at the same time being regarded -particularly starting from the drop of the atom bombs on Hiroshima and Nagasaki- as a source of disruption. Radical criticism of science and the type of progress -based on the subjugation of nature- that science contributed to develop are put forward by environmental groups (Eder, 1990); but also several scientists, politicians and lay people are acknowledging the "dark side" of science. Especially concerning environmental matters, scientific knowledge is in fact required not only to cope with natural disasters but also to deal with its own undesirable side-effects such as major technological accidents and widespread pollution.

Policy makers ask and utilize scientists' advice to design and legitimate regulatory options and other policy instruments aimed at coping with those "science-induced" problems. However, as it was mentioned in the previous paragraph, there are limits to the ability of science to assess and help in the management of health and environmental risks. Limits which are due to both internal constraints, like the inadequacy of available theories or methods and the limits of rationality, and external ones, like the finiteness of financial, technical and time resources.

Furthermore, it has been pointed out by post-empiricist philosophers and sociologists of science, as well as by psychologists working in the field of risk perception, that the pretence to completely separate facts and values, object and subject of research is ill-grounded. Starting from Heisenberg's principle of indeterminacy, the interactions between what is observed, the experimental equipment used and the subjective assumptions made to interpret the observations are acknowledged also in "hard sciences" such as theoretical physics (Heisenberg, 1958); and the theory-ladenness of all observations and statements of fact has been pointed out by some contemporary philosophers of science, particularly by Mary Hesse (Hesse, 1974). Moreover, the role of value judgements in scientific practice has been inquired by various authors who emphasize the embeddedness of science in its social and historical context (Barnes and Edge, 1982; Hausen and Nowotny, 1986; Knorr-Cetina, 1981; Kuhn, 1962; Ravetz, 1971).

These elements prevent the achievement of a perfect and objective scientific knowledge, particularly in fields which are relevant for answering policy relevant questions such as whether and how much certain chemicals or low doses of radiation are dangerous for health and environment in the long-term.

The term "trans-scientific" was introduced in 1972 by Alvin Weinberg to characterize those questions that can be stated in scientific terms but that are in principle beyond the proficiency of science to answer (Weinberg, 1972). Among these questions he includes the issue of the risks for health due to low doses of radiation. According to Weinberg, such questions transcend science because to get answers would be impractically expensive, or because the subject matter is too variable to allow rationalization according to the canons established within the natural sciences, or because the issue at hand involves moral and/or aesthetic judgements. In a subsequent article, Weinberg also suggests that one should define a new branch of science, called **regulatory science**, in which the norms of scientific proof are less demanding than are the norms of ordinary science (Weinberg, 1985).

Weinberg's contributions get to the heart of two very important problems, that is the recognition of the limits of science and the particularly weak status of some of the disciplines which are referred to in the regulatory process. However, his distinction between science and trans-science or between ordinary sciences and regulatory science is problematic.

One can in fact interpret such distinction as a matter of principle (as Weinberg seems to do) or as a matter of degree. In the first case science is assumed to be able to establish the truth and provide objective answers while trans-science cannot; but the already mentioned criticisms to the separation between object and subject and between facts and values undermine such interpretation. In the second case, one can note that some disciplines are less "mature" than others but that certainty cannot be achieved even in the better established disciplines (Ravetz, 1971: cap.3, cap.14). This does not mean that the distinction between science and trans-science must be totally discarded, but that it must be regarded as a matter of degree. Mainly the degree of clarity in understanding and responding to certain problems.

But then the issue arises of institutional power (Jasanoff, 1987), that is, who should determine how the boundary is drawn between science and trans-science? And once this line is drawn, who should decide the controversial trans-scientific issues and by what procedures?

Weinberg attributes to scientists the prerogative of defining boundaries; in his words scientists have in fact the crucial role "...to make clear where science ends and trans-science begins" (Weinberg, 1972: p.220). However, other relevant actors advance different positions; for instance, some administrative lawyers view Weinberg's analysis as a rationale for expanding the role of law and legal processes in face of scientific uncertainty (McGarity, 1979). It can therefore be argued, with Sheila Jasanoff, that the linguistic labels used to delimit the boundaries between science and policy are politically charged because they are aimed at explaining or justifying the allocation of power and prestige between the institutions of government and those of science (Jasanoff, 1987: p.199). Especially between government and that part of science (or, as Jasanoff calls it, "the fifth branch of power", Jasanoff, 1990) which is created and used for policy advice.

The relation between science and policy, and especially the management of scientific uncertainty in the policy process, remain an open and critical problem. As Jerome Ravetz and Silvio Funtowicz write, nowadays "...we face "hard" policy decisions (involving huge investments and the fates of many people) whose necessary scientific inputs will be irremediably "soft", uncertain and contested" (Ravetz and Funtowicz, 1989). In this respect the authors add that not only uncertainty but also ignorance has to be acknowledged; and they remind us that Renaissance mapmakers, who drew black spaces to locate the unknown, already understood that worse than ignorance of facts is ignorance of ignorance.

Given this situation it is important to analyze how uncertain knowledge and even ignorance can be and are actually used in policy making, particularly in the field of risk management.

Decisions concerning the management of technological and environmental risk necessitate the consideration of the consequences of various possible options. And this involve the evaluation of the uncertainties (and ignorance) in the scientific basis and the uncertainties regarding the political, economic and social implications of each alternative at the local, national and international level.

In face of such uncertainties, three main decisional alternatives are available: 1. decide to wait for more information and to postpone decisions; 2. make a decision taking uncertainties and ignorance into account; 3. make a decision neglecting or even hiding uncertainties.

Examples of the first two approaches can be found in the ongoing debate about the greenhouse effect. The US government (but also many developing countries) maintains that given the existing scientific uncertainties it is better to wait for more information rather than adopt costly measures that could be regretted in case further evidence will reveal that they were unnecessary; the EC Commission and most European governments are advocating instead the need to take precautionary action, before it is too late, on the basis of the uncertain but significant evidence already available.

The decision to develop nuclear power on an industrial scale can be interpreted as an example of the third approach.

Uncertainties and ignorance regarding the safe disposal of nuclear waste, the decommissioning of nuclear plants, the possibility to cope with the consequences of major accidents have been underestimated (and kept secret) for a long time; and, as it was mentioned in the previous paragraph, the uncertainties involved in sophisticated risk assessment studies are still not fully acknowledged.

Why these different approaches to the management of uncertainty? Can a rational criterion be found to decide under uncertainty?

Concerning the tools suggested to guide decisions in conditions of uncertainty when high risks are at stake (as in the mentioned cases of climate change and nuclear power, or in the case of war), some rational choice theorists argue for the adoption of the maximin calculus, a calculus aimed at selecting the best worst outcome and implying the imperative of acting as if the worst that can happen will happen (Elster, 1979; Kavka, 1980).

This (normative) proposal sounds very reasonable, and a similar reasoning underlies the precautionary principle referred to in several international legal materials on environment protection issues (see, Cameron and Abouchar, 1991) and initially developed within the German radiation protection regulation. The maximin calculus and the precautionary principle have the merit to guide action in conditions of uncertainty rather than suggesting to wait for eventually unattainable certainty. However some intriguing aspects regarding their applicability should be taken into account.

A problem of these approaches is that choices about the management of technological and environmental risks have a wide social, economic and political impact and different social groups and political or economic organizations can have different perceptions and preferences regarding what is the "best worst outcome". This in turn involves contrasting opinions about the selection of the precautionary action to be possibly taken. For example, one can think that acting as if the worst that can happen will happen means to stop nuclear plants or the production of dangerous chemicals or the research on genetic engineering, while someone else may suggest to put safety devices and adopt regulatory measures.

Uncertainties are involved in each option. What seems to be crucial in the actual evaluation of such uncertainties and in the choice between various possible options are, on the one hand, the way in which problems are defined and risks are selected for attention and, on the other hand, the existence of power relationships where knowledge and information (beside other resources) are not equally available for all and can be used to justify the choice of options which are politically or economically preferred by those who are more powerful.

This last remark points to the fact that knowledge and information have never been the only basis of political decisions, and that their utilization is a far from taken-for-granted process.

In face of a problem, or in defining a problem, decision-makers do not necessarily try to obtain all the information which is or could become available, but select the information they need on the basis of their goals and resources. In other words, they look for a "half-knowledge" which can be safely organized into politics, avoiding the knowledge that could provoke embarrassment and conflicts (Marin, 1981).

This consideration applies also to the evaluation of the quality of information and the uncertainties in the scientific basis. In some cases to deepen and spread the knowledge about a certain issue may be regarded as risky by political and economic elites and then further information or research can be discouraged. On the other hand, also a "half-knowledge" has to be selected in a way to be good enough and credible enough to be usable.

Discretion in selecting and utilizing knowledge is in fact limited by knowledge itself; politicians cannot pretend that certain data do not exist or that they can be neglected, at least when such data are widely known within and beyond scientific communities or national borders.

The relation between knowledge and discretion in policy making is thus twosided.

On the one hand, policy relevant knowledge is usually uncertain and insufficient to allow definitive conclusions about the consequences of policy options. This is demonstrated (for instance, in the Chernobyl case) by the widespread disagreements between scientific advisers not only about the interpretation of data or phenomena but also about the measures to be recommended. Disagreements due to both the uncertainties which characterize knowledge in any field (starting from the apparently more certain domain of the natural sciences), and to the commitments of each expert to different disciplinary trainings, cultural traditions, values, interests and perceptions. Given this situation, decision-makers cannot escape exercising discretion, that is -in the definition of Ted Greenwood- the power or right to decide or to act on either procedural or substantive matters according to one's own judgement or choice (Greenwood, 1984: p.3). Such political and administrative discretion may take different forms in different contexts, from the selection -in the light of political and economic interests- of scientific evidence, to the interpretation of legal clauses such as the adoption of the best available technology or the adaptation of regulatory measures to scientific and technical progress.

On the other hand, knowledge constrains discretion by offering data, explanations or forecasts that cannot be completely ignored even if they are uncertain and controversial. At least because policy decisions taken, for instance, by national governments can be challenged by opposition groups, local authorities or international organizations on the basis of the available knowledge. Beside that, those who are regarded as depositaries of knowledge, that is the "experts", influence the exercise of political and administrative discretion by contributing to the selection and definition of both the problems to be addressed and the possible solutions. This seems particularly evident in case of crisis situations, such as the occurrence of major industrial accidents, where specialized knowledge is asked to provide quick answers about the risks involved and the measures to be taken. Especially in such situations the management of scientific uncertainties is a crucial aspect of the broader crisis management.

c. Organizational uncertainties and the management of crises.

In face of unexpected events as Chernobyl not only uncertainties regarding their nature, causes and possible consequences have to be taken into consideration. Also uncertainties regarding who should take action and according to which criteria have to be dealt with. Moreover, even when responsibilities and procedures are established, each actor involved in the management of crises must face the uncertainties regarding her/his own reactions to non-routine events as well as the uncertainties regarding the behavior of the other relevant actors.

The main actors involved in risk management, both in routine and in crisis situations, are political authorities, administration, technical-advisory bodies, industry and some international organizations. Moreover, non governmental organizations and interest groups have an important role in influencing and evaluating the performance of risk managers, while the mass-media may act both as risk managers (for example, by diffusing information about measures to be taken in case of industrial accidents or high pollution due to other causes) and as public or private interest groups having the peculiarity of giving voice (even if not in same way and with the same weight) to opinions held by various social groups.

In general terms, activities and responsibilities in the field of risk management can be summarized as follows.

- Political institutions at the central and local level have the responsibility of making decisions and formulating policies aimed at preventing or minimizing risk. Conflicts and overlap of responsibility within governments and between central/federal governments and local authorities may arise, especially in face of unprecedented events.
- Administrations are often regarded as merely implementing the decisions made by governments or local authorities; however it has been pointed out (for instance, by Mèny, 1990 and Rourke, 1984) that bureaucracies, by supplying advice and having the power of implementing -or not implementing- decisions, also contribute to shape the political agenda and to determine the substance of political decisions .
- Political institutions and administrations can resort to the help of some advisory bodies, both internal (like Ministries' technical/advisory committees) and external (like University departments or private consultants) ones. Given the previously mentioned problems concerning the management of scientific uncertainty and the corresponding disagreements between experts, the relations between advisers and adviced institutions can be difficult. Experts' advice is not so much an instrument for implementing policies (for instance, concerning technical aspects like monitoring) but contributes to the framing of problems and the formulation of policies.
- Especially in cases of transboundary risk, national governments and bureaucracies can collaborate with the authorities of other countries and with the relevant international organizations. Supranational settings such as the European Community and some international organizations like the United Nations and its specialized programmes and Agencies (including the

UN Environment Programme and the International Atomic Energy Agency) are becoming increasingly important actors in the field of transboundary risk management.

Given the fact that many risks for health and environment are linked with industrial activities, industry itself is required to adopt measures aimed at coping with risk. Measures that are not only imposed by law (when it is enforced), but also by market competition: usually accidents are not a good business, at least if safety devices and other risk-avoiding mechanisms are not regarded as too costly.

Finally, the mass-media, as arenas and vehicles of risk communication, are involved both in the formulation of decisions (by giving voice to -as well as influencing- the opinions of various social groups) and in their implementation (by diffusing the relevant information).

It is quite easy to see that all these risk managers do not act in isolation from each other.

In some cases they work together, and even when they do not collaborate or are in conflict they have to take into account each other role and behavior; in this way they exert a reciprocal, but usually not symmetrical (because not all of them are equally powerful), influence. Furthermore, each and all of them has/have to take into consideration also other actors (such as strong non governmental organizations and interest groups, and the media) and the features of their social, political, economic and cultural context.

The importance to focus on relational aspects has been stressed by several authors with special reference to political and economic organizations; however, also scientific institutions, non governmental (non profit) organizations and the media can and have to be included.

The notion of **interorganizational networks**, that is the totality of all the organizations connected by a certain type of relationships, has been introduced; and some techniques have been developed to measure or graphically represent the links, density, reachability and other elements of the networks which are taken as basic units of analysis (see, Aldrich and Whetten, 1981; Benson, 1975; Laumann and Pappi, 1976; Perrow, 1986: cap.6). Some specifications regarding the field and nature of interorganizational networks have been introduced such as issue networks (Heclo, 1978), policy networks (see, Marin and Mayntz, 1991; Kenis and Schneider, 1991) and regulatory networks (Huber, 1991). Apart from these distinctions regarding various types of interorganizational networks, Howard Aldrich and David Whetten draw an interesting distinction between networks, **organization-sets**, i.e. those organizations with which a focal organization has direct links, and **action-sets**, i.e. those groups of organizations that have formed a limited alliance for a limited purpose (Aldrich and Whetten, 1981).

The notion of action-set seems particularly useful when interpreting organizations' responses to non-routine events such as major technological accidents. In those cases action-sets may represent a way, for each organization involved, to reduce the uncertainties regarding the behavior of the other relevant organizations (or **inter-organizational uncertainties**) in order to cope with the problems at hand.

Besides inter-organizational uncertainties also **intra-organizational uncertainties** must be usually dealt with in managing non-routine events.

Activities related to the prevention and minimization of risk are only a part of the activities carried on by political and administrative institutions, firms, media, scientific institutions not specialized in this area. Routines are followed in this field as in all the others, and this is not surprising because routines are necessary components of organized activities. In fact, in order to preserve or enlarge their structure and to work efficiently, organizations of any kind are based on the definition of certain tasks that have to be performed by some responsible units. In this context, the usual way to cope with non-routine events and manage risk is to create specialized units within the relevant organizations (see, Thompson, 1967, cap.6) or to establish new organizations that will also follow certain routines in their monitoring, research, enforcement or planning activities. The extreme case being the alienating but necessary work of some people in emergency units (especially when these units are permanently active) who spend their working time in front of a monitor to control if everything is all right.

But in spite of sophisticated forecasts, planning and training, in many cases organizations are taken by surprise when non-routine events take place. According to some authors (Wohlstetter, 1962; Shrivastava, 1987; Medvedev, G., 1991) such surprise is mainly due to the neglect of **warning signals**. This in turn can be attributed to misleading individual and collective perceptions (for instance, about the safety of nuclear plants or about the behavior/"move" expected from other individuals and organizations) and to various intra- and inter-organizational features like certain difficulties in, or even lack of, communication.

Therefore when non-routine and weighty events occur they bring along some elements that, because unexpected, challenge the routinized management of non-routine occurrences. In this respect these elements represent sources of uncertainty within each organization (intra-organizational uncertainty) concerning, for instance, its own abilities, resources, solidity and adaptability.

Different responses can be given in such circumstances. And these responses depend very much on the definitions of the situation and on the relations within and between the organizations involved.

Concerning the first point, James March and Herbert Simon argue that choice is always exercized with respect to a simplified model of the situation, or definition of the situation; definition which elements are not given but are themselves the outcome of social and psychological processes including the activities performed and the procedures followed by the actors (organizations) involved, and their limit of attention or memory (March and Simon, 1958: cap.6). The authors also suggest that when a stimulus coming from the organizations' environment (which include other organizations) is of a kind that has been experienced repeatedly in the past, the response will be highly routinized; instead, when a stimulus is relatively novel, it will evoke problem-solving activity aimed initially at constructing a definition of the situation and then at developing one or more performance programs (March and Simon, 1958: p.140).

In a later article, March goes further and writes that, "life is not primarily choice; it is interpretation" (March, 1982: p.38), and that decision processes are only partly concerned with making decisions since they also provide an occasion for defining virtue and truth, distributing glory or blame for what has happened, and so on (March, 1982: p.37).

Also with respect to the links between definitions of the situation and organizations'responses to crises, William Starbuck maintains that environments instigate crises by changing unpredictably while also promulgating ideologies that impede adaptation to unpredicted changes (Starbuck, 1982: p.5). For instance, their environment instructs organizations to rely on rational analysis, to justify and plan their action, and to maintain coherence through hierarchical authority. According to Starbuck, these properties produce detrimental inertia when environments change abruptly in unexpected directions (Starbuck, 1981: p.5).

On the basis of these remarks by March, Simon and Starbuck, it can be argued that in face of non-routine events, organizations' responses are firstly aimed at defining the situation; especially, whether it is a crisis or not, and which kind of crisis. Such definition will only partially depend on the specific features of the non-routine, unexpected events: the features of the organizations involved (their structure, technical resources, authority, etc.) being also very important. These organizational features and the definitions of the situation they contribute to produce influence the way intra and inter-organizational uncertainties are managed. For instance, the attempts to reduce non-routine events to routines and adopt a "normalizing" behavior or, on the contrary, to define and treat non-routine events as abnormal occurrences to be managed with the help of new or modified instruments and procedures.

After discussing some specific aspects related to the management of scientific and organizational uncertainties, some more general features of issue framing, decision making and learning processes will be analysed in the next chapter. The short-term responses the medium/long-term changes that followed Chernobyl were the result of these distinct but linked processes.

REFERENCES

ALDRICH, Howard and David WHETTEN (1981), "Organization-sets, action-sets, and networks: making the most of simplicity", in Paul Nystrom and W. Starbuck eds., Handbook of organizational design, vol.1, Oxford University Press, Oxford.

ASHFORD, Nicholas (1981), "Alternatives to cost-benefit analysis in regulatory decisions", in William Nicholson ed., Management of assessed risk for carcinogens. Annals of the New York Academy of Sciences, vol.363.

BARNES, Barry and David EDGE eds.(1982), Science in Context. Readings in the Sociology of Science, The Open University Press, Milton Keynes.

BENSON, Kenneth (1975), "The interorganizational network as a political economy", in Administrative Science Quarterly, vol.20, pp. 229-249.

BEYER, Janice (1981), Ideologies, values, and decision making in organizations, in NYSTROM, Paul and William STARBUCK eds., Handobook of Organizational Design, vol.2.

BREYER, Stephen (1982), Regulation and its reform, Harvard University Press, Cambridge Mass. and London.

CAMERON, James and Julie ABOUCHAR (1991), "The Precutionary Principle: A Fundamental Principle of Law and Policy for the Protection of the Global Environment", in Boston College International and Comparative Law Review, vol.XIV, n.1.

CYERT, Richard and James MARCH (1963), A Behavioral Theory of the Firm, Prentice Hall, Englewood Cliffs, New York.

DONINI, Elisabetta (1986), La saggezza della paura contro la filosofia del rischio, in LEONARDI, Grazia ed., Scienza, potere, coscienza del limite. Dopo Chernobyl: oltre l'estraneità, Editori Riuniti, Rome.

DOUGLAS, Mary and Aaron WILDAVSKY (1982), Risk and Culture, University of California Press, Berkeley and Los Angeles.

DOUGLAS, Mary ed. (1982), Essays in the Sociology of Perception, Routledge and Kegan Paul, London.

EDER, Klaus (1990), The Cultural Code of Modernity and the Problem of Nature. A critique of the naturalistic notion of progress, in ALEXANDER, J. and P.SZTOMPKA eds., Rethinking Progress: Movements, Forces and Ideas at the End of the Twentieth Century, Unwin Hyman, London/New York.

ELSTER, Jon (1979), "Risk, Uncertainty and Nuclear Power", in Social Science Information, vol.18, n.3, pp. 371-400.

EPA, Environmental Protection Agency (1984), Risk Assessment and Management: framework for decision making, EPA, USA.

FISCHHOFF, Baruch (1977), "Cost benefit analysis and the art of motorcycle maintenance", in Policy Science, vol.8; pp.177-202.

FISCHHOFF, Baruch, Sarah LICHTENSTEIN, Paul SLOVIC, Stephen DERBY and Ralph KEENEY (1981), Acceptable Risk, Cambridge University Press, Cambridge, UK.

GILLESPIE, Brendan, Dave EVA and Ron JOHNSTON (1982), Carcinogenic Risk Assessment in the USA and UK: the Case of Aldrin/Dieldrin, in Barry BARNES and David EDGE eds., Science in Context. Readings in the Sociology of Science, The Open University Press, Milton Keynes, UK.

GREENWOOD, Ted (1984), Knowledge and Discretion in Government Regulation, Praeger, New York.

GROSS, Jonathan and Steve RAYNER (1985), Measuring Culture, Columbia University Press, New York.

HAFELE, Wolf (1974), "Hypotheticality and the New Challenges: The Pathfinder Role of Nuclear Energy", in Minerva, vol.10, pp.301-322.

HAUSEN,Karin and Helga NOWOTNY eds.(1986), Wie männlich ist die Wissenschaft?, Suhrkamp, Frankfurt am Main.

HECLO, Hugh (1978), Issue Networks and the Executive Establishment, in KING A. ed, The New American Executive Establishment, American Entreprise Institute, Washington D.C.

HEISENBERG, Werner (1958), Physics and Philosophy, Chicago University Press, Chicago..

HESSE, Mary (1974), The Structure of Scientific Inference, MacMillan, London.

HUBER, Michael (1991), Das regulative Netzwerk. Risiko und regulative Politik im bundesdeutschen Kernenergiekonflikt, dissertation, EUI, Florence.

JASANOFF, Sheila (1987), "Contested boundaries in policy-relevant science", in Social Studies of Science, vol.17, pp.195-230.

JASANOFF, Sheila (1990), The Fifth Branch. Science Advisers as Policymakers, Harvard University Press, Cambridge Ma., USA.

KAHNEMAN, Daniel, Paul SLOVIC and Amos TVERSKY (1982), Judgment under uncertainty: heuristics and biases, Cambridge University Press, Cambridge.

KAVKA, Gregory (1980), "Deterrence, utility, and rational choice", in Theory and Decision, vol.12, n.1, pp. 41-60.

KENNIS, Patric and Volker SCHNEIDER (1991), Policy Networks and Policy Analysis: Scrutinizing a New Analytical Toolbox, in MARIN, B.and R.MAYNTZ eds., Policy Networks. Empirical Evidence and Theoretical Considerations, Campus Verlag, Frankfurt am Main and Westview Press, Colorado.

KNORR-CETINA, Karin (1981), The Manufacture of Knowledge, Pergamon Press, Oxford-New York.

KUHN, Thomas (1962), The structure of scientific revolutions, University California Press, Chicago- London.

LAUMANN, Edward and F.U.PAPPI (1976), Networks of Collective Action: A Perspective on Community Influence Systems, Academic Press, New York.

LIBERATORE, Angela (1989 b), "Robinson e la foresta. Sui limiti della teoria della scelta razionale", in Meridiana. Rivista di storia e scienze sociali, n.6.

LIBERATORE, Angela (1989), EC Environmental Research and EC Environmental Policy. A Study in the Utilization of Knowledge for Regulatory Purposes, EUI Working Paper, Florence, Italy.

LOWRANCE, William (1976), Of Acceptable Risk. Science and the Determination of Safety, William Kaufmann Inc., Los Altos, USA.

MAJONE, Giandomenico (1983), The Uncertain Logic of Standard Setting, IIASA, Laxenburg, Austria.

MAJONE, Giandomenico (1989), Evidence, Argument and Persuasion in the Policy Process, Yale University Press, New Haven/London.

MARCH, James (1978), "Bounded rationality, Ambiguity, and the Engineering of Choice", in Bell Journal of Economics, vol.9, pp.587-609.

MARCH, James (1982), "Theories of Choice amd Making decisions", in Society, pp. 29-39.

MARCH, James and Herbert SIMON (1958), Organizations, John Wiley & Sons Inc., New York-London-Sydney.

MARCH, James and Johan OLSEN (1976), Organizational Learning and the Ambiguity of the Past, in MARCH,J. and J.OLSEN eds., Ambiguity and Choice in Organizations, Universitetsforlaget, Bergen-Oslo.

MARIN, B.and R.MAYNTZ eds., Policy Networks. Empirical Evidence and Theoretical Considerations, Campus Verlag, Frankfurt am Main and Westview Press, Colorado.

MARIN, Bernd (1981), "What is half-knowledge" sufficient for -and when? Theoretical comment on policymaker's uses of social science", in Knowledge: Creation, Diffusion, Utilization, vol.3, n.1., pp.43-60.

MAUGH, Thomas (1978), "Chemical carcinogens: the scientific basis for regulation", in Science, vol.201; pp.1200-1205.

MAZUZAN, George and WALKER, Samuel (1984), Controlling the atom. The beginnings of nuclear regulation 1946-1962, University of California Press, Berkeley-Los Angeles-London.

McGARITY, Thomas (1979), "Substantive and procedural discretion in administrative resolution of science policy questions: regulating carcinogens in EPA and OSHA", in The Georgetown Law Journal, vol. 67, pp. 729-810.

MENY, Yves (1990), Government and politics in Western Europe. Britain, France, Italy and West Germany, Oxford University Press, Oxford.

NOWOTNY, Helga and Helmut HIRSH (1980), "The consequences of dissent:sociological reflections on the controversy of the low dose effects", in Research Policy, vol.9; pp. 278-294.

NYSTROM, Paul and William STARBUCK eds. (1981), Handobook of Organizational Design, 2 voll., Oxford University Press, Oxford.

O'RIORDAN, Timothy (1982), "Risk perception studies and policy priorities", in Risk Analysis, vol.2; pp. 95-100.

OTWAY, Harry (1985), "Regulation and risk analysis", in Harry Otway and Malcom Peltu editors, Regulating industrial risk. Science, hazards and public protection, Butterworths, London.

OTWAY, Harry and Brian WYNNE (1989), "Risk communication: paradigm and paradox", in Risk Analysis, vol.9, n.2; pp.141-145.

PERROW, Charles (1986), Complex Organizations, Random House, New York.

PLOUGH, Alonzo and Sheldon KRIMSKY (1987), "The emergence of risk communication studies: social and political context", in Science, Technology and Human Values, vol. 12, n.3-4; pp.4-10.

RAVETZ, Jerome (1971), Scientific Knowledge and its Social Problems, Clarendon Press, Oxford.

RAVETZ, Jerome and Silvio FUNTOWICZ (1989), Usable knowledge, usable ignorance. A discourse on two sorts of science, paper at the Congress "The experts are categorical. Scientific controversies and political decisions concerning the environment", Arc-et-Senans, France

REYNER, Steve and Robin Cantor (1987), "How fair is safe enough? The cultural approach to societal technology choice", in Risk Analysis, vol.7, n.1; pp.3-9.

RIP, Arie (1986), "The mutual dependence of risk research and political context", in Science and Technology Studies, vol.4, n.3/4; pp. 3-15.

ROURKE, Francis (1984), Bureaucracy, politics and public policy, Little Brown and Company, Boston-Toronto.

SCHWARZ, Michiel and Michael THOMPSON (1990), Divided We Stand. Redefining Politics, Technology and Social Choice, Harverst Wheatsheaf, New York/London/Toronto/Sydney/Tokyo.

SHORT, James (1984), "The social fabric at risk: toward the social transformation of risk analysis", in American Sociological Review, vol. 49; pp. 711-725.

SHRIVASTAVA, Paul (1987), Bhopal. Anatomy of a Crisis, Ballinger Publishing Company, Cambridge Mass.

SIMON, Herbert (1957), Administrative Behavior, MacMillan, New York.

SIMON, Herbert (1976), From Substantive to Procedural Rationality, in LATSIS S.J. ed. Method and Apprisal in Economics, Cambridge University Press, Cambridge.

SIMON, Herbert (1982), Models of Bounded Rationality, 2 voll., MIT Press, Cambridge Mass.

SLOVIC, Paul (1986), "Informing and educating the public about risk", in Risk Analysis, vol.6, n.4; pp. 403-415.

SLOVIC, Paul, Baruch FISCHHOFF and Sarah LICHTENSTEIN (1982), Facts versus Fears: Understanding Perceived Risk, in Kahneman, Slovic, Fischhoff ed. Judgment under uncertainty: heuristics and biases, Cambridge University Press, Cambridge.

STARBUCK, William (1983), "Organizations as action generators" in American Sociological Review, vol.48, pp.91-102.

STARR, Chauncey (1969), "Social benefit versus technological risk", in Science, vol.165; pp. 1232-1238.

THOMPSON, James (1967), Organizations in Action. Social Science Base of Administrative Theory, McGraw-Hill Book, New York.

THOMPSON, Michael (1989), Surprises from systems, Natural and Cultural, paper at the Conference "Experts are cathegorical. Scientific controversies and political decisions in the environmental field, Arc-et-Senans, France.

WARTOFSKY, Marx (1986), Risk, Relativism and Rationality, in COVELLO, V., J.MENICES and J.MUMPOWER eds., Risk Evaluation and Management, Plenum Press, New York-London.

WEINBERG, Alvin (1972), "Science and trans-science", in Minerva, vol.10, pp. 209-222.

WEINBERG, Alvin (1985), "Science and its limits: the regulator's dilemma", in Issues in Science and Technology, vol.2, n.1.

WILSON, James (1980), The politics of regulation, Basic Books, New York.

WOHLSTETTER, Roberta (1962), Pearl Harbor. Warning and Decision, Stanford University Press, California.

WONG, S.C.Y. (1986), "Model uncertainty: implications for animal low-dose cancer risk assessment experiments", in V.Covello, L.Lave, A.Moghissi and V.Uppuluri ed., Uncertainty in risk assessment, risk management and decision making, Plenum Press, New York-London.

WYNNE, Brian (1987), Risk management and hazardous waste. Implementation of the dialectics of credibility, Springer-Verlag, Berlin-Heidelberg-New York-London-Paris-Tokyo.

WYNNE, Brian (1989), "Frameworks of rationality in risk management: towards the testing of naïve sociology", in Jennifer Brown ed., Environmental Threats. Perception, analysis and management. Belhaven Press, London.

WYNNE, Brian, Peter Williams and Jean Williams (1988), Cumbrian Hill Farmers' View of Scientific Advice, Evidence to the House of Commons Select Committee on Agriculture, Lancaster University.

YOUNG, Gerald (1986), "Environment: term and concept in the social sciences", in Social Science Information, vol.25, n.1, pp.83-124.

ZAPPONI, Giovanni, G.MARSILI and C.VOLLONO (1991), Factors which influence public reactions to environmental risks. Some past experiences in Italy, WHO Working Paper, ICP/PCS 020/A/10.

2

ISSUE FRAMING, DECISION MAKING AND LEARNING.

As previously mentioned, the management of scientific and organizational uncertainties is crucial both in defining problems and responding to them. In other words, two processes must be taken into account, i.e. the way problems are defined (as scientific, trans-scientific, political problems, or non-problems at all, as routine or abnormal events, etc.), and the way actions are taken -or not taken- to deal with these problems.

As we will see in the cases studies, the same event -i.e. the Chernobyl fallout and its consequences- was defined in different ways and different actions had been taken to deal with it. It is thus worthwile to analyse the distinct but linked problems of issue framing and decision making.

In the first two sections of this chapter a discussion is provided of different conceptual models focusing either on issue framing (i.e. how problems are defined) or on decision making (i.e. how solutions/responses are produced). As far as the first conceptual "stream" is concerned, the contribution of Joseph Gusfield (1981) and the work of Michiel Schwarz and Michael Thompson (1990) are analysed. Regarding the second stream, the three conceptual models sketched by Graham Allison (1971) are referred to, i.e. the Rational Policy Model, the Organizational Process Model and the Bureaucratic Politics Model. After such examination, the hypothesis suggested in the Introduction -which forms the core of what will be called the Policy Communication Model- is discussed in the light of both conceptual streams. Aim of the Policy Communication Model is in fact to integrate the different but linked foci on issue framing and decision making. In the last part of the chapter some theories of learning are also discussed to provide a theoretical background to the subsequent analysis of the medium and long-term changes occurred after Chernobyl. Also learning processes can be interpreted on the basis of the Policy Communication Model, but they present some peculiarities to be taken into account.

a. **Issue framing approaches**.

With respect to issue framing, reference was made in the previous chapter to studies that point to some specific issues regarding the definition of certain problems as scientific or trans-scientific ones (such as the theory-ladeness of all observations, the issue of institutional power in defining the boundary between science and trans-science, etc.). Moreover reference was made to contributions that identify some peculiarities of organizational definitions of problems (like the presence of SOPs, inertia and/or ideologies that may favour or prevent the emergence of certain issues).

On a more general level, several sociologists (like Garfinkel, 1967; Goffmann, 1974; Goodman, 1978; Gusfield, 1981; Snow and Benford, 1991; Schwarz and Thompson, 1991) point to the social construction of problems, that is the way in which certain events and experiences are interpreted according to cognitive frames which are in turn developed on the basis of the interactions between actors living in a given society. According to Erving Goffmann (and other authors, especially those in the field of ethnomethodology), "primary frameworks" are needed to render what would otherwise be a meaningless aspect into something that is meaningful (Goffmann, 1974). This happens by locating, perceiving, identifying and "labeling" a seemingly infinite number of concrete occurrences (Goffmann, 1974; Goodmann, 1978). Primary frames and their combination into "interpretive packages" (Gamson and Modigliani, 1989), influence also the forming of conjectures as to what occurred before and expectations of what is likely to happen in the future. In turn these conjectures and expectations influence the designing and selection of possible options, i.e. decision making.

Among the studies that focus on the way problems are framed and socially constructed, "The Culture of Public Problems" by Joseph Gusfield (1981) and "Divided We Stand" by Michiel Schwarz and Michael Thompson (1990) provide an excellent basis for examining which elements we can see looking through the cultural approach "lenses", and which ones we may eventually miss.

Joseph Gusfield (1981) focuses on how meaning is constituted, particularly on how certain events are categorized and defined as "public problems" (as distinct from "social problems" since not all social problems become public ones). Taking the case of drinking and driving as a public problem in the US context, Gusfield masterly illustrates how the link between drinking and unsafe driving had been developed and how certain solutions (focused on preventing drivers to drink and punishing them if they do) had been selected shuting out other possible ways of seeing the phenomenon.

Three main factors are identified by Gusfield to explain how such definition of the problem and the selection of its solution developed: a. the authority of scientific research as a basis for the construction of factual reality; b. the role of law in reinforcing meanings; c. the "ownership" of public problems by some actors who try to exclude others from defining and taking responsibility about such problems. With respect to these factors, Gusfield also points to some of the mechanisms that determine each of them and the form of their influence. For example, the social organization and internal dynamics of scientific research and the use of scientific evidence as arguments in the legal sphere; sphere which is in turn very influencial since it is given the authority of building an image of social order based on moral consensus. The author concludes that public actions and policies can be regarded as "theatrical" since cerimonies and rituals are performed to develop and establish meanings, and thus to construct reality. This last point raises some problems regarding the distinction between "performers" and "audience" of the public policy "drama"; in fact in many cases also those actors who do not "own" problems do not simply "watch" those who lead the definition of problems but participate in such definition. Nevertheless, Gusfield's approach provides important tools to understand not only how meaning is constituted and problems are framed, but also to see how frames influence the definition and selection of possible solutions.

In the Chernobyl case, we will see that scientists played a crucial role in defining the fallout as a radiological and public health problem (or non-problem) by interpreting and selecting the available information. And the attempts by governmental experts and authorities to "own" the framing and management of the Chernobyl fallout, together with the attempts by non-governmental actors to challenge such "ownership", will be also evidentiated.

Gusfield's analysis helps to identify these elements, but it leave us with an unanswered question, that is why certain *specific* actions and decisions are taken. While the definition of the problem certainly influences the formulation and selection of possible solutions, it remains to be understood why, for instance, different measures (or non-measures) are taken in the US and in Italy regarding the similarly defined drinking-driving problem. Or why (as it will be discussed in chapters 4 and 5) some different measures were taken in the FRG and Italy notwithstanding a similar "dominant" definition of the problem during the fallout. Furthermore, while the emphasis on issue framing attracts our attention to the fact that the different frames that emerged with respect to the consequences of Chernobyl influenced (particularly set limits to) the possible adaptations to be made, it does not explain why certain specific changes occurred in the years following the accident.

Also Schwarz and Thompson (1990) focus on how issues are framed. They argue that, above and beyond the various interests of the various actors, there are different convinctions as to how the world is and to how people are. Therefore to understand how, for instance, technology choices are made, it is necessary to analyse how different definitions of the problem (and different definitions of the solution) develop.

In order to identify the main elements that underlie different definition/framing of issues, the authors elaborate a typology (building on the work of anthropologists, mainly M.Douglas, and ecologists like C.Holling) which includes three main dimensions: forms of social relationships (market -or individualism-, hierarchy, egalitarianism, fatalism), myths of nature (benign, perverse/tolerant, ephemeral, capricious) and models of rationality (substantive, procedural, critical, fatalist). Linking these dimensions, the authors draw the following typology (adapted from Schwarz and Thompson, 1990, p.9):

market/individualism nature benign substantive rationality	hierarchy nature perverse/tolerant procedural rationality
fatalism nature capricious fatalist rationality	egalitarianism nature ephemeral critical rationality

Criticisms can be made regarding this typology; for instance, it can be argued that other forms of rationality ("systemic", "communicative", etc.) or myths of nature ("sacred" vs "dominated by humans", etc.) or social relationships (totalitarianism, etc.) should be also taken into account, or that not necessarily the links between the three selected dimensions are the ones suggested in the typology (for example, not all "egalitarians" see nature as "ephemeral"; on the contrary -as the case of Marxism show- they can regard it as "benign"). Moreover it can be noted that the "myths of nature" are already frames; therefore, while they can certainly underlie the development of other frames, they need an explanation regarding how are they elaborated. In this respect it must be noted that according to the authors the main explanatory variable within the typology is the form of social relationships the actors participate to. Social relations are in fact regarded by Schwarz and Thompson as the basic source of framing and frame-shifts; the last ones taking place as a result of shifts in social context ("egalitarians" coopted by the establishment being a case in point).

Apart from the above mentioned criticisms, the typology suggested by Schwarz and Thompson can still help identifying some elements (even if not all the elements) that contribute to the different definitions of the problem. In the case of Chernobyl, for instance, one can argue that the different definitions of the fallout put forward by environmental groups and by governmental authorities were influenced by the "myths of nature" held by the various actors and by their positions within (or preference for) certain forms of social relations.

However, while Schwarz and Thompson approach can explain why different kinds of actors hold different views and frame problems in different ways, it is insufficient to make sense of the *different framing* eventually referred to by *similar groups of actors* such as governmental authorities in the same country or in different ones. Moreover, it does not explain (as it was noted also concerning the analysis of Gusfield) why certain *specific* outcomes (decisions and actions) are produced. For instance, why some different measures were taken in Italy and the FRG during the Chernobyl fallout in spite of a similar dominant definition of the problem as a nation-wide radiological risk. Finally, Schwarz and Thompson contribution helps understanding how the consequences of (or lessons from) Chernobyl had been differently framed by different social groups in the years following the accident. But it does not fully explain why certain specific changes occurred on the basis of those different frames.

The main features of the approaches focusing on issue framing as exemplified by Gusfield, Schwarz and Thompson and others can be summarized as follows: 1. individual and collective actors are regarded as participating in -and being constrained by- forms of social relations that differ in different contexts; 2. social actors make sense of the world on the basis of given frames; 3. beside referring to primary frames, actors participate in the elaboration of frames and frame packages which can be viewed as unintended results of the interaction and communication between the actors involved; 4. issue framing influence the way any other action is performed.

As previously mentioned, issue framing approaches provide important tools to understand how problems are defined and how this influence the selection of possible solutions. However, they leave us with some unanswered questions regarding how certain specific actions and decisions are actually taken to address those socially framed problems. It is thus necessary to see whether some decision making models are able to answer such questions.

b. Decision making models.

Allison's "Essence of Decision" (1971) provides a thoughtful summary and discussion of the most widely used (even if with some variations and/or in mixed -rather than "pure"- form) decision making models in political science literature. Allison calls them the Rational Policy Model, the Organizational Process Model and the Bureaucratic Politics Model [1].

Other interesting ways of analysing the various models of decision making had been put forward following Allison's

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1 In a previous article (Allison, 1969), the author uses the term Bureaucratic Politics Model while in book he adds "Governmental, or Bureaucratic". To be short, and to keep the broader notion of bureaucracy, the original term will be used in these pages.

contribution. John Steinbruner, for instance, contrasts what he calls "the analytic paradigm", based on the rational choice approach, and the "cybernetic paradigm" based on the work of those authors (like W.R.Ashby and H.A.Simon) who emphasize the limits of rationality and the role of cognitive processes in decision making (Steinbruner, 1974). The "analytical paradigm" coincides with the "Rational Policy Model" and the "cybernetic paradigm" overlaps with the "Organizational Process Model" even if it is not limited to organizations'specific dynamics but refers also to individuals' thought processes (see Steinbruner, 1974: cap.2-3). While taking the "cybernetic paradigm" and its emphasis on cognitive processes in mind, Allison's distinction will be referred to in the following pages as it seems the one that makes explicit and discusses in the clearest way the basic assumptions and inference patterns of different decision making models.

b.1. The Rational Policy Model.

Rational Choice Theory assumes that individuals have clear and stable preferences, are self-interested, are able to utilize all the available infomation concerning both the means to achieve their goals and the consequences of all possible actions, and try to maximize their utility [2]. The **Rational Policy Model** springs from Rational Choice Theory as applied to collective actors and assumes that national governments, conceived as unitary decision makers, are agents who choose actions in a rational way, i.e. on the basis of the above mentioned assumptions. Therefore, in terms of this conceptual model, analysts attempt to understand happenings as the purposive acts of unified national governments (Allison, 1971: cap.1).

On the basis of the assumptions made by the Rational Policy Model, the responses to Chernobyl can be regarded as rational and

2 Standard and less standard formulations of Rational Choice Theory can be found in Barry and Hardin, (1982); Elster (1979; 1983); Heath (1976); Hogarth and Reder (1987).

intended choices made by unified national and transnational actors. However, those very assumptions present problematic aspects.

As far as actors are concerned, the assumption of the Rational Policy Model (but not of Rational Choice Theory) that collective actors can be treated as large individuals or "unitary actors" may turn out to be simplistic or even misleading. An analysis based on such assumption can in fact deal with conflicts and other forms of interaction between different actors but fails to "see" and explain conflicts or bargainings *within* collective actors such as governments, firms, etc.

Also the assumptions stating that actors have clear preferences and goals and that it is possible to explain their choices/behavior according to the category of intentionality (i.e. intention to pursue given goals) are rather intriguing. Going back to issue framing approaches, it can be argued that the Rational Policy Model (and Rational Choice Theory more in general), neglect the possibility that actors change their views, preferences and goals through communication beside dealing strategically and intentionally with each other on the basis of given and stable preferences and goals.

Finally, even supposing that there are rational and intentional actors willing to pursue certain goals and maximize their utility, it is at least to be verified whether they are really able to discern which means are useful to achieve which ends and whether they can obtain and use all the necessary information to make choices. Usually (and certainly in the Chernobyl case), scientific and organizational uncertainties make not so easy to find out which means would be more suited to achieve any supposedly clear goal. To give an example, it is not so evident whether the best way to protect the national nuclear programmes from the Chernobyl political fallout was to underplay the extension of the radioactive fallout or to exhibit efficiency in copying with it.

Summing up, in spite of its apparently crystal-clear logic the Rational Policy Model provides us with some debatable assumptions. Let us see whether the other models sketched by Allison offer more promising analytical tools.

b.2. The Organizational Process Model.

According to the Organizational Process Model, what the Rational Policy Model categorizes as "choices" are instead outputs of large organizations functioning according to standard patterns of behavior. At any given time, a government consists of existing organizations, each with a fixed set of standard operating procedures and programs. "The behavior of these organizations -and consequently of the government- relevant to an issue in any particular instance is, therefore, determined primarily by routines established in these organizations prior to that instance" (Allison, 1971: p.68).

Within the framework of the Organizational Process Model (based on concepts developed by Organization Theory) actors and actions are then defined as follows.

The actor is not a monolithic nation or government but rather a constellation of loosely allied organizations (also not to be seen as monolithic units) on top of which government leaders sit. In a case like the one of Chernobyl also the relations between these governmental organizations and various non-governmental organizations (involving different degrees of internal differentiation and complexity [3]) has to be taken into account.

Actions are regarded as organizational outputs resulting from the prominent features of organizational activity, that is: a.the constraints (i.e. internal resources as well as external

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3 One can think about the different degrees of organizational differentation which characterize (just to mention actors relevant for the Chernobyl case) anti-nuclear groups, the press and the nuclear industry.

expectations and demands) defining acceptable performance; b.the sequential attention to problems; c.the standard operating procedures -SOPs- that enable organizations to perform their routine tasks; d.the avoidance of uncertainty (mainly the attempt of each organization to regularize the reactions of other actors with whom they have to deal); e.the problem-directed search; f.the possibility of organizational learning and change especially in response to major disasters (Allison, 1971: cap.3). It can be noted that some of these organizational features play a role not only in responding to problems but also in defining, framing them. In this respect, organization theory specifies some (organizational) incentives and/or constraints to the broader social process of issue framing discussed above.

The Organizational Process Model provides us with interesting elements to understand the responses to Chernobyl.

It pays attention to the specific features of certain collective actors -organizations- instead of just transferring to them the characteristics of individuals. It also points to the relevant intra- and inter-organizational relations rather than treating collective actors as monolithic units. Moreover, it illuminates important organizational elements that enter the process of problem definition (like the processes of organizational intelligence and organizational options selection) instead of starting with given preferences and goals as sorts of pre-defined problem definitions. Finally, it accounts for results/outputs which do not imply a value judgement about their being "rational" according to a means-ends model of rationality.

However, also the Organizational Process Model presents some problems.

In the first place, the dynamics characterizing the inter-organizational relations between different sorts of organizations are not dealt with. The Organizational Process Model only takes into consideration governmental bodies leaving out the interactions between them and non-governmental organizations of different sorts. Interactions that proved to be crucial in the Chernobyl case. It must be added that not only the Organizational Process Model but Organizational Theory more in general tends to neglect this point. While there is a large literature on intra- and inter-organizational relations concerning similar kinds of organizations (especially firms and governmental organizations) as well as between governmental agencies and strong interest groups, organizational theorists usually do not include in their enquiry the interactions between the mentioned organizations and other (scientific, media, citizens') organizations.

This can be due on the one hand to the fact that the specific features of organizations such as scientific bodies, mass media, environmental groups and citizens'associations are less studied and understood than the features of governmental and business organizations. And, on the other hand, to the fact that a study including the interactions between all these different sorts of organizations must necessarily deal with broader political and societal dynamics that go beyond organizational features and relations.

Beside that, the focus on organizational features can lead to an undervaluation of the role of leading individuals within (but also outside) the relevant organizations. In this respect it can be noticed that if it is controversial and even misleading to transfer the intentions of individuals to collective actors, it is also true that individuals in key positions can try to direct, according to their own interests and perceptions, the behavior of the organization they are part of. Of course, also the scope for such "individual manouvering" is constrained by the features of each organizations; however, attention should be paid to the interests and intentions of individual members[4] that not always coincide with those of the organizations they are member of.

A last point to be made and connected with the two previous ones is that the Organizational Process Model seems to neglect certain political and social dynamics that are quite important in a case like Chernobyl. The emerging of certain organizations instead of others as leading actors is in fact not only due to the specific features of these organizations but also to their position within the political and social sphere. In other words, the political bargainings between Ministers, central and local authorities, political parties, etc. and the prevailing of certain forms of social relations (for instance, degree of acceptance of or contrasts with hierarchy -like state authority- by interest groups and social movements) should be considered beside/together with the features that characterizes the various governmental and non-governmental organizations.

This last consideration make us shift to the third model referred to by Allison, the Bureaucratic Politics Model.

b.3. The Bureaucratic Politics Model.

Following the Bureaucratic Politics Model, the actor is not a unitary government nor a constellation of organizations, but rather a number of individual players whose actions are defined by the position they occupy within the government.

Differently from the Rational Policy Model and the Organizational Process Model, "What moves the chess pieces is not simply the reasons which support a course of action, nor the routines of organizations which enact an alternative, but the power and skill of proponents and opponents of the action in

4 This remarks applies to the Organizational Process Model as outlined by Allison rather than to Organizational Theory in general. Contributions concerning the role of individuals in organizations can be found, for instance, in the classical works of organizational theorists such as March and Simon (1958), Selznick (1957), Simon (1957), Thompson (1967), and others.

question" (Allison, 1971: p.145). Accordingly, actions and policies are regarded as political resultants. Resultants in the sense that what happens is not chosen as a solution to a problem but rather results from compromise, conflict and confusion among government officials with different interests and unequal influence; political in the sense that the activity from which the outcomes emerge is best characterized as bargaining (Allison, 1971: cap.5).

The way political resultants are generated depends on various elements: different priorities, perceptions, interests, stakes, power of the actors involved as well as the available action channels, i.e. those regularized ways of producing action concerning type of issues that structure the game by pre-selecting the major players. All this in a context characterized by inordinate uncertainty about what must be done, the necessity that something be done, and crucial consequences of whatever is done. In this perspective, action does not presuppose intention, "The sum of behavior of representatives of a government relevant to an issue is rarely intended by any individual or group. Rather (..) separate individuals with different intentions contribute pieces to a resultant. Resultant which is then distinct from what anyone would have chosen" (Allison, 1971: p.175).

The Bureucratic Politics Model is praiseworthy for its attempt to take into account both subjective (like skills) and structural (for example, position) elements. What is more, it attracts attentions to a particularly important aspect of political life, that is power.

According to Allison's definition, power is equated with the effective influence on policy outcomes and is regarded as an elusive blend of at least three elements: bargaining advantages, skill and will in using bargaining advantages, and other players' perceptions of the first two ingredients (Allison, 1971: p.169). Of course other definitions of power could be and are given in political philosophy and political science literature[5]. Without pretending to summarize in few sentences a debate that traces back to ancient Greek philosophers, one can at least mention that Allison's definition of power correspond to a behavioral perspective (developed, for example, by Robert Dahl, 1961) which regards power as the ability to affect outcomes, i.e. the ability of A to make B do something he/she would not do otherwise.

However this perspective, called by Steven Lukes the one-dimensional view of power (Lukes, 1980), neglects what Peter Bachrach and Morton Baratz name the second face of power; that is the ability of A to limit the scope of the political process to public consideration of only those issues which are comparatively innocuous to A (Bachrach and Baratz, 1962). In this respect, Bachrach and Baratz argue that not only decisions should be taken into account but also the nondecision-making process, defined as the practice of limiting the scope of actual decision-making to "safe" issues (Bachrach and Baratz, 1963).

According to Lukes also this two-dimensional view of power, by focusing on nondecision-making power as existing only when there are grievances which are denied entry in the political process in the form of issues, neglects important aspects. Mainly the fact that, "the supreme and most insidious exercise of power (is) to prevent people, to whatever degree, from having grievances by shaping their perceptions, cognitions and preferences in such a way that they accept their role in the existing order of things" (Lukes, 1980: p.24).

Finally, it should be mentioned that Lukes' three-dimensional view of power can be related to those contributions that points to the communicative[6], as distinct from the coercive, aspects of

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5 Concerning the distinction and interactions between these two fields see, Bobbio (1971) and Zolo (1987, cap.2).

6 Especially Hannah Arendt (among contemporary thinkers) stressed the difference between power and violence and emphasized communicative aspects. Her concept of power as, "the human ability not just to act but to act in concert" (Arendt, 1969) has

power. One can think, for example, to Niklas Luhmann's definition of power as a medium of communication, i.e. the possibility to influence the selection of acts and options and reduce complexity for others (Luhmann, 1979, cap.1).

These perspectives which conceptualize power as the asymmetrical capability to shape perceptions and preferences and to select options for others provide useful insights to understand the Chernobyl case. In that case in fact no use of direct coercion and violence was made to impose certain decisions or nondecisions. Which does not mean, of course, that the coercive aspects are not crucial in other circumstances.

Coming back to the Bureaucratic Politics Model, a controversial aspect should be pointed out. While trying to put together subjective and structural elements, that model mainly emphasizes the first ones ("the core of the bureaucratic politics mix is personality" writes Allison, 1971: p.166) and deals with the second ones only as basis or constraint for individuals'action.

But if it is usually the case that who sits in a certain position matters and makes a difference, it is rather problematic to reduce complex decisional processes involving several collective actors to the skills and stakes of few leading individuals. While the Rational Policy Model is based on the debatable assumption (among others) that collective actors can be treated as large individuals, the Bureaucratic Politics Model seems to imply a similarly debatable assumption: i.e. that it is possible to reduce the behavior of collective actors to the behavior of some individuals.

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been however criticized (see, Habermas, 1977) as involving too a consensual view of power. While the interpretation of Arendt's view remains open, undoubtedly she had an important role in attracting attention to non coercive aspects of power.

c. <u>Linking frames and decisions: the Policy Communication Model</u>.

The hypothesis presented in the Introduction argues that the short-term responses to Chernobyl and the changes occurred in the following years were due to the way scientific and organizational uncertainties were managed in defining the problem and responding to it. And that this in turn can be explained in the light of what scientists select as relevant knowledge, what politicians wish to know and to be let known, what information the mass media have access to, pick out and construct as news, and what pressure social movements and/or interest groups are able to exert concerning the selection, utilization and diffusion of information.

In other words a policy communication process is outlined, that is a process where the various actors involved in a certain policy field (in this case, nuclear risk management) communicated in a multi-directional way and reciprocally, but asymmetrically, influenced each other both in framing issues and in making decision.

Differently from the models and approaches previously discussed, the Policy Communication Model suggested in this work does not focus either on issue framing or on decision making but on the links between these two processes, particularly on the transformation/passage from the definitions of problems into actions to deal with them. In this respect it must be underlined that the influence of frames and interpretive packages on decision making is mediated by communication processes such as the circulation and strategic use (as in the case of politically-driven interpretations of scientific uncertainties) of competing frames and interpretive packages. It is through such circulation and use that certain definitions of problems and solutions emerge (or are discarded) and that decisions, which are always "framed decisions", are made.

When evaluating options and adopting responses, the various actors cannot but be influenced by the actual or expected definitions of the situation, and the connected responses, of the other relevant actors. In other words, mutual -while asymmetrical- adjustment processes take place (Lindblom, 1959, 1965 and 1990) where actors do not simply respond to events such as accidents or economic recession but also to each other's expectations, views and behaviors. The only exceptions being the "monopolistic" cases, very rare indeed, where one actor has the absolute power of defining the situation and chosing the response to be adopted. With the exception of "monopolistic" cases, the issue of the role of arguments and the strategic use of information comes into play when one analyses the processes through which certain definitions become "dominant" or are "marginalized" and certain responses are selected. It is in fact through the interpretation of available evidence and the elaboration of arguments that interested parties may impose their definition of the problem and of the instruments appropriate to its resolution (Majone, 1989), and may eventually adjust to each other positions and views. And it is on the basis of what is conceivable/make sense according to the dominant frames and what is feasible taking into account each other positions and interests, that actors select certain specific options and responses. This seems especially the case when "hard facts" cannot be referred to as uncontroversial basis for decisions and uncertainties must be rather dealt with.

By emphasizing the communicative inter-action [7] between actors in framing problems and making decisions, the Policy Communication Model does not aim at substituting preferences, interests and power relations which are the "core" of the conceptual models previously discussed. Rather it tries to extend those decision-making models and introduce a dynamic element that can account for changes in preferences and interests and that can explain why not always the most powerful actors (in terms of their economic

7 This play upon words refers to the notion of "communicative action" introduced by Jürgen Habermas (see Habermas, 1984).

resources and/or political status) are the "winners", i.e. are able to impose certain definitions of problems or certain decisions. Such dynamic element, that is the (asymmetrical) communicative interaction between actors and the way this interaction shapes the management of scientific and organizational uncertainties, seems also to go beyond -while building on- those approaches that regard frames as "given" or that limit themselves to the analysis of issue framing without dealing with the transformation of frames into actions.

It must also be mentioned that the concept of communication utilized in these pages does not involve any assumption, nor judgement, concerning the motivations of those who communicate. Or better, it is assumed that the different actors involved in a communication process have different motivations and try to use and eventually manipulate the communication process for different purposes (reach understanding, improve their image, cope with critics, impose certain meanings or decisions, etc.). What matters in this perspective is not so much the motivation of actors, since the interactions between individual intentions can still produce unintended results, but the overall process. A process where actors must interpret and use evidence and give arguments when defining problems and making decisions; and, according to the non-decision approach, also when trying to prevent the emerging of certain issues and the prevailing of other definitions and decisions. It is through this communicative interaction that response and learning processes develop.

Summing up, the main features of the Policy Communication Model are the following.

First, all the actors involved in a certain policy arena or issue, both governmental and non-governmental actors (in asymmetrical positions) and individual and collective actors (both of them acting on the basis of rules and constraints provided by the social and organizational context they take part to) are taken into account. These actors are assumed to refer to different values and models of rationality, and to have intentions and preferences that may change over time and that not necessarily result in intended choices.

Two main kinds of action/activity are considered, that is issue framing and decision making. The way issues are framed influences (especially by limiting the scope of) decision making, but it does not completely determine decisions (for example, their content and timing).

Issue framing and decision making are developed through the asymmetrical communicative interaction between the actors involved in the specific policy field where the issue under consideration is dealt with. The specific forms of interaction between actors (including the use of actors'resources) determine the way issues are framed and why certain specific decisions and actions are taken. Both issue framing and decision making are constrained by some specific elements; institutional features (openess or closure of the political system, centralization or fragmentation of such system, etc.), organizational features (such as SOPs and inertia), and social ones (collaboration or conflict between different social groups, apathy of certain groups of actors, etc.).

The management of scientific and organizational uncertainties is crucial in framing technological crises and responding to them, both in the short period (response) and in the long term (learning). In this respect the interpretation and use of information resources play an important role since they determine whether and how scientific and organizational uncertainties are taken into account or neglected, are regarded as a public or "private" (within restricted circles) issue, and influence decision (or non decision) making.

d. Theories of learning.

In the following chapters both the short-term responses to the Chernobyl fallout and the medium/long-term changes that occurred as a consequence of that event are analysed.

"Short-term" and "long-term" refer to both the quantity and quality of time, but in particular to the second aspect since it is always relative to determine whether one day or one century is a "short" or a "long" period. By referring to the "quality" of time I therefore suggest (as it is often done in economic theory and policy analysis literature) to regard as **"short-term"** a period characterized by the fact that actors take certain constraints (laws, technology, economic resources, etc.) as given and act -or do not act- on the basis of them, and to regard as **"medium and long-term"** those period which allow (even if they do not necessarily lead to) to reconsider/reflect on and eventually change constraints, behaviour and perceptions.

With respect to the latter, in the following chapters it is inquired whether they can be interpreted as parts or results of learning processes.

To address this issue a preliminary investigation on the uses of the term "learning" is necessary[8].

d.1. **Who ?**

First of all, a distinction must be made concerning who is supposed to learn. In this respect, the basic distinction to be made is the one between individual and collective learning.

A large part of literature on learning focuses on individuals and regards learning as an individual process based on certain features or mechanisms of the human mind. This view is shared not only by most authors working in the psychology field, but also by

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8 A different and more comprehensive review of the literature on learning can be found in Parson and Clark, 1991.

some sociologists. Jürgen Habermas, for example, grounds his theory of social evolution on individual learning and argues that, "Individually acquired learning abilities and information must be latently available in world views before they can be...transposed into societal learning processes" (Habermas, 1984: p.121).

This approach has been criticized by Klaus Eder and Max Miller who oppose the genetic individualistic view -held by Habermas- that ascribes the process of learning only to individuals and regards cognitive structures as a priori attributes of individuals (Eder, 1985 and 1987; Miller, 1986). These authors consider instead learning as a **collective, interactive process** and point to the communicative processes and to the structures of the social world which are constitutive of individual learning. In other words, according to these authors, learning can take place only through the intersubjective, communicative experience that occur in given social and historical contexts; therefore also learning by individuals is a social process. As Piet Strydom notes, Habermas reacted to Eder's and Miller's criticisms by making some significant theoretical concessions; particularly by acknowledging the relevance of a sociological learning theory (Strydom, 1987).

The analytical tension between learning as an individual or as a collective process is relevant also with respect to the development of a theory of learning at the level of organizations.

The literature on **organizational learning** borrows heavily from research on individual cognition (see, Argyris and Schön, 1978; March and Olsen 1976; Simon, 1957 and 1976; Simon and A.Newell, 1972). But while recognizing that organizational learning occurs through individuals, organization theorists do not conclude that organizational learning is nothing but the cumulative result of their members' learning. In the words of Bo Hedberg, "Organizations do not drift passively with their members' learning: organizations influence their members'learning, and they retain the sediments of past learning after the original learners have left" (Hedberg, 1981). In this perspective, organizational features such as SOPs can be regarded as behavior repertories inherited from past experience and transmitted to the new members whose learning is therefore influenced and constrained by these organizational features. Thus organizational learning represents a specific form of collective learning.

Theories of organizational learning assumes that learning occur through a stimulus-response relationship between organizations and their environment [9]. In such relationship, characterized by unpredictable changes in the environment, the time dimension is crucial as organizations need to elaborate new information before responding to non-routine stimuli. We will expand on this point later on when discussing the notion of adaptiveness.

Another form of collective learning which has been researched is **governmental learning** both in the domains of domestic and foreign policy. In this respect, Peter Haas stresses the role of groups of scientists, or "epistemic communities", in favouring governmental learning through persuasion (at the international level) and through the bureaucratic preemption (at the domestic level) of policy making by ministries sensitive to the arguments provided by the epistemic communities themselves (Haas, 1989).

Also concerning governmental learning, some authors suggest that governments can learn either vertically, when new ideas and norms are generated through the interaction among domestic groups,

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9 In the framework of Organization Theory, the "environment" of a certain organization is usually regarded as being formed by the other organizations which directly or indirectly interact with such organization. It also includes the broader social context which changes may affect the organization(s) under analysis. In other words, the focus is on the "artificial" rather than on the "natural" environment. For a discussion of the concept of environment in Organization Theory, see Perrow (1986). A review of some uses of the term "environment" in the social sciences is provided by Young (1986).

or horizontally, that is through interactions with other governments at the international level (Legvod, 1988; Putnam, 1988).

The term "**social learning**" is used by several political and social scientists. On the basis of the remarks suggested above social learning can be viewed as a synonim of collective learning since any form of collective learning occur through social interactions. However the term "social learning" is attributed different meanings; some examples can be useful to illustrate the polysemy of such term.

In his "The Nerves of Government", Karl Deutsch refers the term social learning to organizations, to political decisional systems and to systems in general (Deutsch, 1963: cap.10). Adopting a systemic and cybernetic approach, Deutsch defines learning as the structural changes made in response to an external stimulus; changes which depend on the possible recombinations of some single information elements and the resources available (not already utilized) within the system or organization under consideration. It can be noticed that both the reference to the stimulus-response paradigm and the emphasis on information management aspects characterize also organizational learning (and problem-solving) theories. Therefore Deutsch's use of the term "social learning" largely overlaps with the concept of organizational learning.

From a rather different perspective, Hugh Heclo focuses on the policy process and writes that, "Much political interaction has constituted a process of social learning expressed through policy" (Heclo, 1974). Following Heclo's footsteps, the concept of social learning has been taken up by other policy analysts and by theorists of state. Some of them point to the internal dynamics of the policy process and treat social learning as a dimension of policy making that confirms the autonomy of the state (Sacks, 1980; Skocpol, 1985); others argue instead that societal developments intimately affect the learning processes that take place in the policy field (Hall, 1989 and 1990). Even if Peter Hall agrees with those scholars who say that policy is influenced by and responds to previous policies, he maintains (and shows in his case study on economic policy making in Britain) that this is only one side of the coin and that policy is also, "..deeply influenced by the terms of policy discourse, and these are generally constructed out of a dialogue in which politicians, officials, the media, organized interests, and experts in the outside marketplace of policy ideas are all involved" (Hall, 1990: p.20-21). Given this emphasis on the strict links between policy and the broader social context, it is understandable that Hall uses as synonyms "social learning" and "policy learning". It is however disputable that those two terms can be regarded as synonyms outside a policy analysis context. Policy learning can be rather regarded as a special case or component of a broader social learning process.

In dealing with the issue of social learning in the management of global environmental risk, William Clark adopts a catholic approach by using the term "social learning" in a very general meaning, i.e. as opposed to merely individual learning (Clark, 1990). In this way he is able to include all kinds of collective learning processes taking place within society, to take into account the interactions among all the involved social groups and eventually to discover -both empirically and theoretically- the processes of innovation, selection and diffusion that emerge from the interactions among social groups and that constitute, in his definition, the main aspects of social learning (Clark, 1990: p.12). While attractive for its comprehensiveness, this approach needs some specifications to avoid remaining too general. Reference to specific contexts (policy, organizational, cultural) is in fact necessary to identify the mechanism of and constraints to learning. On the other hand, Clark's definition provides a basis for understanding different forms of collective learning as inherently social processes even if they take place in specific (but not isolated) sectors of society.

Finally, it can be mentioned that the term "social learning" has been also used to denote a model of policy research aimed at designing experiments in social practice, that is experiments that call for responses in the actors' (policy-makers) theory of action, values and strategies, either confirming what they already know or creating incongruities that clamor for resolution (Friedmann and Abonyi, 1978). While the viability of such kind of intended and designed (therefore partially "controllable") experiments in social practice is debatable, it can be noted that unintended "social experiments" -a term used also to define the Chernobyl accident (Krohn and Weingart, 1986)- provide matter for reflection on the learning abilities of social actors as well as on the social sciences abilities to interpret and eventually (as suggested by Friedmann and Abonyi) to promote learning.

d.2. **What ?**

While asking who is supposed to learn, we also came across some elements concerning what is the learner supposed to learn and how. It is however necessary to better clarify what these elements are as they constitute the core of the concept of "learning".

As far as the content of learning is concerned, it is implicit in the everyday use of the term learning (for example, referred to the role of schools and education more in general) that what is learned mainly includes skills and information. However it can be argued that information cannot be "learned" as such since it requires that the ability to process information is acquired first. Among skills one can include as different things as reading, writing and counting, practical skills such as walking or swimming, the ability to recognize, process and utilize (new) information, the ability to adapt to changes in the environment, and even the ability to learn how to learn (or, as Gregory Bateson calles it, "deutero learning", Bateson, 1947).

As a result of learning these skills, various results can come out including the changes in knowledge, perceptions, behaviors, organizational structures, and so on. Michel Crozier and Erhard Friedberg argue, for instance, that through collective learning processes actors discover or create new models of understanding and new relational models (Crozier and Friedberg, 1977).

The problem is to understand how skills are actually learned and how the corresponding results are being produced. In other words we must ask, what characterize the very process of learning?

d.3. **How ?**

When analysing how does learning occur, the mechanisms of and the constraints to learning must be identified. In this perspective, several elements have to be taken into consideration. Especially important are the development and use of cognitive abilities and their limits, the utilization of existing frames as a basis and as a constraint to learning, the reference to experience as a source of and as a test for learning, the communication processes through which changes in cognition and eventually in behavior take place. A brief examination of each of these elements seems useful to understand their specific role and the relations between them.

Cognition. As already mentioned, the concept of learning - both at the individual and the collective level- is often associated with the concept of cognition. Cognitive capabilities can be regarded as the tools that allow learning. In fact learning takes place through the use of cognitive abilities such as information processing and evaluation, memory, attention and others (including the mentioned ability to learn how to learn).

Following this reasoning, learning is a cognitive process. But this does not mean that cognitive abilities are the only elements needed to allow this process to occur. Information, experience and communication are also needed.

Before treating these elements, it is worthwhile to discuss two points with respect to cognitive elements; one regarding the limits of cognition and the other concerning frames.

As far as the **limits of cognition** are concerned, the concept of "bounded rationality" firstly introduced by Herbert Simon (Simon, 1957) points to the intrinsic as well as to the external limits of human rationality. The last ones include, among other things, the constraints on information availability and on the viability of different options; the intrinsic limits of rationality indicate the limits of attention, memory, information processing capabilities and so on. Both these types of limits must be taken into account as they can eventually constrain learning.

About **frames**, they can be regarded both as vehicles of learning and as socially constructed and individually internalized constraints to learning. As previously mentioned, according to Goffman and other authors "primary frameworks" are needed to make sense of otherwise meaningless aspects (Goffman, 1974). On the other hand, as Gaye Tuchman writes, frames not only produce but also limit meaning (Tuchman, 1978). Therefore not only the ability to learn through given frames but also to learn to change frames should be taken into consideration. Paul Watzlawick, John Weakland and Richard Fisch examine what they call "the gentle art of reframing", and they regard it as the process through which the definition of the situation is changed by re-classifying concepts once regarded as belonging to a certain class of objects and by putting them into another class (Watzlawick et al., 1974: cap.8).

Reframing involves then "**unlearning**", that is a process through which learners discard acquired knowledge and make way for new responses and mental maps. Only by unlearning the previous definition of the situation, a new frame can emerge.

Within the context of organization theory, Bo Hedberg and William Starbuck argue that while minor changes in the environment can be handled by organizations through adjustments in existing action programmes, more substantial changes in organization-environment relationships require that old responses be deleted and sometimes replaced (Hedberg, 1981; Starbuck, 1983). According to Hedberg, unlearning (at the organizational and at the individual level as well) can occur through the disconfirmation of mechanisms for selecting and identifying stimuli, or the disconfirmation of connections between stimuli and responses, or the disconfirmation of connections between responses (Hedberg, 1981). At the broader societal level, arguments for unlearning are often put forward by social movements such as the environmental one. Criticisms to the ideology and practice of consumerism or to models of unrestrained economic growth involve the idea that these things should be unlearned in order to make way for new (more "sustainable" and fair) economic and social behaviors. How this can occur, or how can the above mentioned disconfirmations occur, is an open question which involve the consideration of actual experience besides cognitive abilities and information.

Experience is a powerful source and tool of learning. Source as it provides the "material" for reflection and self-reflection; tool because, especially though trial-and-error strategies, it makes possible not only to recognize in theory but also to test in practice what mistakes are made and eventually what changes/adaptations should be developed not to repeat them.

Regarding reflection and self-reflection, reflection on events that occurred outside the sphere of action (in other times or places) of the learners and self-reflection on the actions taken and the results achieved are an important basis for learning. It is in fact mainly through reflection and self-reflection that experience does not simply take place but is cumulated and can be transmitted to others. On the other hand it must be noted that learning not always involves reflection and self-reflection; in some cases (as children's learning of language seems to exemplify) unintended, non self-reflective "matching" between the cumulation of information or skills and certain experiences produce the acquisition of new abilities or the emerging of a new awareness and framing of problems.

With respect to experience as a "test", it must be stressed that learning from experience though trial-and-error is often a purely reactive process and presents several problems like the interpretation of problematic feedbacks or the need to anticipate -rather than wait for- severe consequences (see, Morone and Woodhouse, 1986). This is a very important point regarding the management of high-risk technologies designed to master unique challenges such as nuclear power (see, Häfele, 1974).

Adaptiveness. Learning is a process, and as such it involves change; but not any change is learning. According to several authors, learning can be regarded as that form of change which is adaptiveness at the cognitive and behavioral level (for instance, Hall, 1990; March and Simon, 1958; Morone and Woodhouse, 1986; Starbuck, 1983). Furthermore, not any adaptation is to be considered as learning.

Following the classical definition of March and Simon, "Short-run adaptiveness corresponds to what we ordinarily call problem-solving, long-run adaptiveness to learning" (March and Simon, 1958: p.170). In other words, only adaptiveness that develops and lasts in time should be referred to when we speak about learning. What is quickly done in response to a certain event but also quickly forgot or discarded is "just" (but it can be absolutely crucial) response, not learning. This means that learning involves, beside all the mentioned aspects, some kind of institutionalization and transmission of what is learned.

Peter Hall points to other important aspects and argues that, "we can define policy learning as a deliberate attempt to adjust the goals or techniques of policy in the light of past experience and information. Learning is indicated when policy changes as the result of such a process" (Hall, 1990: p.5). A problematic aspect of this perspective regards the issue of intentionality. While reflection and self-reflection, i.e. intended activities, are (usually) crucial components of learning, the adaptations actually made are not necessarily intended. These adaptations can in fact be hardly imaginable as the result of a long (learning takes time) and consistent sequence of intended choices; rather they are the unintended result of political, social, organizational and/or bureaucratic dynamics in which the learners are involved and that they contribute to shape without being necessarily able to "direct", even if they have the intention to.

Other authors argue that learning and adaptations are different processes. According to several scholars (see, for instance, Hedberg, 1981) learning -differently from adaptation- involves improvement. A discussion of this point is offered in the last part of this chapter. Moreover, in the view of Ernst Haas, learning and adaptation differ in their dependence on new knowledge that may be introduced -for instance- in decision making (Haas, 1990). He makes then a distinction where, a. adaptation is characterized by incremental changes in behavior without examining implicit theories and without altering existing ends; b. learning is instead characterized by the questioning of implicit theories and the redefinition of ends (Haas, 1990: cap.1). Ernst Haas' definition, while representing a brilliant attempt to introduce a more precise use of the term "learning", can be regarded as a matter of degree rather than a matter of different logical types. Beside that, and beside its focusing only on knowledge while underestimating the role of experience, that definition implicitly introduces an evaluative/normative element by suggesting that only "radical" rather than "incremental" changes represent learning. While one may sympathize with this view, its analytical usefulness seems arguable.

Communication is a constitutive element of learning processes.

On the one hand, communication enables all those involved to exchange factual information as well as to be aware of each other points of view; and this represents an increase of knowledge, an aspect always implied (sometimes the only one) in the concept of "learning". On the other hand, through communication -and through communicative elements such as argumentation- frames are developed and changed. In other words, through communication elements previously neglected or new ones are circulated and paid attention to, and the existing ways of interpreting experience are modified and/or new ones emerge.

The communicative processes through which framing and reframing occur are very important when we deal with the issue of "learning from experience" as in the case of the Chernobyl accident. In fact, as March and Olsen point out, "..organizations adapt their behavior in terms of their experience, but that experience requires interpretation" (March and Olsen, 1976: p.55). In this respect they argue that organizations' members interpret "facts" depending on whether they are integrated or not in their organization and whether they trust or not the other members. In other words, socialization processes -which necessarily involve communication- determine the way experience is interpreted, and consequently they influence learning.

A similar line of argumentation can be found also in the literature on risk communication, risk perception and risk management previously discussed. In that context some authors point to the fact that, on the one hand, the way risks are perceived influence the way they are regarded as acceptable or not and indirectly influence the way they are communicated and managed; and that, in turn, the perception of risks depends on past and present experience concerning the way risks are managed and concerning the related credibility and trust (or distrust) relationships.

Following this reasoning, learning to deal with risks is not a merely technical or organizational matter but a complex social process where communication is crucial.

Summing up, a working definition of learning can be suggested where the relations between the above mentioned elements are sketched. That is, learning as a collective cognitive process involving the re-framing of issues (which may then produce changes in behavior and various kinds of adaptations) and the acquisition of skills. Such process occur through communication and is based on the incorporation of new or previously neglected information and (usually) on reflection and self-reflection on previous experience. Beside these "mechanisms" of learning, also some constraints to learning can be identified such as limits to cognitive abilities and skills, restrictions in communication (such as lack of access to certain information sources), strenght of existing frames and consensus that may prevent reframing, organizational and institutional inertia, and others.

In the following chapters it will be examined how did these mechanisms and constraints work in the Chernobyl case, and whether they can help understanding and explaining why certain changes were made.

d.4. Learning and improvement.

The idea of improvement is usually associated with that of learning, the assumption being that "to learn" can be regarded as a synonymous of "doing better". Instead it seems more correct to argue that learning can be a basis for doing better, but it is not the same as doing better.

As noted by Mark Granovetter, theories of social evolution often assume that it is possible to make systematic rank ordering of societies by referring to the idea of advancement defined as problem solving and adaptive capability (Granovetter, 1979). However, the author argues that, on the one hand, the idea of ranking societies by referring to the concept of advancement involves controversial issues such as the interpersonal comparison of utilities; and that, on the other hand, the idea of adaptation does not necessarily involve the idea of advancement.

With respect to this last point, Klaus Eder points out that evolutionary processes can involve both improvement or worsening and that therefore also *"pathologische Lernprozesse"* can occur (Eder, 1985; cap.2). In a different context, but from a similar perspective, Hall argues that policy does not necessarily becomes better or more efficient as a result of learning, "Just as a child can learn bad habits, governments, too, may learn the 'wrong' lessons from a given experience" (Hall, 1990: p.26).

The concepts of "bad" and "good", the related comparative "worse" and "better", and the idea of "improvement" that involves the last one, all implies value judgements. While it is true that the distinction between facts and values is not sharp and that the interpretation of facts usually involves implicit or explicit judgements, the mentioned concepts are definitely a normative rather than an analytical (more or less "biased") matter.

Since the notion of "improvement" implies normative judgments one should ask, "better for whom and in which circumstances ?" Therefore the analyst should try to reconstruct the "consistency frameworks" of the relevant actors/learners to find out whether, from their point of view, something can be regarded as an improvement or not. It goes beyond the scope of this work to engage in such an exercise; however, looking at certain changes made after Chernobyl (like the abandonment of nuclear power production in Italy or the centralization of monitoring data in the FRG), it can be easily realized that some actors regard them as improvements while others disagree with this judgment.

On a more general level, some possible criteria to evaluate "improvement" may be suggested such as the criteria of effectiveness, i.e. (in our case) the ability of achieving better results in the actual management of nuclear risks, and the one of policy consistency, i.e. the ability of including and integrating all the most important aspects of nuclear risks in the relevant regulatory system.

An evaluation in terms of effectiveness is (fortunately) not possible at this stage because only the occurrence of another fallout could "test" whether the adaptations made are enabling the responsible institutions and society more in general to deal with such event in a way to save more lives and prevent more illnessess, environmental disruption, economic losses and so on. Simulations might provide some hints to evaluate the adaptations made after Chernobyl in terms of increased effectiveness, but also simulations go beyond the scope of these pages.

As far as policy consistency is concerned, the evaluation could focus on the attempts made to fill certain gaps in legislation and certain technical and organizational lacunae. But also when these attempts can be traced, the evaluation in terms of achieved policy consistency may still be controversial since certain changes made to fill the above mentioned gaps and lacunae may be viewed as contradictory or as steps backwards (rather than improvements) in comparison with previous norms or organizational structures.

Given the above mentioned difficulties in evaluating whether learning is also improvement, such evaluation will not be provided in the following chapters. The attention will be focused on analysing whether learning processes can explain certain changes rather than asking whether those changes represent something "better".

REFERENCES

ALLISON, Graham (1969), "Conceptual Models and the Cuban Missile Crisis", in American Political Science Review, vol.63, pp.689-718.

ALLISON, Graham (1971), Essence of Decision. Explaining the Cuban Missile Crisis, Little, Brown and Company, Boston.

ARENDT, Hannah (1969), On Violence, Harcourt Brace, Florida.

ARGYRIS, Chris and Donald SCHON (1978), Organizational Learning, Addison-Wesley, Mass. USA.

BACHRACH, Peter and Morton BARATZ (1962), "Two Faces of Power", in American Political Science Review, vol.56, pp.947-952.

BACHRACH, Peter and Morton BARATZ (1963), "Decisions and Nondecisions: an Analytical Framework", in American Political Science Review, vol.57, pp.632-642.

BARRY, Brian and Russell HARDIN (1982), Rational Man and Irrational Society?, Sage, Beverly Hills, London.

BATESON, Gregory (1947), Social Planning and the Concept of Deutero-Learning, in NEWCOMB, T.M. and E.L.HARTLEY eds., Readings in Social Psychology, Holt, New York.

BEYER, Janice (1981), Ideologies, values, and decision making in organizations, in NYSTROM, Paul and William STARBUCK eds., Handobook of Organizational Design, vol.2.

BOBBIO, Norberto (1971), "Dei possibili rapporti fra filosofia politica e scienza politica", in Quaderno n.1 degli Annali della Facoltà di Giurisprudenza dell'Università di Bari.

BUCKLEY, Walter (1967), Sociology and Modern Systems Theory, Prentice-Hall, Inc., Englewood Cliffs, N.J.

CLARK, William (1990), Social learning in the management of global environmental risks, Research Proposal to the MacArthur Foundation.

CROZIER, Michel and Erhard FRIEDBERG (1977), L' Acterur et le système. Les constraintes de l'action collective, Editions de Seuil, Paris.

DAHL, Robert (1961), Who Governs? Democracy and Power in an American City, Yale University Press, New Haven and London.

DEUTSCH, Karl (1963), The Nerves of Government, The Free Press, New York.

DOUGLAS, Mary (1978), Cultutal Bias, Royal Anthropological Institute, Occasional paper n.35, London.

DOUGLAS, Mary and Aaron WILDAVSKY (1982), Risk and Culture, University of California Press, Berkeley and Los Angeles.

DOUGLAS, Mary ed. (1982), Essays in the Sociology of Perception, Routledge and Kegan Paul, London.

EDER, Klaus (1985), Geschichte als Lernprozess? Zur Pathogenese politisches Modernität in Deutschland, Surkamp, Frankfurt/Main.

EDER, Klaus (1987), "Learning and the Evolution of Social Systems. An Epigenetic Perspective", in SCHMID, M. and F.WUKETIS eds., Evolutionary Theory in Social Sciences, Reidel Publishing Company.

ELSTER, Jon (1978), Sour Grapes. Studies in the Subversion of Rationality, Cambridge University Press, Cambridge.

ELSTER, Jon (1979), Ulysses and the Sirenes. Studies in rationality and irrationality, Cembridge University Press, Cambridge.

FRIEDMANN, John and George ABONYI (1978), Social Learning: A Model for Policy Research, in FREEMAN, Howard ed., Policy Studies. Review Annual, vol.2, Sage Publications, Beverly Hills-London.

GAMSON, William and Andre MODIGLIANI (1989), "Media Discourse and Public Opinion on Nuclear Power: A Constructionist Approach", in American Journal of Sociology, vol.95, n.1, pp.1-37.

GARFINKEL, Harold (1967), Studies in Ethnomethodology, Prentice Hall, Englewood Cliffs, N.J.

GOFFMAN, Ervin (1974), Frame Analysis. An Essay on the Organization of Experience, Northeastern University Press, Boston.

GOODMAN, Nelson (1978), Ways of Worldmaking, The Harvester Press, UK.

GRANOVETTER, Mark (1979), "The Idea of 'Advancement' in Theories of Social Evolution and Development", in American Journal of Sociology, vol.85, n.3, pp.489-515.

GROSS, Jonathan and Steve RAYNER (1985), Measuring Culture, Columbia University Press, New York.

GUSFIELD, Joseph (1981), The Culture of Public Problems. Drinking, Driving and the Symbolic Order, The University of Chicago Press, Chicago-London.

HAAS, Ernst (1990), When Knowledge is Power. Three Models of Change in International Organizations, University of California Press, Berkeley/Los Angeles/Oxford.

HAAS, Peter (1989), "Do regimes matter? Epistemic communities and Mediterranean pollution control", in International Organizations, vol.43, n.3.,pp.377-403.

HABERMAS, Jürgen (1977), "Hannah Arendt's communications concept of power", in Social Research, vol.44, n.1, pp.3-24.

HABERMAS, Jürgen (1984), The Theory of Communicative Action, vol.1, Bacon Press, Boston.

HAFELE, Wolf (1974), "Hypotheticality and the New Challenges: The Pathfinder Role of Nuclear Energy", in Minerva, vol.10, pp.301-322.

HALL, Peter (1990), Policy Paradigms, Social Learning and the State: the case of economic policy-making in Britain, Estudio/Working Paper, Instituto Juan March, Madrid.

HALL, Peter ed.(1989), The Political Power of Economic Ideas: Keynesianism across Nations, Princeton University Press, New Jersey.

HEDBERG, Bo (1981), How organizations learn and unlearn, in NYSTROM, Paul and William STARBUCK eds., Handobook of Organizational Design, vol. 1.

HEDBERG, Bo (1981), How organizations learn and unlearn, in Paul Nystrom and W. Starbuck eds., Handbook of organizational design, vol.1, Oxford University Press, Oxford.

HOGARTH, Robin and elvin REDER eds.(1986), Rational Choice. The Contrast between Economics and Psychology, The Univesity of Chicago Press, Chicago and London.

KROHN, Wolfgang and Peter WEINGART (1986), "Tschernobyl - das grösste anzunehmende Experiment", in Kursbuch, vol.85, pp.1-25.

LINDBLOM, Charles (1959), "The Science of Muddling Through", in Public Administration Review, vol.XIX, pp.79-88.

LINDBLOM, Charles (1965), The Intelligence of Democracy. Decision Making through Mutual Adjustment, The Free Press, New York.

LINDBLOM, Charles (1990), Inquiry and Change. The Troubled Attempt to Understand and Shape Society, Yale University Press, New Haven-London.

LUHMANN, Niklas (1979), Potere e complessità sociale, Il Saggiatore, Milan (translation of, Macht, Ferdinand Enke Verlag, Stuttgart, 1975).

LUKES, Steven (1974), Power: A Radical View, The MacMillan Press Ldt., London.

MAJONE, Giandomenico (1989), Evidence, Argument and Persuasion in the Policy Process, Yale University Press, New Haven/London.

MARCH, James (1978), "Bounded rationality, Ambiguity, and the Engineering of Choice", in Bell Journal of Economics, vol.9, pp.587-609.

MARCH, James (1982), "Theories of Choice amd Making decisions", in Society, pp. 29-39.

MARCH, James and Johan OLSEN (1976), Organizational Learning and the Ambiguity of the Past, in MARCH,J. and J.OLSEN eds., Ambiguity and Choice in Organizations, Universitetsforlaget, Bergen-Oslo.

MILLER, Max (1986), Kollektive Lernprozesse, Surkamp, Frankfurt/Main.

MORONE, Josep and Edward WOODHOUSE (1986), Averting Catastrophe. Strategies for Regulating Risky Technologies, University of California Press, Berkeley/Los Angeles/London.

PARSON, Edward and William CLARK (1991), Learning to Manage Global Environmental Change. A Review of Relevant Theory, Contribution n.8 to the Project on Social Learning in the Management of Global Environmental Risks, Harvard, Cambridge MA.

PERROW, Charles (1986), Complex Organizations, Random House, New York.

REIN, Martin (1986), Frame-reflective policy discourse, Working Paper, Leyden Institute for Law and Public Policy.

SACKS, Paul (1980), "State Structure and the Asymmetrical Society", in Comparative Politics.

SCHWARZ, Michiel and Michael THOMPSON (1990), Divided We Stand. Redefining Politics, Technology and Social Choice, Harverst Wheatsheaf, New York/London/Toronto/Sydney/Tokyo.

SELZNICK, Philip (1957), Leadership in Administration, Harper & Row, New York.

SIMON, Herbert (1957), Administrative Behavior, MacMillan, New York.

SNOW, D.A. and R.D.BENFORD (1991), Collective Action Frames, in A.MORRIS and C:MUELLER (eds), Frontiers in Social Movement Theory, Yale University Press, New Haven.

STARBUCK, William (1982), "Congealing oil: inventing ideologies to justify acting ideologies out", in Journal of Management Studies, vol.19, n.1, pp.3-27.

STARBUCK, William (1983), "Organizations as action generators" in American Sociological Review, vol.48, pp.91-102.

STRYDOM, Piet (1987), "Collective learning: Haberms's concessions and their theoretical implications", in Philosophy and Social Criticism, vol.13, n.3, pp.265-281.

THOMPSON, Michael (1989), Surprises from systems, Natural and Cultural, paper at the Conference "Experts are cathegorical. Scientific controversies and political decisions in the environmental field, Arc-et-Senans, France.

TUCHMANN, Gaye (1978), Making News. A Study in the Construction of Reality, The Free Press, New York.

WATZLAWICK, Paul, John WEAKLAND and Richard FISH (1974), Change, Norton, New York.

YOUNG, Gerald (1986), "Environment: term and concept in the social sciences", in Social Science Information, vol.25, n.1, pp.83-124.

ZOLO, Danilo (1987), Complessità e democrazia, Giappichelli editore, Turin.

3

THE OCCURRING OF A CATASTROPHE.

Before analysing the short-term responses and the medium/long-term changes that occurred in some Western European countries following the Chernobyl accident, it is necessary to inquiry how did such catastrophe happen and why, and how did the fallout started becoming a transboundary problem beside a USSR one.

a. <u>The accident</u>.

On the 25th of April 1986, in the course a planned shut-down for inspection, an experiment was being carried out with one of the turbo-generator sets of Unit 4 of the Chernobyl nuclear plant in Ukraine.

Paradoxically, the experiment that resulted in a major nuclear accident was aimed at improving the safety of the reactor. The intention was in fact to verify whether, in case of power failure, the mechanical energy of the turbo-generator would be sufficient to provide electricity until the emergency diesel generators had run up. Similar experiments had been already carried out at Chernobyl without raising safety problems [1], but their results had not been satisfactory. Therefore a new test had been planned.

A detailed analysis of the accidental sequence is a matter that goes beyond the scope of the present work. Few remarks may be however useful in order to provide the background of some post-Chernobyl measures, and to understand how a core mealtdown with dispersion of radioactive material in the atmosphere (i.e. an event which probability of occurrence was calculated to be one

1 This does not mean that no accidents ever occurred at Chernobyl and other nuclear plants in the USSR (see Medvedev, G., 1991).

chance in a million year reactor by refined risk assessment studies [2]) could happen.

The steps that led to the accident are reconstructed in the report presented by the USSR State Committee on the Utilization of Atomic Energy at the meeting of the IAEA held in Vienna in August 1986 (USSR State Committee, 1986) and in the summary report of such meeting prepared by the International Nuclear Safety Advisory Group (INSAG, 1986). According to these documents, operator error was the main cause of the accident.

A similar explanation had been offered in the report of the Kemeny Commission on the accident occurred in 1979 at the US nuclear plant of Three Mile Island (President's Commission, 1979). With a difference. At TMI a major problem seemed to be the unpreparedness of operators to analyze the events initiated by equipment failures and to timely adopt the necessary emergency measures. At Chernobyl instead it seems that not only there had been errors, but that safety procedures were deliberately disregarded by operators because of their willingness to bring the experiment to an end. Willingness accompanied by an excessive optimism on the good functioning of the reactor.

Beside human/individual failures, the USSR State Committee and the Kemeny Commission also mention some institutional and organizational failures.

With respect to TMI (where a partial mealtdown occurred and a possible catastrophe was avoided at the last minute), the Kemeny Commission concluded that given the deficiencies in the training of operators, the lack of clarity in the operating procedures, the deficiencies in the design of the control room and the failure of the relevant organizations (mainly the nuclear industry) to learn from previous incidents, an accident like TMI was eventually inevitable (President's Commission, 1979, p.11). The Kemeny

2 This estimate was first suggested in the Rasmussen Report (WASH 1400 Reactor Safety Study, 1975) commissioned by the US Atomic Energy Commission. In spite of various criticisms to the Report, such estimate has been widely accepted in risk assessment studies.

Commission also criticized the Federal authority responsible for nuclear power regulation, the Nuclear Regulatory Commission, for its insufficient attention to the process of assuring nuclear safety and for its poor performance in responding to the TMI accident (President's Commission, 1986, Overview).

Deficiencies in the training of operators and in the operating procedures (especially the ones related to the planned experiment) are also mentioned in the report on Chernobyl prepared by the USSR State Committee on the Utilization of Atomic Energy. Particularly it is stated that the quality of the experiment programme was poor, that its provisions regarding safety aspects were purely formal, that the operators were not adequately trained for the experiment and consequently they were not fully aware of the risk involved (USSR State Committee, 1986, cap.2). The report also affirms that the experiment programme had not received the prescribed authorization, but it does not explain how and why could such a thing happen.

With respect to this point, Zhores Medvedev argues that it is unconceivable that a new voltage-regulating system on the turbogenerator could be tested at Chernobyl without the knowledge and authorization of both the Ministry of Power and Electrification and the Ministry of Power Machines and Buildings of former USSR (Medvedev, Z., 1990). On the other hand, former USSR Ambassador to the EC Vladimir Shemiatenkov points to the fact that a growing crisis of the centralized Soviet system at every level of management was already going on at the time of the Chernobyl accident as shown also by other disasters (especially in the transport sector) that happened more or less in the same period (Shemiatenkov, interview). Specifically regarding the consequences of such crisis in the nuclear sector, including the test program at Chernobyl, Grigory Medvedev emphasizes that, "..the irresponsibility and carelessness at these state agencies [All-Union Industrial Department for Nuclear Energy, Nuclear Safety Committee, Gidroproyect Institute in charge of plant's design] had reached the point where they all found it possible to say and do nothing" (Medvedev, G., 1991: p.36). This "irresponsibility and carelessness" at high levels together with the lack of information about negative events (like the TMI accident) at lower levels [3], contributed in neglecting or even not recognizing some "warning signals" such as some minor accidents previously occurred at Chernobyl and other nuclear plants. Administrative changes that took place after the accident indicate that bureaucratic malfunctions at high levels -beside poor management at the Chernobyl plant- were actually found and some corrections, now undergoing revision, were attempted (see Marples, 1988; Medveded, Z., 1990).

A part from the worries that the reported remarks may raise regarding the management of nuclear power (both civil and military) during the ongoing period of major changes in former USSR [4], it can be noticed that plant operators' errors represent only a (minor) part of the accident's explanation and that deficiencies at all levels, but especially at high-levels of management, played a crucial role.

On the basis of the reports presented to the IAEA meeting on Chernobyl and of the above mentioned studies, two remarkable differences may be singled out concerning the role played by organizational problems at TMI and Chernobyl. While at TMI the operational procedures and the overall organization of safety

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3 According to Grigory Medvedev, in the USSR -at least before Chernobyl- "negative information" (such as the TMI accident) were kept for most senior leaders, while the wider public and even the personnel working in nuclear plants were victims of a "conspiracy of silence" (Medvedev, G., 1991: p.7, 39).

4 One can think, for instance, of the illegal trade of nuclear material from the former USSR to the Middle East *via* Italy and Switzerland reported by Western newspapers in December 1991-January 1992 and to the alarmed reports diffused also in 1992 on the safety of nuclear plants in the former USSR. On the risks of accidents due to the impacts of economic and political instability on the management of nuclear power in the former USSR see, for example, Courier International, 1992.

showed to be inadequate to cope with unexpected failures, at Chernobyl safety measures proved to be vulnerable to underestimation (to have them does not necessarily means to use them when it would be necessary) or even to encourage risky operations (there are emergency measures, therefore also risky operations may be -mistakenly- regarded as "safe"). Moreover safety measures proved to be vulnerable to "carelessness" in management of nuclear power at various levels.

All the above mentioned aspects are certainly relevant to understand how did TMI and Chernobyl happen. They also show that multiple scientific/cognitive and organizational uncertainties interact in the management of nuclear power technology. These uncertainties, previously underestimated by risk assessors and by those responsible for technology choices and management, appears to be finally acknowledged. But the way they are acknowledged is still problematic.

Reading the official reports and the recommendations issued after TMI and Chernobyl, one gets the impression that they are based on the implicit assumption that such uncertainties can be eliminated through some improvements in equipment and in organization. Improvements can be certainly made and prove to be useful; yet it is dubious that, for instance, better trained operators would be able to discern all possible accidental sequences and know all possible consequences of their actions. And it is not clear whether more rigid controls and operating procedures could be implemented and would help in responding correctly to unexpected events. In more general terms, it is questionable that uncertainties in knowledge and organizational uncertainties can be overcome. It is then necessary to ask whether major accidents in nuclear plants can be avoided in spite of these uncertainties.

An answer to this question is suggested by Charles Perrow (Perrow, 1984). It is a not optimistic answer, but events like

Chernobyl seem to confirm his point of view. In Perrow's view, operator error, faulty equipments, lack of attention to safety features and poor management are widely spread and unavoidable features of all organized activities. Therefore, in order to account for the occurring of accidents and for variations in the failure rate of different systems, the author argues for an explanation based on system characteristics (Perrow, 1984: p.63).

Following Perrow, nuclear power and other high risk technologies like genetic engineering, chemicals and space technology, are highly complex and tightly coupled system which would require contradictory elements for handling failures in their components. They would need centralization to cope with tight coupling because immediate response and unquestioned obedience are necessary when time is short and sequences are invariant. At the same time they would need decentralization to cope with unplanned interactions of failures; interactions to be each time searched and dealt with by those closest to the subsystems (Perrow, 1984: 331). But while a "mix" between centralization and decentralization is possible and is sometimes implemented in less complex and/or loosely coupled organized activities (like firms and universities), this appears very difficult and perhaps impossible for systems that are highly complex and tightly coupled (see Perrow, 1984: p.334).

Following this reasoning, nuclear accidents should be regarded as normal, rather than abnormal, occurrences. And this is quite alarming given the catastrophic potential involved by nuclear power and other high risk technologies.

Obviously, not everybody agrees with Perrow's analysis. Jacques Theys, for instance, maintains that Perrow holds an unilateral view of complexity which brings him to inapplicable and unacceptable conclusions (Theys, 1989: p.32). According to Theys, it is necessary to develop a less absolute notion of "vulnerability" which links the risk of accidents to specific forms of technical systems' pathologies, such as the aging of technical structures, the vulnerability to abnormal working conditions and the "sicknesses of communication" (Theys, 1989: p.32-33). While it is probably possible to make some improvements with respect to these "pathologies", it is certainly impossible to eliminate them; for instance, no "elixir of eternal youth" is likely to be found for all the components of technological systems. Beside that, it is not clear whether these pathologies should be addressed separately or as a whole in order to cope with them. It seems then that Theys' remarks adds to, rather than undermine, Perrow's argumentation.

On the other hand, one can push Perrow's reasoning even further and ask why "normal" accidents do not occur more frequently. Joseph Morone and Edward Woodhouse address this issue and argue that this is due to the fact that strategies for "averting catastrophe" have been developed (Morone and Woodhouse, 1986). They stress, for instance, that the history of nuclear power regulation (they mainly refer to the US context) is replete with examples of trial-and-error learning [5] and that, even if regulators have been criticized by the nuclear industry for overreacting to incidents, this helped to prevent (more) major accidents (Morone and Woodhouse, 1986: pp.132-133). However, this learning can only occur if errors are recognized and there is information and discussion about them. As previously noticed, this seemed not to be the case in the USSR before Chernobyl.

In his "Normal accidents" published in 1984, Perrow made an unfortunately successful prediction, i.e. that a major accident,

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5 This statement seems to contradict a previous statement by the same authors who writes that, "regulation of nuclear power was never based on normal trial and error" (Morone and Woodhouse, 1986: p.122). However it is true that "normal" trial and error procedures could not been relied upon due the severity of possible consequences of accidental "experiments". Rather actual accidental occurrences like TMI provided a basis for eventually learning from errors. For an interesting discussion of the notion of major nuclear accidents as unplanned social experiments (with special regard to Chernobyl) see Krohn and Weingart, 1986.

worst than TMI and with release of radioactivity in atmosphere, would probably take place within a decade (Perrow, 1984: p.4, 60). Two years later, Chernobyl fulfilled the prophecy. But nobody seemed to be able to forecast nor to cope with the scale and seriousness of the announced but nevertheless unexpected catastrophe.

When the operators of Chernobyl tried to put the emergency barriers into action it was too late. Two explosions occurred, the heavy reactor cover plate was displaced by the suddenly released energy[6] and hot reactor fragments were ejected. The destruction of the reactor and the reactor building allowed air to enter, which caused the graphite to burn.

It was 1.23 of April 26.

Immediately fire brigades were called to extinguish the fires caused by the explosions and then helicopters were used -till May 6- to drop various substances (dolomite, boron carbide, sand, clay, lead) into the reactor where the graphite was burning.

Before 6 in the morning of April 26, 108 people had been taken in some specialized hospitals of Kiev and Moscow. Some of the plant's workers and several valiant rescuers were the first victims of Chernobyl.

While the difficult operations to cope with the fires were undertaken, everything seemed quiet in Prypyat, a village at 3.5 Km. from the plant. On the morning after the accident children were playing football in the streets and a wedding party was held in the city on the same evening. This in spite of the fact that

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6 Many experts emphasized the differences, particularly concerning safety devices, between the RBMK reactors (like the one of Chernobyl) and the reactors more diffused in Western countries, that is the PWRs, and argued that a huge release of radioactivity would be impossible in the case of PWRs thanks to their confinement system. However, there is no agreement about the fact that such a system would be able to withstand explosions like the ones occurred at Chernobyl. For a well-documented discussion of these and other technical points see, Pharabod-Shapira, 1988, cap.6.

the Prypyat city government had some notion of what had occurred (Illesh, 1986).

After some hesitation, several measures were issued by the city government (and implemented thanks to the work of members of the Komsomol, the young communist organization), like the distribution of iodine pills, the closure of schools and the recommendation to remain indoor. However these measures proved to be insufficient; an evacuation was necessary.

The inhabitants of Prypyat were only evacuated 36 hours after the accident. "Knowledgeable people" asked by Andrei Pralnikov (a journalist of Moscovskie Novosti) why the evacuation was carried on so late, answered that radiation levels were only raising gradually and that buses and trucks were assembled in the shortest possible time. In the opinion of Pralnikov, these responses revealed an "absence of glasnost" (quoted in Marples, 1988: p.29). One year later, in June 1987, Viktor Bryukhanov, the former plant director at Chernobyl, received a 10 year sentence for the delay in evacuating Prypyat and for releasing figures on the radiation level that were "dozens" of times lower than reality [7].

As it will be argued later on, the issue of transparency and information had been a major one in the Chernobyl case and, more in general, in cases of nuclear accidents. However it shall be stressed that the Soviet authorities (as the authorities of any other country) were unprepared to cope with a nuclear disaster which possible occurrence had been underestimated; consequently serious difficulties were met in dealing with the burning reactor and in quickly organizing massive evacuations.

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7 Even if this sentence seems to confirm that Pralnikov was right in denouncing the lack of transparency in decisions about evacuation, many observers (including Pralnikov and other Soviet and Western journalists) did not regard the trial of plant official held in Chernobyl in June 1987 as a "victory of *glasnost*". Beside its being held in a secretive way, the trial was also criticized as being aimed at putting the blame on few individuals thereby exonerating the political and scientific establishment (see, Marples, 1988. pp. 118-124).

The tardy but efficient evacuation of Prypyat (in less than three hours 45.000 people were transported in other areas considered safe) was in fact the first of a long series. Approximately 135.000 people had been evacuated in May 1986 from Ukrainian and Bielorussian towns, and thousands of children had been evacuated in the same period from cities quite far from Chernobyl like Kiel (around 130 km from the plant). And evacuations did not end in 1986. In the fourth anniversary of Chernobyl, the mass media of various countries reported that the evacuation of other 200.000 people from still contaminated areas had been decided by Soviet authorities.

b. <u>**Nuclear secrecy versus political "*glasnost*"**</u>.

The first alarm outside the USSR concerning the Chernobyl fall-out came from Sweden on the 28th of April 1986.

Abnormal increases of radioactivity had been detected, starting from the previous day, around the Swedish nuclear plant of Forsmark, in the North of Stockholm. At first the plant's operators thought that a release from the plant had occurred and alerted the National Institute for Radiological Protection. The majority of the plant's worker were evacuated, while others remained in order to check where the failure could be. Eventually none was found. In the meantime increases of radioactivity were detected also in other Swedish plants and research centers, and anxiety started spreading among the Swedish population informed through the media.

The cause of the contamination was unknown. On the basis of the first analysis, the hypothesis of an accident in a military nuclear installation was discarded; in fact, some particles were found of Cesium 134 which can be produced only in nuclear power plants. No accident in Swedish nuclear plants was reported, then the hypothesis was put forward that an accident had occurred in a plant outside Sweden. But where? Winds blowing from South-East indicated that an accident had maybe taken place in USSR, but no information had been yet released from that country (sources, Nohrstedt, 1991; Pharabod-Shapira, 1988; WISE, 1986a).

While Swedish scientists and authorities were still wondering about what was happening, news on radioactivity increases in Sweden started spreading in Europe through official and non-official channels [8]. Radioactivity monitoring were intensified in other countries and showed that there had being increases in radiation levels also in Finland, Norway, and Denmark. The search for the origin of such a large scale contamination became more and more pressing.

According to the statement (reported by Western newspapers the following day) of a spokesman of the White House, the US government was the first one to know for sure the origin of the fallout before the announcement made by the Soviet authorities. This thanks to satellite photographs gathered by the Central Intelligence Service.

In the late afternoon of April 28, the Soviet representative by the IAEA informed the IAEA Director about the accident, and the Soviet TV and the TASS press agency released the first terse news on what was going on at Chernobyl.

This two-days delay in notifying the accident to foreign countries and to IAEA had been widely criticized both within and outside the Soviet Union. Some Western observers maintained that the delay was due to a regime regarded as irreparably authoritarian, while other Western and Soviet observers argued that it was due to the fact that the reforms and the "glasnost" policy promoted by Michail Gorbachev were in progress but still weak (Flavin, 1987; Marples, 1988; Medvedev, Z., 1990; Medvedev, G., 1991; Schemiatenkov, interview).

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8 In Italy, for example, the first news arrived from Cairo where the message of a Swedish amateur radio-operator had been received (Borrelli et al., 1988: p.74).

Nowadays no doubt is left concerning both the significance and the difficulties of Gorbachev's "perestroika". But regarding the Chernobyl case a more general point should be stressed, i.e. that nuclear secrecy and political transparency conflict everywhere. In this perspective it can be argued that the initial silence of the Soviet authorities was not primarily due to specific features of the Soviet political system, but to the secretive attitude that generally characterizes the management of nuclear technology and to the lack of internationally binding provisions on early notification of nuclear accidents.

In fact, as it has been demonstrated by other serious nuclear accidents like the ones at the British plant of Windscale in 1957, at the US military nuclear installations of Hanford, Savannah River and Fernald over many years, at the German plant of Biblis in 1987, etc. (others are probably still kept secret [9]), secrecy within and outside the country where the accidents take place is not peculiar to the Soviet political system. Rather it can be regarded as a necessary feature of the technological-organizational nuclear system. Taking, for instance, the case of Windscale (now, Sellafield), one cannot certainly indicate the behavior of the British authorities as a model of transparency. For three days after the fire at Windscale, British people were not informed about it and protective measures were not issued in spite of the high releases of radioactivity. Information was given after the radioactive cloud had been monitored over Holland (leading to protests by the Dutch government), the fire had been estinguished, and Iodine 131 had been already drunk with milk by children (Gould, 1990: p.17; Wynne, 1982: pp.20-23).

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9 Greenpeace, for instance, published some witnesses (Greenpeace, 1990, Wellington) regarding an accident occurred in 1979 in the atoll of Muroroa where the French were doing experiments with the neutron bomb; according to a witness the accident caused the death of four people. The French authorities deny that any serious accident ever occurred in the atoll.

Secrecy on nuclear matters is especially "needed" in countries where the civil and military uses of nuclear power are directly connected. But not only there; as the NUKEM scandal in the FRG showed (Der Spiegel, 18.1.1988), also countries that do not themselves produce nuclear weapons can help others to produce them by illegally providing the necessary materials. And even putting aside the civil-military connection, nuclear technology compels secrecy because of its centralized and hierarchical management, its vulnerability to terroristic and wartime attacks, and its decreasing public acceptability that could reach the bottom (as demonstrated by the anti-nuclear referenda held in Italy after Chernobyl) if serious accidents are made public.

Furthermore, when Chernobyl occurred there was no international convention on the early notification of nuclear accidents. Some multilateral treaties regarding nuclear issues - especially focused on nuclear weapons- had been concluded starting from the sixties, like the Treaty of 1963 banning atmospheric nuclear weapons tests and the Treaty of 1968 on the non-proliferation of nuclear weapons. However, nuclear matters have been mainly regarded as national affairs and the possible transboundary dimension of contamination caused by a nuclear accident had not been fully acknowledged before Chernobyl [10].

In this context of generalized nuclear secrecy -reinforced in former USSR by the still weak "*glasnost*"- is not surprising that the Soviet authorities had been initially tempted to treat Chernobyl as a "confidential" domestic affair.

But here an important element comes into play, that is the role of the international information network in hampering nuclear secrecy.

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10 It is worth mentioning that the IAEA issued some Guidelines on information in case of transboundary releases of radioactivity just one year before the Chernobyl accident. But these Guidelines were not binding. For a discussion of the role of IAEA see cap.5.

As it was mentioned above, the diffusion of environmental monitoring made possible to detect the fallout before knowing its origin and to orientate the search of the origin itself. Beside that, satellite photographs of the Chernobyl fire prevented any attempt to keep it secret and pretend that radioactivity increases were due to something else. Sophisticated information technologies seemed then to be able to verify news in spite of the lack of accessibility of the official sources of information.

In this respect it has been argued (Minow: Foreword, in Sands, 1988) that the satellite photographs of Chernobyl dramatically demonstrated that governments control over the flows of information is decreasing and that boundaries are now so porous that shutting off communication is impossible. While some distinctions ought to be made regarding the general validity of this argument [11], it seems true that in the Chernobyl case the working of an international information network (including environmental monitoring, satellites, diplomatic/political channels and the media) made absolute secrecy impossible. In more general terms, the important role played by that network also proved that in our "global village" the accountability of the political authorities -and the experts- of each (a bit less "sovereign") State is being scrutinized both within and beyond the borders.

But the existence of an international information network does not necessarily imply that all information and communication problems are solved.

Following the discovery (through monitoring and satellites) and the official announcement of the Chernobyl accident, confusing news started spreading.

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11 At least two points should be taken into account: 1) highly sophisticated and expensive communication technologies are unequally distributed in the world, therefore the governments of some (richer) countries have more control than others on information flows; 2) borders are increasingly porous, but governments have still many possibilities to hide important information and to rig -if not to shut off- communication.

c. <u>Cloudy news</u>.

In the TASS press release of April 28 (as quoted by several European newspapers) it was briefly said that an accident had occurred at Chernobyl, that all the measures to eliminate the consequences of the accident had been taken and that concrete help was being given to those affected.

On the basis of these concise information and on the basis of the data concerning radioactivity increases in Scandinavian countries (and while many ambassadors in USSR were asked by their governments to gather more details on the dynamic and consequences of the accident), the mass media of various countries began working to build the news.

The moving of the "radioactive cloud" was one of the main topics covered by the media of many European countries [12] in the period following the accident. The cloud was an interesting subject because it linked the disaster that was occurring so far away to the *hic et nunc* of everyday life and daily news; people (i.e. the "audience") are usually more interested in things - including danger- that are close, and the cloud represented a direct threat that the media "monitored" for several days. Sources for this "monitoring" were data and opinions provided by scientists and politicians; in turn these data and opinions became in many cases not only sources but also subject of the news.

Scientific data were the necessary starting point for media accounts because of the nature of the event (a technological disaster) and the complexity of the problems involved, especially concerning the health and environmental consequences of the accident. Moreover science was needed to cope with a peculiarity

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12 A more detailed analysis of the coverage of Chernobyl news in three countries (Italy, FRG and France) is offered in the following chapters.

of the cloud as a subject for news, that is its invisibility. A radioactive fallout cannot be seen as such; however the media tried to make visible the invisible. For example, the invisible cloud was drawn on meteorological maps that were shown on TV and published in the newspapers, and the invisible radioactivity took the form of printed words like Iodine 131 and Cesium 137.

In spite of the halo of exactness provided by maps, numbers and technical words, the news on the radioactive cloud appeared quite confusing. Forecasts regarding the moving of the cloud were given in each country according to the contrast "here/there" and were accompanied by evaluations of the risk involved by the fallout which were based on a second contrast, "dangerous/not dangerous". The "here/there" (or "us/they") distinction was usually not merely spatial but ideological (Guizzardi, 1987), explicitly or implicitly meaning that such a thing could never happen "here", i.e. in "civilized and free" -as opposed to "backward and authoritarian"- Western countries. Anyway, the quickly changing winds made the separation here/there already obsolete at the time when the forecasts appeared in the news; and the assessment of risk showed to be based on far from uncontroversial "facts", interpretations and value judgements.

In countries like Italy and the FRG, people were told on April 29 that the cloud and the danger were far away, the day after they were informed that the cloud was very close but that there was no danger, and on May 2 they were asked to comply with some precautionary measures decided by the responsible authorities. In other countries (in France, for instance) citizens discovered later on that they had been exposed to the fallout without being informed about that.

In several cases the media (especially when "pushed" by letters of concerned citizens and/or by pressures from environmental groups) began asking different "knowledgeable people" -but not only "official" ones- why and how it was to be judged whether there was danger or not. Disagreements between experts and between politicians started then emerging about the evaluation of the long-term risk implied by the fallout and about the measures to be taken.

These disagreements and the underlying scientific and organizational uncertainties were managed in different ways and shaped the different responses to the common threat.

The responses to the Chernobyl fallout in Italy, the Federal Republic of Germany and France are analyzed in the following chapters.

REFERENCES.

FLAVIN, Christopher (1987), Reassessing Nuclear Power: The Fallout From Chernobyl, Worldwatch Paper 75.

GOULD, Peter (1990), Fire in the rain. The democratic consequences of Chernobyl, Polity Press, Cambridge.

GUIZZARDI, Gustavo (1987), "Chernobyl, l'esplosione dei mass-media", in Politica ed Economia, vol.6, pp.49-56.

MARPLES, David R. (1988), The social impact of the Chernobyl disaster, Macmillan Press, London.

MEDVEDEV, Grigory (1991), The Truth about Chernobyl, Basic Books, New York.

MEDVEDEV, Zhores (1990), The Legacy of Chernobyl, Basic Blackwell, London.

MORONE, Josep and Edward WOODHOUSE (1986), Averting Catastrophe. Strategies for Regulating Risky Technologies, University of California Press, Berkeley/Los Angeles/London.

NOHRSTEDT, Stig A.(1991), "The information crisis in Sweden after Chernobyl", in Media, Culture and Society, vol.3, n.4, pp.477-497.

PERROW, Charles (1984), Normal Accidents. Living with High Risk Technologies, Basic Books, New York.

PHARABOD, Jean-Pierre and Jean-Paul SHAPIRA (1988), Les jeux de l'atome et du hazard, Calmann-Levy, France.

SANDS, Philippe -editor- (1988), Chernobyl: law and communication, Grotius Publications Limited, Cambridge.

THEYS, Jaques (1989), "La société vulnérable", in Jean-Louis Fabiani and Jaques Theys, La société vulnérable. Evaluer et maitriser les risques, Presses de l'école normale supérieure, Paris.

WYNNE, Brian (1982), Rationality and Ritual. The Windscale Inquiry and Nuclear Decision in Britain, The British Society for the History of Science, Bucks, UK.

List of documents analysed.

COURIER INTERNATIONAL (1992), Les Prochains Tchernobyl, n.73.

INSAG (1986), Summary report of the post-accident review meeting on the Chernobyl accident. Safety series n.75 -INSAG- 1, IAEA, Vienna.

PRESIDENT'S COMMISSION ON THE ACCIDENT AT TMI (1979), Final report, NW Washington.

USSR STATE COMMITTE ON THE UTILIZATION OF NUCLEAR ENERGY (1986), The accident of the Chernobyl nuclear power plant and its consequences. Working document for the IAEA post-accident review meeting , Vienna 25-29 August.

WISE-World Information Service on Energy (1986), Bulletin International. Special Tchernobyl, n.8-9, Paris.

Interviews

Mr. Vladimir Shemiatenkov, former USSR Ambassador to the EC.

4

EMERGENZA ! CHERNOBYL IN ITALY.

a. Background.

To understand the response to Chernobyl in Italy it is necessary to briefly analyze the political and legislative context of nuclear policy previous to the Chernobyl accident.

Italian nuclear policy has been marked by alternating phases of governmental indifference, or "wait-and-see" policy, and phases of nuclear euphoria. The reasons for this are mainly the conflicts of economic interests (especially between the "oil lobby" and the nuclear one, and between the American nuclear industry and the attempts to establish an Italian one), together with quite a strong influence from the international context (for example, the desire not to have a marginal role within EURATOM and in the European nuclear business more in general).

Scientists initially played a role only in the sense of attracting attention to the possible economic utilization of nuclear physics research: at the beginning of the nuclear "adventure", risks were not an issue and the necessity to promote scientific research to deal with these risks has been emphasized only after launching nuclear power on an industrial scale.

As far as the legislation is concerned, some important decisions were taken before establishing the laws regulating the utilization of nuclear energy, i.e. before establishing the "rules of the (nuclear!) game".

Some discussion of the history of these processes may be useful at this juncture.

a.1. Nuclear policy.

Immediately following the Second World War, American, Soviet and European scientists started to debate and conduct research into the possible peaceful use of nuclear energy. Some Italian physicists also took an interest in this field and succeeded in obtaining support from some firms; as a result a research centre on nuclear matters, the CISE (Centre for Information, Studies and Experiences) was founded in 1946 by Edison, Fiat and Cogne, later joined by Montecatini and Sade.

In those first years of nuclear research, the Italian government and Parliament paid little attention even though certain physicists (especially those working in CISE) tried to attract the attention of the politicians and to win financial and institutional support by pointing out the likely economic advantages of nuclear energy (Silvestri, 1968). Only six years later -in June 1952- a public body, the CNRN (National Committee for Nuclear Research), was instituted by a Prime Ministerial Decree.

The CNRN was dependent on the Ministry of Industry and had the task to develop studies and experiments in the field of nuclear physics, to promote the development of the industrial applications of nuclear energy, and to cooperate with the international organizations and foreign institutions in the field of nuclear research. As a first important step, it was proposed to study an experimental reactor to be entirely planned and built in Italy; but then the CNRN decided not to "lose time" and to buy an experimental reactor by the American Car and Foundry. On the 13th of April 1959 the reactor, called Ispra I, was officially inaugurated. After few weeks it had to be stopped and a new core had to be bought; and after two months the Ispra I and its research centre were handed over the EURATOM (European Community for Atomic Energy, founded in 1957) without much explanation by the government.

While the CNRN was initiating this Ispra "*affair*", and before the law regulating the peaceful use of nuclear energy in Italy (Law 1860 of 31 December 1962) was passed, three important contracts were signed and three nuclear reactors were imported afterwards: one reactor (a Magnox) was bought in 1957 by the Agip Nucleare (a sector of the ENI, Hydrocarbon National Agency) from the British Nuclear Power Plant Company, and it started functioning in 1963 near Latina; a second reactor (a BWR) was bought between 1956-1957 by the semi-state industry Iri-Finelettrica, through the Sen (National Electronuclear Society), from the American General Electric, and it started functioning in January 1964 on the river Garigliano; a third reactor (a PWR) was bought in 1957 by Edison from the American Westinghouse, and it started functioning in October 1964 in Trino Vercellese.

Therefore, when Law 933/1960 set up the CNEN (National Committee for Nuclear Energy) which substituted the CNRN, and when Law 1860/1962 regulating the peaceful use of nuclear power was passed, many important decisions concerning the production of nuclear power in Italy had been already made. And it is quite easy to notice that they had been made often hastily and outside the official channels, and that their main result was an almost complete economic and technological dependence on the US nuclear industry (Renzetti, 1979; Silvestri,1969).

This situation was partially challenged by the initial activity of CNEN which included in its first five-year plan experimentation in four different types of reactor to discover which type was more suited for Italian energy needs. But this plan met serious political difficulties beginning in 1963 when the general secretary of CNEN, Felice Ippolito, was accused of wasting public resources, put on trial and sentenced to eleven years imprisonment. Ippolito's explanation of his prosecution (Ippolito, 1977) is that it was due to his attempt to establish a national nuclear industry, attempt which was opposed by the "oil lobby" and by the US nuclear industry.

What is certain is that after this episode the activity of CNEN was more or less blocked for some years and in 1970 it was ENEL (National Body for Electric Energy) that ordered the fourth nuclear plant, then sited in Caorso. Once again the technology was bought from the US General Electric while the Italian industry Ansaldo had to "apply" US technology to build the plant.

Following the oil crisis of 1973, a new period of nuclear euphoria started and was symbolized by the extraordinary nuclear development proposed in the PEN (National Energy Plan) of 1975 prepared by the Ministry of Industry and CIPE (Interministry Committee for Economic Planning). According to the Plan around 50 nuclear plants of 1000 Mw each should have been built in Italy before 1991. However, this policy aroused doubts and conflicts (within governmental and especially business circles) concerning its economic costs and its technical feasibility, and it also encountered some oppositions (by local authorities and anti-nuclear groups) motivated by the high risk involved in nuclear power.

Due to the increasing controversies over nuclear power, an Advisory Commission on Nuclear Safety was appointed in 1979 within the Ministry of Industry; this Ministry also promoted a National Conference on Nuclear Safety held the following year. While being generally acknowledged that the Conference was successful as an occasion of debate between scientists, politicians and representatives of groups opposing nuclear power, no common agreement about the continuation or suspension of the nuclear programme could be reached.

It can be noticed that this lack of agreement and the controversies about nuclear policy in Italy had been met in spite of the fact that all the major political parties, both those ruling (that is, the Christian Democratic Party) or participating in the various governmental coalitions and those in the opposition (mainly the Communist Party, in 1990 renamed Democratic Party of the Left), were pro-nuclear. At least till Chernobyl; following such accident the Communist and the Socialist Parties changed in fact their attitude. Nuclear policy represents then a case of a governmental policy failing to take off not because of disagreements between political parties, but for other reasons. The role played by some powerful economic interest groups like the oil lobby had been very important in this respect; maybe as much important, and surely more visible, had been the wide socio-political opposition to nuclear power which developed in Italy starting from the early seventies.

a.2. Anti-nuclear opposition.

Interestingly enough, the first oppositions to the siting of new nuclear plants in the early seventies did not come from environmental groups (at that time not yet in evidence) but from local authorities. The incidence of disputes between communes and ENEL rapidly increased and the central authorities intervened on the side of ENEL by introducing some Laws (Law 880/1973, and Law 393/1975) intended to curtail the powers of local authorities in the siting procedures (Spaziante, 1980).

Nevertheless, disputes between central and local authorities[1] and between the latter and ENEL continued, and in 1977 the Court - in this case the administrative court (TAR) of Lazio- had to decide on the stoppage, ordered by the Mayor of Montalto di Castro, of the construction of a nuclear plant in his commune. The Mayor's ordinance was revoked, but the plant was still unfinished when the referenda on nuclear power (where the majority of the voters voted against) were held, in 1987, causing the Parliamentary decision (made in August 1988) to complete the Montalto plant as a gas and fuel oil -instead of nuclear- one.

1 On center-periphery relations in the Italian administration see Cassese, 1983 and Dente, 1985.

In the early eighties the issue of the link between the civil and the military uses of nuclear power reached the agenda of local governments, especially the left-wing ones. Several communes established a network of "*comuni denuclearizzati*" (denuclearized communes), that is communes that refuse the location and transit of nuclear weapons -to or from the NATO bases in Italy- in their territory. The issue of the military use of nuclear power was then mainly addressed by peace groups rather than by the anti-nuclear ones, even if there have been overlaps (for example, in terms of militants) between the peace and the anti-nuclear movement (Mattioli, interview).

The anti-nuclear movement [2], formed by environmental and left-wing groups organized at the national level and by local action groups, became highly visible in the late 1970s especially due to a number of mass demonstrations that took place in 1977.

A demonstration against the already operating Caorso plant was organized by the Italian Radical Party with the help of such environmental organizations as *Italia Nostra*, WWF, the anti-nuclear committees of Lombardy and Piedemont, and many left-wing groups; however, local socialist and communist authorities and residents did not participate. In Montalto di Castro instead, where a local antinuclear committee had been established, also local resident and communist local authorities participated -together with environmental, pacifist and leftist groups- to a large demonstration which was held in August 1977. The demonstration, that ended in clashes with the police, was extensively reported by the media.

The efforts of the various antinuclear groups had been partially coordinated by the CCSE (Committee for the Control of Energy Choices) established in 1978 at the national level as well as at the local, decentralized, one. This Committee, mainly

2 On the Italian anti-nuclear and environmental movement see Bettini, 1977; Biorcio and Lodi, 1988; Diani, 1988; Liberatore and Lewanski, 1990.

formed by scientists, provided expertise to the movement and represented the first brick of the so-called "scientific environmentalism" that later characterized large sectors of the Italian environmental movement. The CCSE also started diffusing counter-information in the field of nuclear power and other energy sources through its journal *Quale Energia* (Which Energy) which is still being published.

Beside scientists and students, also some trade unionists had been involved in the CCSE as well as in the antinuclear movement more in general. In this respect it may be mentioned that leading members of UIL (the trade unions linked with the Socialist Party) and FLM (Federation of metal and mechanical workers, a sector of the CGIL, that is the trade unions mainly linked with the Communist Party) expressed strong criticisms of Italian nuclear policy during the National Conference on Nuclear Safety held in 1980 (Benvenuto, 1980; Paparella, 1980). However, with the exception of FLM and reservations within UIL, the Italian trade unions generally supported nuclear power; this till the Chernobyl accident that caused changes especially within CGIL (Bertinotti, 1986; Bondini, 1986).

The Committee for the control of energy choices continued to be active, especially focusing on research and information, during the 1980s and some of its leaders were at the forefront of the anti-nuclear campaign that followed the Chernobyl accident.

In spite of the growth of the anti-nuclear movement, and maybe due also to the lack of representation of this movement within political parties (and this is especially important in political systems, like the Italian one, based on party politics or -as nowadays even party leaders say- "*partitocrazia*"), a new attempt to launch a large scale nuclear programme was made in 1985.

The new National Energy Plan approved in that year provided in fact for the quadruplication (from 3,2% to 12,3%) of nuclear power production and the building of new plants.

When the accident at Chernobyl occurred, the siting procedures of two new plants had been started and were meeting strong opposition from the local populations and authorities of Lombardy and Puglia, while the building of a third plant in Trino Vercellese had been approved by the Piedemont Region in spite of oppositions from the local anti-nuclear committee. As we will see, Chernobyl prevented the continuation of these -as ever controversial- plans.

a.3. Legal and institutional framework .

To complete the account of the political and legislative context relevant in order to understand the policy response to Chernobyl in Italy, it is useful to examine the only comprehensive -but somewhat outdated- piece of Italian legislation in the field of nuclear plants safety and health protection from ionizing radiation: i.e. the DPR (Presidential Decree) 185 of 1964.

DPR 185/1964, that incorporates into the Italian legislation the EURATOM provisions on basic radiation protection norms [3], is crucial for the foregoing analysis because it was the only (even if deficient) legislative reference point for the management of the Chernobyl emergency. Moreover, starting from it we are able to identify the main Italian regulatory and advisory institutions in the field of nuclear risk management.

Leaving aside the procedures established by DPR 185/1964 for the authorization and siting of nuclear plants, let us concentrate on the elements more directly relevant for the Chernobyl case. One important point is the measurement of radiation levels. According to DPR 185/1964, three organizations are responsible -with different competences- for that: 1) the nuclear plants' operator (in Italy, because of the nationalization of energy production, the operator is always ENEL) must provide equipment

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3 While Euratom provisions have been updated in the following years, this was not the case of DPR 185/1964.

for permanent monitoring of levels of radioactivity in the atmosphere, water, soil and food (art.57); 2) the Ministry of Health -by means of its technical bodies- must control (also through inspections) the sources of radioactivity and the levels of environmental radioactivity to protect health and to prevent the contamination of nuclear plant's workers as well as the general population (art.88 and art.109); 3) the CNEN, in 1982 reformed and renamed ENEA (National Committee for Nuclear and Alternative Energy), must -according to the directives established by the Ministry of Health- coordinate the measurements of radioactivity levels, communicate the data to the EC Commission and promote, where necessary, the establishment of monitoring stations (art.109). This last point showed itself to be particularly important during the Chernobyl emergency, when the coordination function of ENEA -DISP was faced with the lack of a homogeneous and efficient national monitoring network.

Regarding ENEA, an important element has to be stressed, that is its double institutional role. When it was set up in 1960, CNEN was assigned not only the tasks to develop research and promote nuclear industry that were previously attributed to CNRN (see previous pages), but also the functions of control and scientific supervision of all the phases of transport and treatment of radioactive substances, and of the phases of siting, building and running of the nuclear plants. In other words, the CNEN was at the same time the controller and the promoter of the activity/industry to be controlled. In 1974 a partial attempt was made to separate these two functions when, within the inner reorganization of CNEN, the DISP (Central Direction for Nuclear Safety and Health Protection) was established. But the relative autonomy of DISP was still not explicitly mentioned in Law 84/1982 which reformed CNEN and renamed it ENEA. Moreover, according to Law 85/1982, the director of ENEA-DISP is appointed directly by the Ministry of Industry: in this way the dependency of the control body on the promotion Ministry remained.

Coming back to the other institutions concerned with radioactivity measurements, the plants' operator, i.e. ENEL, was the main owner of measurement equipment and that was rather problematic with respect to the problem of the transparency and accessibility of data. Following the disputes surrounding the installation of the Caorso plant (Schiavi,1987; Spaziante 1980) and thanks to the approval of Law 833/1978 creating the National Health Service- the local health authorities, both the USL (Local Health Units) and the PMP (Multizone Prevention Stations), were allowed to have access to ENEL data beside making their own measurements.

The institution which is listed third in this account, but is responsible "*in primis*" for the control of radioactivity levels, is the Ministry of Health. And because health protection was a main concern during the Chernobyl fallout, it seems worthwhile to provide some details about the functioning of the scientific bodies that the Ministry of Health has at its disposal to control radioactivity.

Two scientific bodies -operating within the National Health Service- advise the Minister of Health: the ISS (National Health Institute) and the ISPESL (National Institute for Prevention and Safety at Work). According to Law 519/1973, ISS must conduct research on all the elements relevant to citizens' health protection, including radiation risk.

In many occasions (for instance, at the National Conference on Nuclear Safety held in 1980), the members of ISS warned of the dangerous underestimation in the Italian authorization and siting procedures, and in the very deficient emergency plans, of the possible occurrence of serious accidents. The accident at Three Mile Island confirmed the importance of this warning and the "foresight" of the studies made within ISS [4]; but in the meantime a

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4 See, for example, Amaldi,U., G.Campos Venuti, S.Frullani, L.Maiani e E.Tabet (1971), "Criteri di scelta dell'ubicazione

Law which had been passed to reform the health service (Law 833/1978) prevented the ISS from giving scientific advice in the field of health conditions concerning the production of nuclear power and radioactive substances (art.9). This *"coup de main"* was explicitly directed by the Ministry of Industry who argued (see, Corriere della Sera, 6 January 1979) that this exclusion of ISS was necessary in order to eliminate the overlapping of functions (between ENEA and ISS) in the controls of radioactivity levels and sources. This way of solving the problem (if it really is a problem) has been interpreted as an allegedly punitive move against ISS because of its critical position (Spaziante, 1980).

Afterwards, the competence taken away from ISS was attributed to ISPESL; but ISPESL has not yet the equipment and the scientific and technical personnel which would be necessary to carry out the work previously assigned to ISS. As a result, ISS continues to do it (and its role was crucial during the Chernobyl fallout) but in an atmosphere of institutional and legislative uncertainty.

An other advisory institution that has to be taken into account before analyzing the Chernobyl case, is the CGR (High Risks Commission) instituted in 1984 within the Department of Civil protection, a Department within the Council of Ministers and directed by a Minister without portfolio. That Commission has the function of giving scientific advice to the Minister of Civil Protection and includes six sectors of risk; among them, one concerning nuclear risks. The members of the section of CGR dealing with nuclear risk are (according to Decree of 2 July 1986) the Directors of ENEA-DISP, ISS, ISPESL, and two University Professors.

The most important Italian research body, the CNR (National Research Council) has also to be mentioned among the scientific advisory institutions in the field of nuclear power. But it

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delle installazioni nucleari", in Annali dell'Istituto Superiore di Sanità, vol.7, pp.626-646.

played quite a marginal role in the management of the Chernobyl emergency: CNR mainly participated in the measurement campaign by means of IFA-CNR (Atmospheric Physics Institute of CNR) and its President was asked to give his advice during the inquiry of the Chamber of Deputies following the Chernobyl emergency.

After this account of the Italian political and legislative context, and before analyzing the management of the Chernobyl fallout in Italy, it can be useful to sum up by drawing a figure where the main actors of what could appear as an institutional labyrinth are indicated.

Figure 1 summarizes the organization of nuclear safety in Italy, i.e. the responsible (according to the law) authorities, their "in-house" expertise, and the electricity utility. The figure does not comprehend other actors that play an important role in the debate on nuclear safety (mainly, the anti-nuclear movement, the political parties and the media) but are not included in the organization of nuclear safety as defined by law.

It is important to stress that, differently from the USA context where a single Agency (the Nuclear Regulatory Commission) centralizes responsibility in the field of nuclear risk management, in Italy (and in most European Countries) a plurality of related actors -that is, an interorganizational/regulatory network- is involved in nuclear risk management [5] including monitoring, siting, reactor safety and emergency planning. This means that the relations between these actors -mainly the coordination, overlap and/or conflict of responsibilities and competences- are crucial in the actual management of nuclear risk. Beside that, as the analysis of the Chernobyl case will show, such relations are not "given for ever" but are a matter for negotiation. Even if in a sector like the nuclear one, famous for

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5 For a comparison between Italy and the Federal Republic of Germany see, Huber and Liberatore, 1990. On regulatory networks, with specific reference to the German case, see Huber 1991.

its rigidity, the room for negotiation is usually quite restricted.

Figure 1, here

b. The Chernobyl fallout.

b.1.Chronicle

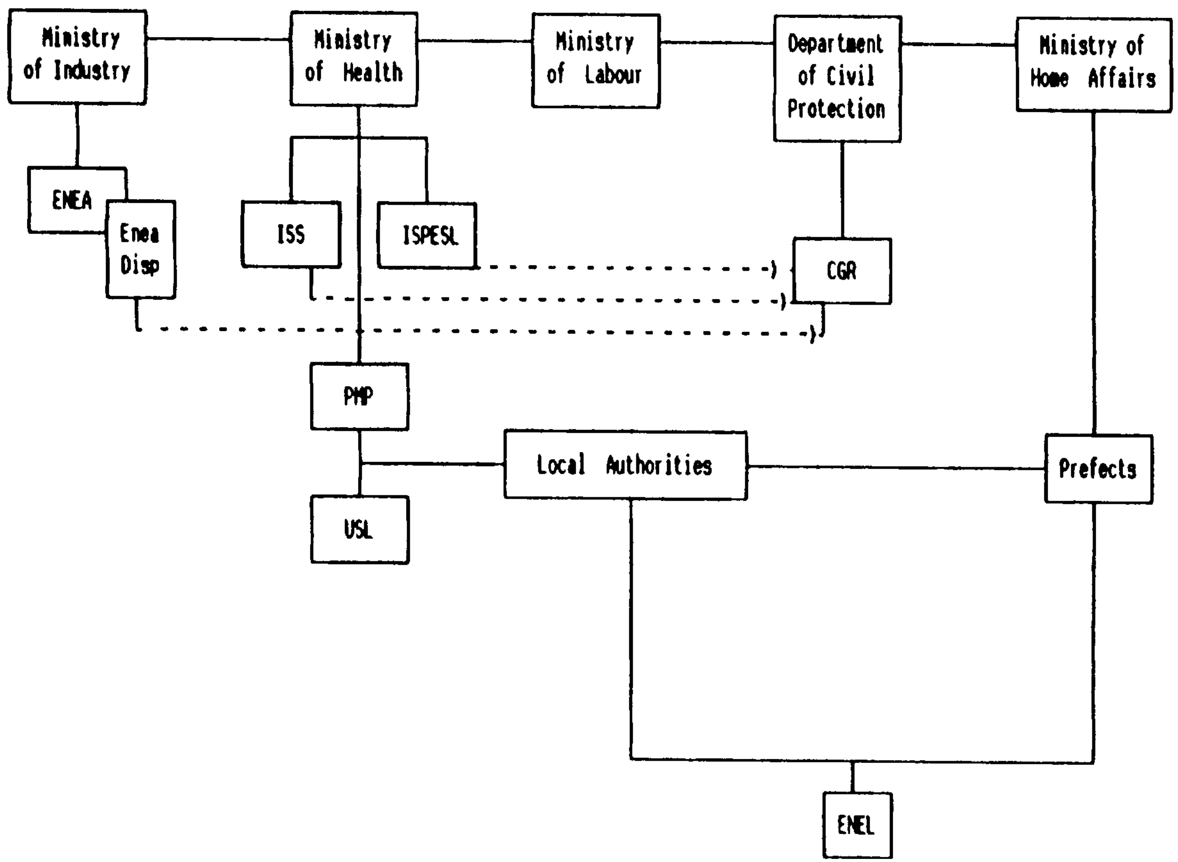
In the late afternoon of the 28th of April 1986 the first news indirectly referring to the Chernobyl catastrophe were received in Italy from Sweden: in that country abnormal increases of radioactivity had been registered. The Italian Minister of Civil Protection was the first who took action. He consulted ENEA-DISP and ISS and -as a precautionary measure- decided to organize, for the following day, a meeting of the CGR and EMERCOM (Operative Committee for the Emergency), a commission formed by members of the Ministries of Agriculture, Defence, Health, Home Affairs, Navy, Public Works, Telecommunications and Transport, and instituted in 1984 to assist the Minister of Civil Protection in protecting populations in case of calamitous events.

On the morning of 29th April the Italian newspapers carried on their front pages the first news indicating that a serious accident in the nuclear plant of Chernobyl had occurred. They also reported the reassuring statements of the Minister of Civil Protection, G. Zamberletti, and of the Director of ENEA-DISP, G. Naschi: according to them the situation in Italy was normal and the radioactive cloud was expected to remain in the north European area. But, as Naschi himself wrote later on (Naschi, 1987) some monitoring stations had already registered in North Italy an increase in levels of radioactivity in the air.

At the meeting of CGR and EMERCOM on April 29 it was decided to check the national radioactivity monitoring network and the stations of ENEA, ENEL, ISPRA, PMP of Piacenza, Air Force, IFA-CNR and Fire Department (some days later joined by others PMP, CISE,

Figure 1

NUCLEAR RISK MANAGEMENT IN ITALY :
THE INTERORGANIZATIONAL/REGULATORY NETWORK



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Laboratories of eleven Universities, and other institutes) were required to intensify their work. During the same meeting the decision was also taken to establish a technical-scientific commission (including members of ENEA-DISP, ISS, Ministries of Home Affairs, Defence and Civil Protection) charged with evaluating the data provided by the various monitoring stations (Malandrino, interview; Tabet, interview).

Italian citizens who began that day reading quite confusing news about Chernobyl, had then the opportunity of listening to Nobel Prize physicist Carlo Rubbia during a TV program. He made no attempt to minimize the problem and explicitly mentioned the possibility that a meltdown had occurred and that this could involve severe and large-scale consequences.

On the 30th of April, the hypothesis that a meltdown had occurred became news. On the same day, the PMP of Piacenza, the ISPRA Research Centre and the Laboratory of Environmental Radiochemistry of the University of Bologna communicated the news that an appreciable increase in the normal levels of radioactivity had been registered.

But the statements of the Minister Zamberletti that were reported in the newspaper of the same day and that he himself made in response to the questions in the Senate also on the 30th of April (Camera dei Deputati, 1986: pp.11-16) were quite optimistic. According to Zamberletti the situation in Italy was perfectly "under control", the radioactive cloud was maybe going to arrive on the 1st of May and remain till the 3rd, but only on North Italy and without risks for the population. Even more optimistic comments were made in the same day by the Minister of Industry R. Altissimo in response to the questions in the Chamber of Deputies. The only negative element stressed by both Ministers was the deficient information coming from Soviet Union; but they did not mention that the deficiency in the information concerning the accident at Chernobyl could challenge the optimistic estimates they were presenting.

On the 1st of May, Labour Day, the Trade Unions meetings did not pay attention to Chernobyl; but all the monitoring stations registered appreciable increases -especially in the North but also in the other areas- of the radioactivity levels in air (Iodine 131 concentration in air doubled between April 30 and the first of May and Caesium 137 concentrations in air increased almost four times in the same short period, see ENEA-DISP a, 1986: fig.4.1).

On that day the radioactive cloud coming from Chernobyl was publicly declared to be on North Italy.

The 2nd of May had been a crucial day. In that day in fact, important measures were taken that started the emergency period, and the first contrasts became evident.

To be more precise, it has been argued that a real emergency -in a strict, technical/legal sense- never began because the average radioactivity remained at the level of the "attention threshold" and did not reach the "danger threshold" (Roberti, interview). On the other hand it has been pointed out that the contamination of vegetables due to Iodine 131 had reached in the North of Italy -and almost reached in the Centre- the reference levels of emergency (ISS, 1987: p.354) and that the activity of Iodine 131 in milk exceeded in the South and in the Centre and almost reached in the North the limit value of 500 bq/l (ISS, 1986: p.349).

Anyway, starting from the 2nd of May, the practical (and symbolic) emergency began for the responsible authorities that had to make decisions, for the scientists and technicians collecting and evaluating data, for the citizens requested to comply with unusually severe measures, and for the mass-media looking for news to be offered to their public.

The decisive organizational measure decided by Minister Zamberletti on the 2nd of May was the centralization of all data. Laboratories and monitoring stations were requested to send their data -to be considered "confidential"- to ENEA-DISP; ENEA-DISP had to coordinate, make homogeneous and process the received data and had to present to the technical-scientific commission instituted by the Department of Civil Protection a daily tabulation including all the measurements made in the country. Moreover the Minister of Civil Protection -and only he- had the power to make public the selected data that were circulated in the form of "daily averages estimates" firstly divided in three big geographical areas: north, centre and south Italy.

This measure had some practical and political reasons, and a quite deficient legislative base. The practical reasons were mainly the necessity to collect a huge quantity of data in the shortest possible time and to avoid confusion in circulating data; the political reason was the authorities' need not to alarm people in relation to what was going on, and in relation to the risks of nuclear power in general and of Italian nuclear plants more in particular. When this measure and the measures (to be examined later) decided by the Minister of Health started to be implemented, the emergency began. And to initiate the emergency was a political (scientifically advised) decision.

The legislative base of this political decision included the part of DPR 185/1964 concerning the case of nuclear emergency and the Law 938/1982. DPR 185/1964 (and the Italian legislation more in general) does not provide for cases of nuclear emergency concerning all Italy and caused by nuclear plants sited outside the Italian territory. Therefore there is no precise definition concerning who are the responsible authorities in that cases. The decree only establishes that, in case the possible danger for public security regards more than a Province, a Committee within the Prefecture of the province where the accident occurred has to be appointed, and the Prefect is responsible for the coordination of the provincial emergency plans (art.118). Moreover (art.122) the Prefect must take all the necessary steps to protect public safety and has to communicate to the Ministry of Interior any accident that implies a radioactive contamination of the population; that Ministry has to apply the directives (provided

-art.88- by the Ministry of Health) concerning the health protection of workers and populations from the dangers connected to ionizing radiations.

It seems therefore that in the Chernobyl case, the central responsible authority to be referred to should have been the Ministry of Interior. But here Law 938/1982 comes on the scene. It concerns "urgent interventions on behalf of populations affected by natural calamities and exceptional events" and establishes that the Minister of Civil Protection -after having consulted the involved Regions- takes steps to face the emergency (art.1.). Taking this Law as a reference point, the Minister of Civil Protection assumed the responsibility to take the steps he regarded as necessary: among them, the centralization of data collection and communication.

But, as far as health protection is concerned, we have already seen that -according to DPR 185/1964- the responsible authority is the Ministry of Health. And on the 2nd of May also the Minister of Health, C. Degan, took some very important countermeasures.

On the basis of the advice provided by the ISS, Degan signed an ordinance that forbade the selling of fresh wide leafed vegetables and to give fresh milk to children under ten years and to pregnant women. He also signed an ordinance (suggested by the technical-scientific commission appointed by the Civil Protection Minister) restricting the imports of fresh vegetables and animals from Ukraine and Eastern countries, and requiring a certificate for foodstuffs imported from other EC countries stating that those products were not radioactive.

The following days had been characterized by many polemics and conflicts concerning these countermeasures. Only the restrictions on imports, which was criticized by the authorities of some neighbouring states (mainly France), did not raise controversies within the country.

While some local authorities not only tried to apply the countermeasures taken by the Minister of Health but also added other recommendations to be followed in their territory (for example, the suggestion to parents and school teachers not to let children play outdoor), the Ministers of Agriculture and Industry accused the Minister of Health of exaggerating dangers and to cause big damages to agriculture, foreign trade and to Italian economy in general by ordering superfluous countermeasures.

The different attitudes toward the countermeasures decided by the Minister of Health were dependent on different and sometimes conflicting institutional concerns (economy promotion vs. health protection) and on different and conflicting political and economic interests (the risk of losing legitimacy and money in case that measures would turn out to be pointless; the risk of losing legitimacy and human lives if the measures were not taken and afterwards this decision would reveal itself to be wrong; the risk of losing legitimacy and money if -independently from taking these measures or not- a strong opposition to nuclear power production would spread and lead to the suspension of the Italian, already unstable, nuclear policy).

But different attitudes toward these measures, and a big confusion among the citizens, were also provoked by the way the data were circulated and by the divergent evaluations made of them. Some scientists and the Greens argued that to circulate average estimates divided into three such large areas as North, Centre and South (only some days later regional data were diffused) was meaningless because very contaminated and scarcely contaminated areas were mixed in the same group. And they also pointed out that the official data available to the public were very deficient since they only took into account Iodine 131 and Cesium 137 and never mentioned other dangerous radioactive elements (De Sanctis, 1986). Moreover, the use of different measurements units, that is Curie (Ci) or Becquerell (Bq), provoked a big confusion in the collection and especially the communication of information: not only for citizens and journalists, but also for many scientists it was not easy to "translate" from one measurement unit to the other and fully understand what the given data meant (Mattioli, interview; Roberti, interview; Tabet, interview).

As a consequence of divergent interests and evaluations, while in the opinion of the Ministers of Industry and Agriculture the countermeasures decided by the Minister of Health were a costly mistake, for others these measures were hardly sufficient to cope with the radioactivity level increase of those days.

Among the last ones, many anti-nuclear groups that organized demonstrations at nuclear sites and in several towns on the 3rd of May and in the following days.

On the 5th of May, after a meeting of the Ministers of Agriculture, Industry, Health and Civil Protection with the Secretary of the Cabinet, contrasts remained but the Minister of Health did not revoke the measures.

During the same day, the Minister of Industry was requested to answer some questioning in the Chamber of Deputies concerning the security of the Italian nuclear plants, and especially the one of Latina which is the only graphite plant (like the one of Chernobyl) in Italy. He maintained that the Italian nuclear Installations are completely different from the one of Chernobyl and absolutely safer than that (Camera dei Deputati, 1986: pp.22-24).

On May 6, Italian citizens had the occasion to verify that not only between politicians, but also between scientists the disagreements can be very deep. At the end of a long and careful TV program where the Ministers of Health and Civil Protection, the directors of ENEA-DISP and ISS and some Italian scientists were invited, one of them, a famous physicist who had been one of the initiators of Italian nuclear research in the fifties and one of the founders of CERN -Edoardo Amaldi- harshly attacked the physicist and Greens' leader Gianni Mattioli. If someone had still some illusion concerning the purity of science and the neutrality of scientists, it is likely he/she lost it that night.

On the 7th of May, during a press conference, the Radical Party, *Democrazia Proletaria*, the Greens and several environmental organizations presented the proposal of some referenda against nuclear power production.

In the same day and in the following two, some motions were presented especially by left wing parties in the Chamber of Deputies and the Senate. The main issues included in the motions were: the prompt closing of the nuclear plants of Latina; a careful control of all the Italian nuclear plants; an improvement of the emergency plans; the establishment of a specific High Risks National Body; the proposal to organize a National Conference on Energy (Camera dei Deputati, 1986).

On Saturday 10, an impressive demonstration of 150.000-200.000 people (different newspapers gave different numbers) in Rome showed that the opposition to nuclear power in Italy was very widespread.

On May 13, the prohibition to sell wide leaves vegetables was revoked in some Regions of the Centre and South of Italy, while the prohibition for children and pregnant women to drink fresh milk remained in the whole Country.

In the meantime the disagreements between the EC member states regarding the measures to be taken were reported by the Italian newspapers together with news about the starting of the polemics about the management of the fallout in France and the debate on nuclear power in the FRG and in other countries. Italian physicists were also interviewed concerning the future of nuclear energy; especially the opinions of Nobel Prize Rubbia, who is famous for his research on nuclear fusion and argued for the development of fusion as an alternative to current nuclear fission installations, were quoted by various journalists.

On the 17th of May, the selling of wide leaves vegetables was allowed also in the Northern Italian Regions, while the restrictions on fresh milk were extended.

On the 20th of May, the emergency was officially closed by the satisfied remarks of both Degan and Zamberletti who stressed the efficiency and the prudence followed in the previous days by the Italian authorities.

b.2. Analysis

Different policy and social responses to Chernobyl emerged in different countries, therefore what happened in Italy cannot be regarded as the only possible response. What are then the elements that gave rise to the above mentioned course of action? The answer to this question is needed not only to explain/interpret the Italian response to the Chernobyl fallout, but also to understand why there had been different responses to the same threat in neighbouring EC member countries.

As I have already mentioned in the Introduction, my hypothesis is that there are reciprocal influences between what scientists (especially the ones within advisory institutions) select as relevant knowledge and information, what politicians wish to know and wish to let be known, what pressure social movements and interest groups are able to exert concerning the utilization and diffusion of knowledge, and what information the mass-media decide to stress or to minimize. Depending on the different shapes these interactions take, scientific and organizational uncertainties will be differently managed and different different responses will result.

In the attempt to shed some light on these interrelationships I concentrate the analysis of the Italian case (and also the following analysis of the German and French cases) on four elements: the role of the policy advice institutions in the collection, interpretation and selection of the relevant information; the use of that information by political decision-makers for the management of the Chernobyl emergency; the pressure exercised by counter-experts and anti-nuclear groups in utilizing and diffusing information; the role of the mass-media as constructors of news and as means of communication.

Before examining these points, let us summarize the relations between the main actors (and actions) involved in the management of the Chernobyl emergency in Italy.

Figure 2 indicates the action-set, that is the organizations that formed a limited alliance for the limited purpose of managing the crisis, that emerged during the Chernobyl fallout. The figure also indicates the countermeasures decided.

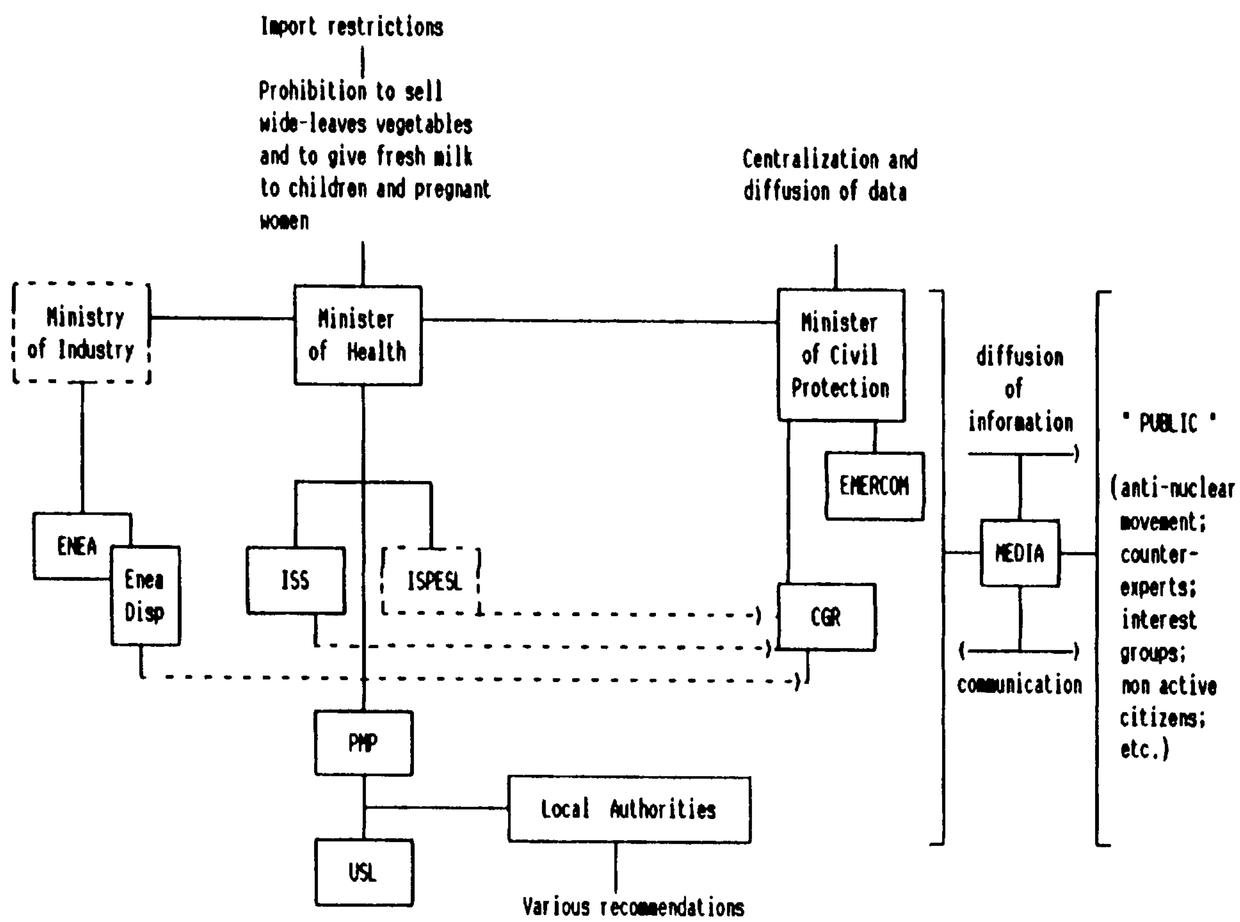
It can be noticed that in face of an unprecedented/non-routine event two Ministers (Health and Civil Protection) and the experts of three advisory and/or regulatory bodies (ISS, ENEA and ENEA-DISP) acted as leading institutional figures. This was due to their ability and willingness to assert their authority by imposing (mainly through scientific arguments) a specific definition of the situation -a nation wide public health emergency- and taking action.

The figure also points to the information and communication role played by an actor which is not included in legislative or administrative procedures, that is the mass media. The media proved in fact to be very important in the management of the emergency by transferring information from the institutional action-set of decision makers to non-governmental actors (the so-called, very differentiated, "public"), and by providing an arena and vehicle of communication between the institutional authorities and the wider society.

Figure 2, here

Figure 2

THE CHERNOBYL EMERGENCY IN ITALY :
THE ACTION-SET AND THE COUNTERMEASURES



b.2.1. Policy advisory institutions and information problems.

As we have seen already in the two previous paragraphs, the main Italian policy advisory institutions in the field of nuclear risks are ENEA, ENEA-DISP, ISS, and CGR -nuclear risk section; and they are all "in house" -within or dependent on Ministries-bodies. In the Chernobyl emergency period, these institutions were requested to work together in the technical-scientific commission appointed to evaluate data and to give advice to the governmental authorities (particularly the Minister of Civil Protection). They in fact cooperated within that commission, but they also operated separately both because of different institutional competences and because of some diverging opinions between them.

When, on the 29th of April 1986, the technical-scientific commission was appointed, one main difficulty became immediately clear: there were crucial lacks of information regarding the characteristics of the Chernobyl nuclear plant and the kind of accident that occurred, and therefore it was problematic to already understand the seriousness of the event. Given the impossibility to quickly obtain these information from the main source, i.e. Soviet Union, it was necessary to start from the data communicated by the Swedish authorities; data that had been the first (ex-post) warning for radiation experts of many countries about the potential scale of the fallout. On the basis of those data, all experts participating at the first meeting of the technical-scientific commission agreed that something serious had happened, but gave different evaluation about the possible consequences in Italy of the not yet known event (Tabet, interview). Some of them were inclined not to worry about those possible consequences and that position influenced the reassuring statements pronounced the following day by Ministers Zamberletti and Altissimo at the Senate and at the Chamber of Deputies. Others stressed instead the necessity not to underestimate not only the possibility that the radioactive contamination registered in Sweden could take place in Italy too, but also that it could affect population health. As a result of the discussion, the precautionary measure was taken to check the national monitoring network and to control the levels of radioactivity in air, water and soil.

In this respect, some other problems concerning data gathering (Finetti, interview; Roberti, interview) had to be faced: a) in spite of the fact that all the Italian monitoring stations within different institutions were requested and started to cooperate, their geographical distribution was not homogeneous; in general terms, in the South, in the Adriatic coast and in the Islands there were fewer monitoring stations than in the North, and in some regions there was no one. The national monitoring network had therefore to be completed (during and after the Chernobyl emergency) to make measurements in the whole Italian territory. b) Moreover, the measurements were made by differently equipped laboratories, which means that not all of them were able to monitor all the relevant radioactive elements and that the quality of the measurements also of the same elements were different.

This was a problem for ENEA-DISP that had to make the measurements homogeneous, to process them and to prepare the daily tabulation it was requested to submit to the whole technical-scientific commission. Consequently, only some radioactive elements have been taken into consideration in the average estimates calculated on the basis of the available measures. And this is a first element that may be considered important or unimportant for health protection, and that could be a matter of disagreement between experts depending on what they look for, on the theories they refer to, and on their "extra-scientific" attitudes. As previously mentioned, the selection of radioactive isotopes gave raise to controversies as several non governmental experts (including those of the Committee for the Control of Energy Choices) argued that also other isotopes, like strontium and ruthenium, that had been detected during the fallout should have been taken into more careful consideration.

Beside the selection of the radioactive elements to be taken into account, also a selection of the relevant "food matrix" was made. Since, for example, high concentrations of Iodine 131 and Cesium 137 have been found especially in milk and in wide leafed vegetables, and since these foods represent a remarkable part of the "normal"/average diet and milk represent the most important food for babies (a group especially at risk), these foods have been considered especially important by ISS experts. Also this selection was criticized by some non-governmental experts on the ground that especially in certain areas the "normal" diet includes a lot of meat or fish; however the very low levels of radiation detected in these foods and the restrictions on imports of several foodstuffs (regarded as likely to be contaminated) from Eastern countries made the food matrix a less controversial issue than the selection of isotopes to be taken into account.

Let us now see how these selections of information, together with other elements, influenced the decisions concerning the countermeasures to be taken.

b.2.2. Deciding about countermeasures: the interplay between knowledge and discretion.

Once measurements had been made, radioactive elements to be taken into account had been selected and average estimates had been calculated according to some implicit or explicit evaluations, the scientists within the advisory institutions (especially the ones of ISS and ENEA-DISP) were asked to assess the risks for human health and to suggest countermeasures. But (as it was already mentioned) the definition of a "safe threshold" and of "low" dose of radiation, and the forecast of the possible long-term harmful consequences of "low" doses of radiation on human health are very controversial matters. Even if the scientific uncertainties related to these matters are quite widely recognized, divergent attitudes were expressed by the experts concerning the way to cope with uncertainty in the Chernobyl case; and different evaluations have been afterwards expressed concerning the usefulness of the countermeasures adopted during different authorities period (ENEA-DISP, 1986b; ISS, 1987).

These different experts' opinions were referred to by different authorities and interest groups. For example, on the one hand the Italian (but not only the Italian ones) Ministers of Industry and Agriculture and the representatives of farmers maintained that to destroy huge quantities of milk, vegetables and other food was pointless given such uncertain evidence and so diverging experts' opinions concerning the risks for health due to the "low" doses of radiations that had been registered. But, on the other hand, the Minister of Health and the experts of the ISS strongly defended the necessity of taking the already mentioned precautionary countermeasures just because of the uncertainties in the definition of a "safe threshold".

At this point it is quite evident that the problem was no more the (trans-)scientific assessment of radiation risks for human health, but the need to manage scientific and organizational uncertainties to cope with an unexpected event. The decision to take or not some precautionary measures, and the choice among various possible measures, had to be made in conditions of uncertain knowledge and unclear definition of political responsibilities (which increased the inter-organizational uncertainty regarding the behavior to be expected by the various institutions involved) at the governmental level as well as regarding the relations between central and local authorities. Therefore both scientific knowledge and legal norms had to be interpreted; that is, discretion had been exercised by those who acted as the institutional protagonists of the management of the Chernobyl fallout in Italy.

As already pointed out in the Chronicle, the legal gap regarding the measures to be taken in case of a radioactive fallout due to an accident occurred beyond the Italian borders was filled by interpreting and utilizing some existing norms. In this respect norms could be regarded both as constraints and as opportunities/resources. In fact, on the one hand, they limited (while keeping it rather broad) the scope of the authorities that could be eventually expected to take responsibility in an occurrence related to nuclear power utilization; and, on the other hand, those authorities who were willing to strengthen their power and/or were more sensitive to the issue of nuclear risks had the possibility to resort to norms that provide for health and emergency issues.

The framing of the fallout in terms of a nation-wide health emergency can be regarded as a way to manage the existing organizational uncertainties by using those norms that would allow the Health and the Civil Protection Ministers to take action in spite of oppositions by other central authorities. And it can be seen as a way to manage scientific uncertainties too by interpreting norms according to a precautionary approach that was already familiar to the advisory body of the Health Ministry and at the same time fit the Civil Protection Department emergency tasks (as well as the "emergency approach" of many Italian governmental policies).

As far as this last point is concerned, it can be argued that the resort to the precautionary approach by the Health Ministry and the ISS was not only due to the development of that approach in the field of radiation protection at the international level and within the ISS, but also to previous experience in the management of industrial hazards.

Ten years before Chernobyl the Health Ministry and the ISS had been involved in the management of the consequences of a major industrial accident, the one occurred in July 1976 at the ICMESA chemical plant at Seveso in the Lombardy Region. On that occasion delays in assessing the risk (also due to the secretive attitude of the plant management), in alarming the population and in taking measures such as evacuation (decided and implemented 16 days after the accident) caused exposure to dioxin -TCDD- and other chemicals through inhalation and ingestion of contaminated food; and this provoked the dead of animals and serious illnesses -including skin eruptions and malformations in children born in the following months- among the inhabitants of the Seveso area [6]. Criticisms of public authorities' late reaction and complaints concerning the occurred damages to health and the environment that could have been eventually prevented by more timely and strict measures followed the accident. The echo of these criticisms and complaints sounded in the ears of those members of ISS who participated in the management of the Seveso crisis -but only starting from 12 days after the accident since previously only local and regional authorities were involved- for many years (see Zapponi et al., 1991). The need to avoid the repetition of that experience in the Chernobyl case was then among the background elements of ISS' experts advice to adopt precautionary measures at a relatively early stage in the case of the Chernobyl fallout [7].

b.2.3.Chernobyl news and Chernobyl as a mass-media construction.

The mass-media played a crucial role in the shaping of the Chernobyl emergency in Italy. On the one hand, they performed the proper general function of any "medium", i.e. the communication function; and, on the other hand, they actively contributed in constructing "reality". These two aspects are strongly intertwined; however, for the sake of clarity, let me treat them sequentially starting from the last point mentioned above.

Italian mass-media have been severely criticized by some politicians, scientists and scholars in mass-media communications

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6 On the Seveso accident see, Conti, 1977; Lagadec, 1981; Pocchiari et al., 1987; Zapponi et al., 1991.

7 In this respect it must be noticed that different units and individuals of ISS dealt with Seveso and Chernobyl, however these units and individuals are frequently in contact due to the relatively small size of the ISS and personal relationships (conversation with Prof. G. Zapponi of ISS).

who maintained that journalists "distorted the truth", exaggerated the "facts" and reported false information from the scientific point of view (see, for example, Minerva, 1986; Pierantoni, 1987). It is true that, especially because the danger (radiation) was an invisible one, the media had a main role in making it "real" by mentioning it, by using written and spoken words as "radioactivity", "Iodium 131", "mealtdown", "cancer", and by showing photographs and documentaries about nuclear plants, about the big fire at Chernobyl, about technicians at work and about instruments for radioactivity measurements. The point to be made clear in this respect is that the media made "visible" the "invisible" not the "non-existing"; in other words, they shaped and constructed the perception of the danger, but they did not totally "invented" the danger itself.

It is also true that sometimes journalists diffused incorrect information from the scientific point of view. This is due both to the lack of scientific competences by journalists and to the fact that many scientists do not put much effort in making technicalities and data (or better, numbers) intelligible to non-specialists and in helping journalist in the difficult "translation" work from the scientific to the common language. Beside that some newspapers reported completely false news; this happened especially in the first days when some newspapers carried in their front pages the "news" that 2.000 people were dead near Chernobyl (Il Tempo, 30 April 1986) or -to be even more shocking (and to better recall the anti-soviet campaigns of the cold-war period) that the dead were maybe more than 2.000 and that they had been buried in common graves together with the nuclear wastes (Il Secolo XIX; quoted in Minerva, 1986). Even if the "news" was firstly circulated by (US) Press Agencies, this is not a good reason/excuse for reporting it without at least a question mark and without verifying its veridicality as it was done by certain newspapers.

Also concerning the role played by the mass media, it is worth noticing that the emergency had been an emergency especially thanks to the diffusion through the mass-media of the previously filtered (but still confusing) data concerning the concentrations of radioactive elements in the environmental media and in foodstuffs, and of the governmental prohibitions and recommendations to be complied with by citizens. But this crucial role played by the media cannot be regarded as a sufficient argument for concluding that the Chernobyl accident was an event of a "merely informative nature" because it was perceived by the public only by means of newspapers, radio and TV (Pierantoni, 1987), or that Chernobyl was merely "an opinion" because people had no knowledge of the "objective facts" (Minerva, 1986).

As far as the so-called "lay people" was concerned, something serious had happened that concretely endangered the lives of many people in Ukraine (and that unfortunately caused -and is going to cause- many deaths among the Ukrainian population); that there was an invisible cloud moving about in Europe full of an invisible and dangerous "substance"; that some quantities of that "substance" were in the air, in the rain water, in the soil and in some foods; that some scientists were of the opinion that to ingest even small quantities of that "substance" can provoke -or contribute to provoke- cancer and leukemia in the long-period; and that some authorities ordered not to eat and drink some food and recommended not to leave children play on the grass and to wash frequently their hands. These elements (that have not been "invented" by journalists) were the quite sound "evidence" available to the "lay people", and on the basis of this "evidence" was perfectly reasonable to have some fears. Moreover, newspaper articles (starting from the titles) frequently used the word "*paura*" (fear) to describe/construct as news the general attitude -in Italy and other countries- towards the fallout, in this way favouring a sort of amplification effect [8].

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8 A study on the titles of five Italian newspapers during the first five days of the Chernobyl fallout shows that "*paura*" was the second most frequently used word after the word "*nube*" -cloud-

On the basis of the previous remarks, the communication role of the mass-media becomes evident: scientists and politicians were not allowed to discuss and decide in isolation; and this partially public dimension of the scientific debate and of the political decision-making process influenced them. Particularly it stimulated them to give explanations (even if controversial) about what was happening and about the need to take (or avoid) action. A feed-back process can be noted in this respect: the quality of mass-media communication and its effects on the public have been deeply influenced by the atmosphere of scientific (showed by the disagreements between experts) and organizational (showed by the conflicts between Ministries and between central and local authorities) uncertainty of those days; uncertainty that contributed to the diffusion of confusing news and to the spreading of fears among citizens. On the other hand, this public dimension of uncertainty and the worries it caused influenced the debate between scientists, so that critical points of view had more room.

The anti-nuclear movement played a particularly important role in putting forward critical points of view and in making them being widely known also through the media. "Counter-experts" like the scientists of CCSE were able to challenge with scientific arguments (beside ideological ones) those governmental or independent pro-nuclear experts who denied or played down the risks involved by the Chernobyl fallout and by nuclear power more in general. And the opinion of those counter-experts and other leading figures of the anti-nuclear movement were extensively reported by the Italian media [9].

(Pucci, 1990: p.14). On the issue of the "social amplification of risk" through information see, Kasperson et al., 1988.

9 Following an analysis regarding the way the Chernobyl event had been treated by 9 Italian newspapers, ecologists had been the most frequently covered actors -together with the Minister of Civil Protection and the Minister of Health- in the period from the end of April till the end of June 1986 (see Borrelli et al., 1988: pp.44-45).

This activism and visibility of the anti-nuclear movement, together with the (partially) public dimension of the scientific debate and the decision-making process, influenced the management of the Chernobyl emergency so that a strategy aimed at avoiding the worst possible health and political effects prevailed on economic costs calculations.

b.3. Concluding remarks.

Why at the end strict countermeasures were applied in conditions of scientific and organizational uncertainty and in spite of the opposition of strong economic and political organizations?

On the basis of the analysis suggested above four interrelated answers may be suggested:

1) because the Ministry of Health is the only governmental authority which competences in the field of health protection against ionizing radiation are clearly defined by the Italian legislation. Given the general surprise caused by the occurrence of such an unexpected event as the mealtdown in the nuclear plant of Chernobyl, and given the gap in the Italian legislation concerning the definition of the responsible authorities and the procedures to be followed in cases of a radiological emergency due to an accident occurred outside the national borders, the role of the Ministry of Health was the only clearly defined reference point. And the Minister of Civil Protection (who had at least the merit of assuming -in that confusing situation- the responsibility to face that exceptional event and to coordinate the emergency) took that into consideration and adjusted his behavior consequently.

2) Because the Ministry of Health has the necessary scientific and technical "resources" in that field, mainly its advisory body -ISS- which scientific expertise is widely recognized within the scientific community and by the political authorities. Given the scientific uncertainties concerning the

effects of "low" levels of radiation on human health, these scientific and technical resources revealed themselves to be very important in orientating decisions. The cautious attitude of some leading ISS' experts (due to the precautionary approach developed in the field radiation protection and to previous experience such as the Seveso accident), proved to be influential in framing the fallout as a public health problem and in orientating decisions towards the adoption of relatively strict measures.

3) Because of interministry conflicts that revealed to be very important in the management of the Chernobyl emergency. Such conflicts could have been paralyzing; instead they encouraged Ministers to take actions, and find some forms of adjustment, to assert in practice their ill-legally defined competences. Particularly the Minister of Civil Protection was able -while being a Minister without portfolio- to have a leading role by imposing, thanks to the *ad hoc* alliance (sometimes conflictual) with the Minister of Health, a definition of the situation as a case of emergency.

4) Because of the pressure of public opinion and the anti-nuclear movement. Italian citizens, who everyday read and listened to alarming and confusing news and which were awakened to the issue of the risks connected with nuclear power production by the campaigns of environmental/anti-nuclear groups, were very worried about what was going on. Therefore it was important to make citizens (electors..) feel that the authorities were doing all the necessary to protect the health of the population. Some politicians and some scientists argued that mass-media and the anti-nuclear groups exaggerated the dangers and that, also because of this, ordinary people had "irrational" fears. However, independently from judgements concerning the rationality or irrationality of such fears, the Italian authorities knew that one important political resource -legitimacy- was at stake, and that, because of this, people's fears had not to be underestimated.

All these interrelated elements contributed in making relatively strict measures to be adopted to cope with the Chernobyl fallout in spite of (and even thanks to) scientific and organizational uncertainties and notwithstanding the opposition of powerful interest groups.

As we will see in the next chapters different patterns of interactions between politicians, experts, anti-nuclear groups and the media, and different access to and use of that crucial resources which is information brought about different responses in neighbouring countries.

c. The years after.

After the emergency period immediately following the Chernobyl accident, remarkable events and changes occurred in Italy with respect to nuclear power.

A Parliamentary inquiry on the safety of Italian nuclear plants was conducted between May 1986 and January 1987; a National Conference on Energy -required by the Parliament and promoted by the Government- was held in February 1987; the same year, in November, three consultative referenda regarding important aspects of nuclear policy proved that large sectors of society were against such policy; a new National Energy Plan was adopted in 1988; ENEA and ENEA-DISP went through a new and controversial reorganization process.

Why did these specific events and changes took place? Can they be interpreted as parts of a learning process in the field of nuclear risk management?

c.1. Post-Chernobyl events.

c.1.1. The Parliamentary inquiry.

An inquiry concerning the safety of Italian nuclear plants was conducted by the Commissions of Industry and Health of the Chamber of Deputies in the period May 1986-January 1987 (see, Camera dei Deputati, 1987). Such inquiry represented a first institutional arena where the positions of political parties about nuclear issues where discussed and adjusted in the light of the Chernobyl radioactive and political fallout. It can be argued -given the technical limits of a Parliamentary debate and on the basis of the fact that no final assessment/judgment about the safety or non safety of Italian plants was given- that the safety of nuclear installations was a topic for the process of political adjustment more than the real aim of the inquiry.

The major conclusions of the inquiry can be summarized as follows: 1. nuclear plants need a social and institutional organization able to cope with the risk they involve; 2. Italian authorization procedures are consistent with international standards; 3. there are serious problems concerning the disposal of nuclear waste and the decommissioning of old plants; 4. during the Chernobyl fallout, the monitoring network proved to be very deficient; 5. during the Chernobyl fallout also problems concerning information and emergency planning emerged.

Recommendations were also given such as: improve the monitoring network, improve the diffusion of information concerning emergency measures, elaborate a national emergency plan beside the local ones, separate ENEA-DISP from ENEA, address the problem of waste disposal and decommissioning. While the suspension (decided since May 1986) of the siting procedures for new plants was taken for granted, no specific recommendation was given regarding the fate of the Italian nuclear plants which had been closed for inspection since May 1986. These recommendations can be regarded as resulting from a compromise between the anti-nuclear, but still in the phase of change, attitude of the Communist and Socialist Parties and the pro-nuclear, but less resolute than in the past, attitude of the Christian Democrats, just to mention the major parties.

c.1.2. The National Conference on Energy.

Requested by the Parliament in June 1986 and promoted by the Government, the National Conference on Energy held in February 1987 was the main arena of debate offered by political institutions.

Declared aim of the Conference was the evaluation of energy choices taking into account the safety of installations and the protection of health and environment. Such evaluation was required by the Parliament in order to re-examine Italian energy policy in the light of the Chernobyl accident.

According to the Minister of Industry V. Zanone, who was responsible for its organization, the Conference should have been a technical-scientific forum without the participation of political parties; and actually a technical-scientific commission and three working groups were appointed and party representatives did not speak at the Conference (see, Conferenza Nazionale sull'Energia, 1987). However, conflicts regarding the composition of the commission and of the three working groups (one on economic aspects, one on health and environmental aspects, one on legal and institutional aspects) as well as the contents, participation procedures and timing of the Conference indicated that the Conference itself was becoming an arena for conflict and compromise between political -predetermined- positions rather than an arena for scientific debate (Ceri, 1987; De Paoli, 1987). And this is not surprising because, especially in the context of the uncertainties and fears connected with the Chernobyl accident, the debate on nuclear power and -more in general- on energy production was interwoven with the debate on risk acceptability and on models of development and society.

Disagreements emerged before and during the Conference on various points; for example, on the forecasts about energy demand, on the weight to be attributed to different kind of energy sources, on the evaluation of the risks for health and environment involved by different energy systems. However, aside from the explicitation of some of these disagreements by the Chairman of the working group on economic aspects, the conclusions drawn at the end of the Conference by the Chairmen of the three working groups and by the Minister of Industry seems to represent (as in the case of the Parliamentary inquiry) a compromise between different points of view. On the one hand the utilization of nuclear energy was regarded favorably but not firmly argued for; on the other hand the need was stressed to intensify research and action in the field of energy saving and renewable energies which are considered by some experts as alternative and by other experts as complementary to nuclear power. Moreover the importance of protecting health and environment and to improve the institutional framework for nuclear risk management (particularly by separating, as already recommended by the Parliamentary inquiry, the control and the promotion bodies) were also emphasized.

Some of these conclusions (for instance, those concerning energy saving) influenced the formulation of the National Energy Plan of 1988. However, more than providing scientific advice for policy making, the Conference offered another institutional arena (larger than the Parliamentary inquiry) for political adjustment. No specific decision followed the Conference which had rather the effect of attracting attention and spreading -also through the media coverage of the Conference itself (see, Borrelli et al., 1988)- the debate on energy and technological risk. Debate which continued and became even more burning in the campaigns for the referenda which were held in November the same year.

c.1.3. The anti-nuclear referenda.

The referenda proposed by various environmental and left-wing groups during the Chernobyl fallout were accepted by the Constitutional Court (which in the past had rejected other proposals of referenda on nuclear power) and were held on the 8th of November 1987.

The campaigns that preceded the referenda had been the largest arena of debate on nuclear power that was created in Italy and that was started (differently from the Parliamentary Inquiry and the Conference on Energy) "from below". Such campaigns and the actual referenda can be regarded as a sort of nation wide participatory experiment.

Differently from the Information Campaign on Nuclear Energy that was conducted in Austria before the referendum of 1978 on nuclear power (see, Nowotny, 1979; Nowotny, 1980), the debate which developed in Italy in the perspective of the referenda was not institutionally structured. While the Austrian Information Campaign was initiated by the Chancellor and organized by the ministerial bureaucracy (similarly to the Conference on Energy) according to the tradition of "reform from above", the campaign for the Italian referenda was initiated by environmental non governmental organizations and by left wing parties not participating in governmental coalitions. Beside that, while the Austrian Information Campaign attempted to be a mass but mainly scientific one and was structured through experts' working groups and public meetings, the Italian debate started with a mass collection of signatures among citizens (needed to make the referenda acceptable according to Constitutional Law), it was explicitly political and developed through various channels like seminars and meetings organized by environmental associations, party meetings and media programs.

Due to its explicitly political nature and to the direct involvement of political parties, the Italian debate previous to the referenda resembled traditional electoral campaigns. However, similarly to the Austrian Information Campaign, scientific issues had to be addressed and experts -and controversies between experts- played an important role in shaping the debate. In this context, the presence of scientists among environmentalists allowed arguments against nuclear power not to be simplistically labeled as "irrational" by proponents of such technology. It has also to be noted that some of the scientists who have been arguing against nuclear power starting from the seventies, particularly those active in the Committee for the Control of Energy Choices, had become in the meantime Members of the Parliament in the Green List following the elections of June 1987, and this enhanced their political influence.

As far as the contents of the referenda are concerned, Italian citizens were not explicitly asked to vote for the further development or for the abandonment -immediate or delayed- of nuclear power production, as it was the case with the referenda held in Sweden in 1980 (see, Jahn, 1989) that resulted in the decision to stop nuclear power production by 2010. Due to legal constraints, the questions submitted to Italian citizens were quite technical and regarded the abrogation of three articles (of two different laws) regarding respectively: 1. the possibility for CIPE (Interministry Committee for Economic Planning) to decide about the siting of nuclear installations in case local authorities had not made a decision within a certain time; 2. the economic contributions to municipalities and regions where plants are located; 3. the participation of ENEL to international projects in the nuclear field. The idea behind the proposition of these specific questions was to eliminate the possibility for central authorities to overcome through institutional or economic devices the opposition of local authorities and to prevent ENEL from participating to projects like the French fast breeder reactor Superphenix. But in more general terms, the referenda were meant to indicate whether the majority of Italian citizens were pro or against nuclear power.

The majority of the voters who attended the referenda (abstentionism was quite high) voted for the abrogation of the mentioned articles and this result was due to the quite strange "coalition" that emerged in the occasion of the referenda: not only the Greens, the Radicals, *Democrazia Proletaria* and the recently "converted" Communist and Socialist Parties asked their electors to vote for abrogation, but also the Christian Democratic Party invited its electors to vote for the abrogation of the first two articles. Such situation can be explained by the willingness of the ruling party not to upset large sectors of public opinion, including its own electors, who changed attitude towards nuclear power following the Chernobyl accident [10].

Following the referenda, the sorts of the Italian nuclear plants remained "congealed" for a while [11] but the nuclear programme was put aside.

c.1.4. The National Energy Plan of 1988.

According to the National Energy Plan adopted by the government (without a previous discussion at the Parliament) in 1988, the activities of promotion and development of nuclear fission reactors are suspended and nuclear energy is no more mentioned among the sources of electricity production; moreover, the participation to international collaborations on fast breeder reactors is suspended and only research in the fields of nuclear fusion and so-called intrinsically safe reactors is encouraged (see, Piano Energetico Nazionale, 1988: parts IV-V).

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10 According to opinion polls by DOXA (quoted by Biorcio, 1988: p.33), while in Spring 1981 only 31,7 % of the Italian people interviewed were against nuclear power, in November 1986 the percentage of the interviewees who declared to be against nuclear power was 72,5%.

11 The decision to convert the Montalto di Castro plant was taken by the Parliament in summer 1988 and the decision to close the other plants was taken in July 1990.

The Plan also acknowledges the need to diversify the sources of energy production and to promote energy saving in order to meet energy demand while protecting the environment and reducing the high dependency (around 80%) on imports, mainly oil imports. In this respect, the utilization of gas and fuel oil (even if the last one is very polluting) has been encouraged while the budget for the development of renewable energies and energy saving was cut in 1989 and only in November 1990 the programme for energy saving was finally approved; moreover it took until 1991 to pass two Laws (Law 9/1991 and Law 10/1991) aimed at encouraging energy savings and their implementation seems rather problematic (see, Ambiente Italia, 1991).

In short, after saying "No thanks!" to nuclear power, the energy challenge, that is the ability of defining a feasible, manageable and environment friendly energy policy, remains open.

During the Gulf/oil crisis started in August 1990, and especially during the war in January and February 1991, arguments for the restarting of nuclear power production were re-launched. However even the proponents of such arguments (for instance, the Minister of Industry C.Battaglia) acknowledge that nuclear fission is no more viable in Italy because of economic -beside societal- reasons, therefore they speak about launching a "new" nuclear option mainly based on intrinsically safe reactors (and fusion only in the long term). But even the former nuclear agency, ENEA, is not pursuing as its main aim the implementation of such "new nuclear option" which seems then not to have a very sound basis.

c.1.5. The reorganization of ENEA and ENEA-DISP.

The long and controversial restructuration process of ENEA and ENEA-DISP is a very interesting case of institutions' design and change in a specific policy, political and economic context. The vicissitudes of these two institutions are in fact strictly linked to the already mentioned fluctuations of Italian nuclear policy and to the still ongoing ambiguities of energy policy more in general; fluctuations and ambiguities which are due to contrasts and negotiations between different political and economic interests.

Following the Chernobyl accident, radical reforms of ENEA and ENEA-DISP have been suggested; mainly the separation of DISP from ENEA (in order to make the control body independent from the promotion one), and the change of the research and promotion activities of ENEA previously only (till 1982) or mainly (till Chernobyl) related to nuclear energy. However to convert the activity field of a research and promotion institution into others is not easy. And it is a very hard task to reform an institution with around 5.000 employees (around 500 in ENEA-DISP and the rest in ENEA); especially when different parties -mainly different Ministers, business groups and trade unions- have different interests and hold different points of view concerning the aims and features of the institution's reform.

As a result, a law for the reform of ENEA has been approved by the Senate only in November 1990 but strong oppositions (within ENEA itself, within political parties and by the Minister of Industry) to such law postponed till August 1991 its approval by the Chamber of Deputies. This situations obviously gave rise to a feeling of deep uncertainty among ENEA -and especially ENEA-DISP- members (Buonamici, interview; Finetti, interview; Roberti, interview).

The main points of the reform approved in 1991 (Law 282/1991) can be summarized as follows: a) change the name -but not the acronym- of ENEA from "*Comitato Nazionale per la ricerca e lo sviluppo dell'energia nucleare e le energie alternative*" (National Committee for the research and development of nuclear and alternative energy) into "*Ente per le nuove tecnologie, l'energia e l'ambiente*" (Agency for new technologies, energy and environment); b) ENEA will remain under the Minister of Industry but such Minister will have to consult the Minister of Research and the Minister of Environment; c) ENEA will be organized into three departments: energy, environment and technological innovation; d) these departments will draw up program agreements with the Ministers of Industry, Research and Environment; e) ENEA will promote consortia with local administrations and with private bodies on specific matters (the first one being the rational use of energy); f) the Safety and Protection Department -DISP- will not be separated from ENEA.

As it is easy to see, energy becomes -according to the reform- only one among three sectors of activity, and research on nuclear energy (nuclear fusion and intrinsically safe reactors) becomes only a subsector within the energy department. And this is a first thing that met the opposition of those who still hope in the possibility of launching again nuclear power production in Italy in a short-medium term. Moreover, the introduction of consultations and program agreements with other two Ministers is probably not so palatable for the previously only "king" of ENEA, i.e. the Minister of Industry. Finally, DISP remains within ENEA is spite of the recommendations of both the mentioned Parliamentary Inquiry and the Conference on Energy. More than that, the tasks and organization of DISP are not redefined in the changed context of energy policy[12] and this leaves DISP in a sort of unproductive nimbus.

c.2. Learning from Chernobyl ?

It seems not too difficult to find out some of the reasons why these events and changes occurred after Chernobyl.

First of all, the seriousness and the public dimension of the catastrophe caused an increased politicization -and, so to say,"partyzation"- of issues which were already political but that till Chernobyl had not attracted too much attention from Italian

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12 A proposal made by two Senators in 1988 to include DISP among the institutions responsible for the implementation of the Seveso Directive of major industrial hazards was rejected. And the proposal made by various politicians to establish an High Safety (or High Risk) Authority including DISP is still vague.

political parties. Due to the need of political parties to adjust to the changed context, including shifts in public opinion, some arenas for debate (also regarded as ways of delaying decisions) had been created.

Even if the Italian nuclear programme had been weak, its abandonment was not a very easy matter; this is why decisions about Italian nuclear plants and about energy policy remained "congealed" for a while after the referenda and many of them had not been yet implemented. Finally the conflicts of interest which hamper the implementation of the new National Energy Plan also caused difficulties and uncertainties regarding the reorganization of ENEA and ENEA-DISP, i.e. the largest Italian resource of technical-scientific expertize in the field of nuclear risk management.

Having spelled out some of the reasons why the mentioned changes occurred, the problem is to see whether they can be interpreted as parts of a learning process with respect to nuclear risk management.

In order to provide some hints to answer this question, two aspects will be distinguished: a. the changes in the framing of issues; b. the technical, organizational, legal and/or policy adaptations.

c.2.1. Changes in the framing of issues.

As far as this aspect is concerned, two points deserve attention. On the one hand, the post-Chernobyl Italian debate was framed (especially on occasion of the anti-nuclear referenda) according to the far from new dichotomy "yes or no to nuclear power". On the other hand, some shifts/changes of emphasis within such dichotomy can be noticed.

First of all, yes-or-no arguments were not only based on a general reasoning regarding the intrinsic nature of nuclear power technology but also on the issue of its context-specific manageability. The argument of the non-manageability of nuclear power in Italy (due to the lack of credibility of Italian nuclear policy, to the crisis of ENEA, to economic constraints, etc.) was mainly put forward by previously unconditionally pro-nuclear political parties and experts [13] that modified in this way the absolute yes/no dichotomy by emphasizing the conditions for deciding whether to say yes or no. With respect to this frame-shift the importance of fora such as the National Conference on Energy and the Referenda campaign must be stressed. Those fora provided in fact the opportunity for circulating arguments firstly in form (even if not in substance) of experts/"neutral" debate (at the Conference) and then in form of political debate (during the Referenda campaign) with multiple stakes, like the continuation of the nuclear programme, political credibility, and others. Such differentiated and broad communication process favoured partial reframing and gradual adjustments regarding nuclear issues.

Another aspect of the partial reframing of the yes/no dichotomy that characterized part of the Italian after-Chernobyl debate is the increased attention towards the need to acknowledge the limits (including ethical limits) of science and technology. Such attention can be especially found in the debate within the environmental movement and that part of the women movement that focused on the issue of the "*coscienza del limite*" -awareness of the limit- (see, Leonardi, 1986; Donini, 1990). Also in this perspective the conditions for answering yes or no to nuclear power are emphasized, but in a more radical way in comparison with the position that stressed contingent (and eventually country specific) factors. Especially during the referenda campaign this "radical" argument partially complemented and partially challenged as too weak the "contingent" argument on manageability, in this way deepening the crisis of the "optimistic" -all under control-

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13 See, for instance, the remarks by the economist P.Baffi who chaired the working group on economic aspects of the National Conference on Energy (Baffi, 1987; Conferenza Nazionale sull'Energia, 1987).

arguments on nuclear power. Those arguments were attacked not only on practical but also on theoretical ground.

Summing up, shifts in the existing frame of nuclear debate rather than a change of frame occurred. But this only partial reframing had far from marginal consequences since it was used by important actors to adjust their position in occasions such as the referenda. Whether the modified frame was used because of conviction or convenience is not of importance here. What is important is that such frame was persuasive enough to be regarded or presented as a basis for changing views and positions on nuclear power.

c.2.2. Policy, organizational, legal, technical adaptations.

Several kinds of adaptations were made in the years following the Chernobyl accident, including a "core" [14] policy change and some "peripheral" one.

Policy change.

Following the Referenda, a "core change" in Italian nuclear policy took place, i.e. the abandonment of nuclear power as a source of electricity production. In that way nuclear policy as a specific component of energy policy dissolved, and it only survives as a sector of research policy relatively to nuclear fusion and intrinsically safe reactors. The failure of the attempts to re-launch nuclear power during the Gulf crisis and war indicates that the core policy change that emerged from the post-Chernobyl events described above, and from the mentioned partial reframing of nuclear issues, is likely to be a long-term change.

The core change in nuclear policy influenced the peripheral (legal, technical and organizational) adaptations that were made

14 The distinction between core and peripheral policy change is due to Majone, 1989.

regarding various aspects of nuclear risk management, i.e. reactor safety, radioactivity monitoring, emergency planning, information and communication [15]. These adaptations may be summarized as follows.

Reactor safety.

The safety of nuclear installations had been a major issue following the Chernobyl accident but no major adaptations were made in this field in Italy. On the one hand, this is due to the diffused opinion among nuclear engineers (in Italy and abroad) that Western reactors are much safer than the Russian ones and that there are so many and important differences between the RBMK reactors and the reactors more common in Western Countries (mainly LWR and PWR), that no particular lesson can be drawn from Chernobyl regarding the safety of nuclear installations. On the other hand, the phase-out of nuclear power production involved a decreased attention on reactor safety issues. Several inspections were made by DISP and OSART teams (Operational Safety Review Teams) of the IAEA to verify the safety of Italian nuclear plants and some improvements were suggested; but the temporary "congealment" of decisions regarding Italian nuclear plants favoured an atmosphere of "wait and see" that made these suggestions useless. During the Parliamentary debate that resulted in the decision to close definitively the Caorso and Trino Vercellese plants (see, Camera dei Deputati, June 1990) some Deputies stressed the risks connected with this situation, mainly the possible underestimation of safety measures in the no more operating but still dangerous plants. The situation did not improve very much following the Parliamentary decision: while being officially "closed", Italian nuclear plants are still not really so because there are serious difficulties regarding the decommissioning process (Buonamici, interview) and the safety of no more operating reactors remains problematic.

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15 Another important aspect, i.e. international cooperation, will be addressed in chapter 7.

Radioactivity monitoring.

Some technical and organizational adaptations had been made, during and following the Chernobyl fallout, concerning the extension and organization of the Italian monitoring network.

The gaps in the national monitoring network had been partially filled during the fallout. However the problem of constituting an homogeneously distributed and functioning monitoring network remained open.

In March 1987, following a directive of the Health Ministry, Regional monitoring networks started working; but several laboratories did not work properly and this prevented the publication of a six-monthly report on environmental radioactivity in Italy (Naschi, 1987). The problem is not yet solved due to Regional disparities in the working of the Health Service (Risica, interview; Tabet, interview).

Emergency planning.

As previously mentioned, the Parliamentary inquiry conducted after Chernobyl recommended the elaboration of a national emergency plan to supplement the existing (and insufficient) provincial emergency plans. This recommendation can be regarded as resulting from the diffused perception/definition of the Chernobyl fallout as a case of nation wide (beside transboundary) emergency. But it must be also added that, independently from judgements regarding the "objective" validity of this perception, the idea of establishing a national emergency plan seems reasonable given the presence of many nuclear plants in neighbouring countries and the seriousness of the effects that a nuclear fallout may cause in a densely populated country like Italy.

In 1987 a working group directed by the Minister of Civil Protection -with the participation of experts of DISP, ISS and other institutions- drafted a national emergency plan (Tabet, interview). However such plan was not approved -nor made public- due to contrasts concerning the establishment of the National Service of Civil Protection. A bill on such Service was approved (after a very long debate) by the Chamber of Deputies and by the Senate but it was returned to the them by the President of the Republic, F. Cossiga, who refused to sign. This because, according to the message sent to the Parliament by Cossiga (Camera dei Deputati, 1990), such bill would introduce -among other things- overlaps of responsibilities between the Ministry of Interior and the Minister (without portfolio) of Civil Protection, and it would concentrate in the hands of a central authority some responsibilities which are peculiar of the Regions. Without entering upon the substance of Cossiga's arguments, it can be noticed that interministry and centre/periphery relations are crucial and controversial elements in defining which authority should be responsible and which procedures should be followed in declaring and managing an emergency.

Information and communication.

Informing the population about measures to be taken and communicating between different sectors of society about risk proved to be crucial elements in the management of the Chernobyl emergency. Without repeating the discussion on this matters, it can be just mentioned that contrasting tendencies -towards centralization (by the Minister of Civil Protection) and towards differentiation (by local authorities, environmental groups and the media) of information- emerged.

In the following years a tendency toward centralization can still be found in the proposal to reinforce the central role of the Minister of Civil Protection in case of emergencies, including information aspects. On the other hand, differentiation of information sources did practically occur in occasion of the National Conference on Energy, and even more in the perspective of the referenda. Beside the public relation and information activities performed by central and local institutions, media surveys and information campaigns by environmental groups have been conducted.

c.2.3. **Concluding remarks.**

On the basis of the discussion suggested above, an answer regarding the possibility to interpret the changes that occurred after Chernobyl as parts of a learning process can be offered.

In terms of those cognitive processes that are regarded as crucial components of learning by most literature on the subject, a partial reframing of issues took place in the post-Chernobyl debate on nuclear power. The previously existing no/yes dichotomic frame conditioned the reframing of issues in the light of the Chernobyl experience; however, this did not prevent a new emphasis on the practical manageability of the nuclear technology and the limits of science to emerge.

Partly as a consequence of the reframing of nuclear issues and partly as a consequence of organizational (as in the case of the reorganization of ENEA) and bureaucratic dynamics (as in the case of the abandonment of nuclear power), various kinds of policy, technical, organizational and legal adaptations were made. It is worthwile to stress that, beside peripheral adaptations, a core policy change was made. This can be explained by the patterns of interaction between the relevant actors and their interpretation (and use) of the Chernobyl experience, and by the impact of certain anti-nuclear arguments in a situation where nuclear policy and the related "policy paradigm", as Peter Hall calls it (Hall, 1990), were already rather weak. Such impact was in fact greater than in other situations (especially France) where nuclear policy is practically and symbolically very strong and therefore offers more resistance to anti-nuclear arguments.

Both reframing and adaptations were the results of the interactions and communication between various actors who played differently important roles depending on the issues at stake and the available fora for action and debate. For instance, the anti-nuclear movement was a crucial actor with respect to the anti-nuclear referenda but not regarding the reform of ENEA. Important elements that entered the communication between the actors had been not only the reflection on -and different interpretations of- the Chernobyl event, but also the (different) evaluations of previous organizational performance (by specific organizations like ENEA and ISS) and policy (nuclear policy).

In short (a longer discussion of this issue will be offered in the last chapter), one can argue that the changes occurred following Chernobyl can be interpreted as results of learning processes where reframing and adaptations took place on the basis of experience, reflection and communication.

REFERENCES

AMBIENTE ITALIA (1991), Newsletter n.3 - Osservatorio sulle leggi 9/91 e 10/91, Milano.

AMMAN, Fernardo (1986), "Una alternativa di sviluppo per il nucleare" in, Economia delle fonti di energia, n.30, pp: 23-38.

BAFFI, Paolo (1987), "Ripensando temi della conferenza sull'energia", in Il Postnucleare. Perplessità e proposte sull'energia dopo Cernobyl, ed. Il Manifesto, Roma.

BERTINOTTI, Fausto (1986), "Punto di svolta. Le ragioni del lavoro e le ragioni dell'ambiente si incontrano", in Quale Energia, n.16, pp: 35-36.

BETTINI, Virginio (1977), Contro il nucleare. Ecologia e centrali nucleari, Feltinelli, Milano.

BIORCIO, Roberto (1988), Opinione pubblica, questione ambientale e movimento ecologista, in BIORCIO, Roberto and Giovanni LODI eds., La sfida verde. Il movimento ecologista in Italia, Liviana editrice, Padova.

BIORCIO, Roberto and Giovanni LODI eds. (1988), La sfida verde. Il movimento ecologista in Italia, Liviana editrice, Padova.

BONDINI, Massimo (1986), "Una nuova geometria sociale", in Quale energia, n.16, pp: 37-38.

BORRELLI, Gaetano, S.CIAMPI, A.SARGENI and T.VALENTINI (1988), L'immagine di Chernobyl nella stampa quotidiana italiana, ENEA, Roma.

CASSESE, Sabino (1983), Il sistema amministrativo italiano, Il Mulino, Bologna.

CERI, Paolo (1987), Dopo Chernobyl. Il "nucleare" come nuova frattura nella politica e nella società italiana, in CORBETTA Piergiorgio and Robert LEONARDI eds., Politica in Italia. I fatti dell'anno e le interpretazioni. Edizione 1987, Il Mulino, Bologna.

CLO, Alberto (1987), "Una politica economica per l'energia", in Il Mulino, n.1, pp: 68-77.

CONTI, Laura (1977), Visto da Seveso, Feltrinelli, Milano.

DEGLI ESPINOSA, Paolo and Enzo TIEZZI (1987), I limiti dell'energia, Garzanti, Milano.

DENTE, Bruno (1985), Governare la frammentazione. Stato, Regioni ed enti locali in Italia, Il Mulino, Bologna.

DE PAOLI, Luigi (1987), "Quale politica energetica?" in Sapere, n.9-10, pp: 25-31.

DE SANTIS, Vincenzo (1986), "Dossier Chernobyl" in Essere Terrestre. Rivista degli scienziati preoccupati, n.11-12, pp: 16-27.

DIANI, Mario (1988), Isole nell'arcipelago. Il movimento ecologista in Italia, Il Mulino, Bologna.

DONINI, Elisabetta (1991), La nube e il limite. Donne, scienza, percorsi nel tempo, Rosenberg & Sellier, Torino.

HUBER, Michael and Angela LIBERATORE (1990), "Organizational Uncertainties Unlimited. Risk Management between Cognitive and Institutional Uncertainties", paper at the Second Conference of the European Section of the Society for Risk Analysis, IIASA, Austria.

IPPOLITO, Felice (1977), Politica dell'energia, Editori Riuniti, Roma.

IPPOLITO, Felice (1989), Energia ieri oggi e domani, Editori Riuniti, Roma.

JAHN, Detlef (1989), Changes in the Political Culture. Challenges to the Trade Union Movement: the Debate on Nuclear Energy in Swedish and German Trade Unions, in J.Gibbins ed., Contemporary Political Culture, Sage, London.

KASPERSON, Roger, O.RENN, P.SLOVIC et al.(1988), "The Social Amplification of Risk: A Conceptual Framework", in Risk Analysis, vol.8, n.2, pp:177-187.

LAGADEC, Patric (1981), La civilisation du risque. Catastrophes technologiques et responsabilitè sociale, Seuil, Paris.

LEONARDI, Grazia ed.(1986), Scienza, potere, coscienza del limite. Dopo Chernobyl: oltre l'estraneità, Editori Riuniti, Roma.

LIBERATORE, Angela and Rodolfo LEWANSKI (1990), "The evolution of Italian environmental policy", in Environment, vol.32, n.5, pp: 10-15, 35-40.

MATTIOLI, Gianni and Massimo SCALIA (1990), "Quando il Ministro programma il crack energetico" in Arancia Blu, 15 maggio 1990, pp: 13-17.

MINERVA, Daniela (1986), "Chernobyl è un'opinione?", in Sapere, n.12, pp: 29-37.

NASCHI, Giovanni (1987), Relazione del dierttore dell'Enea-DISP al Ministro dell'Industria per l'anno 1986, ENEA-DISP, Roma..

NOWOTNY, Helga (1979), Kernenergie: Gefahr oder Notwendigkeit, Suhrkamp Verlag, Frankfurt/Main.

NOWOTNY, Helga (1980), "The role of experts in developing public policy: the Austrian debate on nuclear power" in Science, Technology and Human Values, vol.5, n.32, pp. 10-18.

PIERANTONI, Ferrante (1987), "Chernobyl: la sindrome televisiva", in Il Mulino, vol.309, n.1, pp:94-115.

POCCHIARI, Francesco, V.SILANO and G.Zapponi (1987), The Seveso Accident and its Aftermath, in P.KLEINDORFER and H.KUNREUTHER eds., Insuring and Managing Hazardous Risks: From Seveso to Bophal and Beyond, Springer-Verlag, Berlin/New York/London/Paris/Tokio.

PUCCI, Emilio (1990), Strategie di titolazione dei quotidiani italiani in una situazione di emergenza: il caso Chernobyl, Quaderno n.90/3 ISIG, Gorizia.

RENZETTI, Roberto (1979), L'energia. Storia, attualità e prospettive del problema energetico, Savelli, Roma.

RISICA, Serena -ISS-(1987), "Il controllo della radioattività ambientale anche alla luce dell'incidente di Chernobyl", paper at the Convegno sull'era ambientale, Caltanissetta.

RUBBIA, Carlo (1987), Il dilemma nucleare, Sperling & Kupfer Editori SpA, Milano.

SCHIAVI, Gian Giacomo (1987), Nucleare all'italiana, Franco Angeli ed., Milano.

SILVESTRI, Mario (1968), Il costo della menzogna, Einaudi, Torino.

SPAZIANTE, Vincenzo (1980), Questione nucleare e politica legislativa, Officina Edizioni, Roma.

ZAPPONI, Giovanni, G.MARSILI and C.VOLLONO (1991), Factors which Influence Public Reactions to Environmental Risks: Some Past Experiences in Italy, WHO Working Paper, ICP/PCS 020/A/10.

ZORZOLI, G.B.(1975), Il dilemma energetico, Feltrinelli, Milano.

Documents analysed

CAMERA DEI DEPUTATI -Servizio Studi- (1986), Documentazione per le commissioni parlamentari, Atti del sindacato ispettivo sulla sicurezza delle centrali nucleari e sulla protezione dalla radioattività.

CAMERA DEI DEPUTATI -Atti Parlamentari- (1987), Indagine conoscitiva ai sensi dell'art.144 del regolamento, sullo stato di sicurezza delle centrali nucleari italiane, sula relativa gestione operativa nonchè sul grado di rispondenza dele relativa normativa.

CAMERA DEI DEPUTATI -Atti Parlamentari- (1990), Resoconto stenografico della seduta di lunedì 11 giugno 1990. Mozioni concernenti la chiusura delle centrali di Caorso e di Trino Vercellese.

CAMERA DEI DEPUTATI -Atti Parlamentari- (1990), Messaggio alle Camere del Presidente della Repubblica a norma dell'art.74 della Costitutzione trasmesso alla Presidenza il 15 agosto 1990 sulla proposat di legge d'iniziativa del Deputato Balestracci, Istituzione del Servizio Nazionale della protezione civile.

CONFERENZA NAZIONALE SULLA "SICUREZZA NUCLEARE" (1980), Atti della Conferenza. Venezia.

CONFERENZA NAZIONALE SULL'ENERGIA (1987), Atti della Conferenza. Roma.

DIPARTIMENTO DELLA PROTEZIONE CIVILE (1985), Il Dipartimento della Protezione Civile.

ENEA-DISP (1986), Incidente di Chernobyl. Conseguenze radiologiche in Italia, relazione al 27.5.1986.

ENEA-DISP (1986b), Rapporto di attività 1986.

ENEA (1988), Relazione del direttore della DISP al Ministro dell'Industria per l'anno 1987.

ENEA (1989), Relazione del Direttore della DISP al Ministro dell'Industria per l'anno 1988.

ISTITUTO SUPERIORE DI SANITA' (1987), Annali dell'Istituto Superiore di Sanità, vol.23, n.2: Il rischio ambientale nella produzione di energia: risultati sperimentali, calcoli e riflessioni dopo Chernobyl.

LA REPUBBLICA, daily newspaper, 28.4.1986 - 1.6.1986

PIANO ENERGETICO NAZIONALE (1988), Schema del Piano.

SENATO -X Commissione Industria- (1990), Resoconto stenografico della seduta del 14 novembre 1990 sul disegno di legge su "norme per il riordino del Comitato Nazionale per la ricerca e lo sviluppo dell'energiz nucleare e delle energie alternative (ENEA).

Interviews:

Department of Civil Protection:

Dr. Malandrino

ENEA:

Dr. Roberto Buonamici

ENEA-DISP:

Dr. Giovanni Finetti
Dr. Massimo Roberti

Greens:

MP Gianni Mattioli

ISS:

Dr. Serena Risica
Prof. Eugenio Tabet

5

BONN ODER DIE LAENDER ?
CHERNOBYL IN THE FEDERAL REPUBLIC OF GERMANY.

a. Background.

Nuclear power has been a very hot issue in the Federal Republic of Germany [1], especially since the early seventies; and it became even more heated following Chernobyl.

The presence of both a big nuclear industry and a strong anti-nuclear movement make the German nuclear controversy particularly tough. Moreover, the evolving of such controversy and the management of nuclear risk are influenced by peculiar features of the German federal system as well as by the role of expertise in technology policy decisions.

In order to put in context the response to Chernobyl in the FRG, a brief analysis of the German nuclear policy, the anti-nuclear movement and the legislative and institutional framework is sketched below.

a.1. Nuclear policy.

The development of German nuclear policy began in the second half of the fifties [2]. For ten years following the defeat of the

1 My analysis regards only the former West Germany since the idea is to compare and understand the responses to the fallout in countries that were both neighbouring and members of the same transnational (EC) Community. Reference to some of the problems that emerged with respect to nuclear risk management in the reunified Germany is made in the last part of the chapter dedicated to "The years after".

2 For a detailed account of the development of German nuclear power policy see Kitschelt, 1980; Radkau, 1983. Useful

Nazi regime, the FRG was not allowed by the Allies to build a nuclear industry nor to promote research in the nuclear field. And when a nuclear policy was started, in 1955, it was allowed to develop exclusively the civilian utilization of nuclear energy. Utilization which was regarded as a very important element of the post-war German economic reconstruction.

The absence of military goals together with the strong committment of the Federal Republic to market economy (constantly reinforced by comparison with the centrally planned system of the Democratic Republic of Germany) favoured the development of a big private nuclear industry and a direct involvement of the public sector only with respect to the regulation of such industry and the development of nuclear research.

In 1955 the Federal Ministry for Atomic Energy was established and the following year a commission was appointed to advise this Ministry. Such commission -the German Atomic Commission (DAtK)- was formed by eight scientists (among them the well-known physicists Otto Hahn and Werner Heisenberg), two representatives of the administration (one being the minister himself), thirteen representatives from large industrial corporations, two from financial institutions and two from trade unions. The presence of industry, finance and trade unions representatives within the DAtK shows that such commission was not merely required to provide scientific advice to the Ministry but it functioned as a forum for the negotiations between interest groups.

In this regard it is interesting to notice that the collaboration of labour and capital in the so-called *Sozialpartnerschaft* (social partnership) that characterized the post-war economic and social history of the FRG, also applies to the nuclear sector. The Federation of German Trade Unions (DGB) strongly supported (till Chernobyl) nuclear power, even if some

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information can also be found in Hatch, 1991; Metz, 1981; Nelkin and Pollak, 1981.

unionists in the social service sector expressed an anti-nuclear attitude starting from the mid-seventies (Jahn, 1989). While this attitude seemed to become dominant in April 1977, when DGB adopted a declaration favouring a moratorium on nuclear power, this was not the case; the declaration was in fact reversed few months later (Hatch, 1991).

With respect to the role and collaboration between interest groups in the nuclear sector, it must be mentioned that an influential lobby group, the German Atomic Forum -DAtF- was created in this first period of german nuclear policy development (in 1959) and is still active. The DAtF is a non governmental organization formed by managers, politicians and scientists and it is aimed at coordinating promotion and public information efforts; in Radkau's words (Radkau, 1983: p.148), it acts as a sort of public relation agency of nuclear interests.

On the governmental side, some important institutional changes had been made.

In 1962 the Ministry for Atomic Energy became/was replaced by the Ministry for Scientific Research, while competences concerning the regulation of nuclear power were concentrated within the Ministry of Interior.

In 1958 the Reactor Safety Commission (RSK) was appointed by the Minister of Interior -taking some experts from the DAtK- to advise him and to provide recommendations in the fields of reactor safety and radiological protection. The RSK is formed, as a rule, by 18 members, mainly experts in physics and engineering. Later on, in 1974, the Radiological Protection Commission (SSK) was established -also by the Minister of Interior- to deal specifically with radiological protection matters. The SSK is composed, as a rule, of 15 members, mainly covering the fields of radiology, genetics and biophysics. The members of both the RSK and the SSK are appointed for a period, renewable, of three years but they can be dismissed prematurely by the Minister of Interior on not specified "special grounds"; the commissions' members are committed to confidentiality about the issues discussed in sessions and to secrecy about matters being the subject of licensing procedures (SSK, 1988: pp.90-91).

Beside the Ministry's of Interior "in-house" advisory bodies, other scientific institutions (partially financed by the Ministry of Research and Technology) provide advice to Federal and State authorities; among them the Society for Reactor Safety (GRS), the Society for Radiological Research (GSF), the nuclear research centres of Jülich (KFA) and Karlsruhe (KFK), and various University departments. Moreover, the technical norms relevant for the implementation of reactor safety and radiation protection measures are set by other two organizations: the Nuclear Technology Committee (KTA), a governmental body, and the German Institute for Norms (DIN), an institute mainly financed by industry.

It is worth noticing that differently from many other countries (including Italy and France) radiation protection is competence of the Ministry of Interior instead of the Ministry of Health. Since 1962 -till Chernobyl- the Ministry of Health had been however responsible for the publication of an yearly report on the measurements made and the actions taken by the Federal and State authorities to protect the population against ionizing radiation, with special reference to the contamination due to the weapons tests' fallout.

Coming back to nuclear power development in the FRG, as in the Italian case the production of different prototypes to select the technology more appropriate to national needs was initially suggested. This proposal, made within the framework of the first nuclear programme (1956-1962), the so-called Eltviller programme, was not applied since the immediate construction of light-water reactors was favoured in practice. The first commercial reactor, Kahl on Main, was in operation in 1961: it was built by the German AEG electronics industry that worked with a license of the US firm General Electric.

The second (1963 to 1967), third (1968 to 1972) and fourth (1972-1976) nuclear programmes sustained and expanded the initial policy choices. Moreover, a rapid expansion of nucler power was included among the goals of the overall energy policy in the 1974 revision of the energy programme formulated within the Federal Economic Ministry; revision that emphasized the need to increase nuclear power production to reduce the FRG's dependence on imported oil following the oil crisis of 1973. By 1977 fourteeen nuclear plans were operating in the FRG, seventeen were under construction and others were planned.

The market leader in the field of nuclear plants construction has been the German corporation Siemens. After creating, in 1969, a joint enterprise (the KWU) with AEG, Siemens bought out the AEG share in 1977; through KWU, Siemens controls also INTERATOM, engaged in the development of experimental plants including fast-breeder reactors. Beside Siemens, also US (General Atomic, Babcock and Wilcox) and Swiss (BBC) corporations play a role in the German market.

Public authorities are shareholders in the big electricity generating and supplying utilities, and Federal and *Länder* (State) representatives are present in the administrative boards of the major utilities. However they do not influence very much the utilities' strategies; on the contrary, energy policies planned by the Federal and *Länder* governments are usually based on the forecasts prepared by these firms.

The increases of nucler power production planned in the mentioned nuclear and energy programmes was hampered by the rising of a strong anti-nuclear movement and (also due to the pressures form that movement) by more complex licensing procedures. Only seven other plants (out of the 17 under construction in 1977 and others planned in the following years) were completed by 1986.

a.2. Anti-nuclear opposition.

The first anti-nuclear mobilization in the FRG can be traced back to the late fifties. In 1958 the "*Kampf dem Atomtod*" (Fight against the nuclear death) was launched by various left wing groups, the Social democratic party (SPD), the trade unions and several scientists (Metz, 1981). This campaign was aimed at opposing the military use of nuclear energy and the localization (within the framework of NATO agreements) of nuclear weapons in the FRG. No concern for the civilian utilization of nuclear power emerged at that time and this is not surprising giving the lack of operating nuclear plants in the fifties.

But starting from the early seventies, after ten years of nuclear power development, a new anti-nuclear opposition grew in the FRG and expressed concern for the risks involved by the utilization of nuclear power for energy production. A series of heated disputes regarding the siting of nuclear plants took place, the most important ones being those in Wyhl and Brokdorf (see, Nelkin and Pollak, 1981: cap.5; Rucht, 1980).

The choice of Wyhl as a site for a nuclear plant was a rather myopic one. The government of Baden-Württemberg selected Wyhl in 1973, immediately after the project to build a plant few kilometers away (in Breisach) had to be abandoned due to the strong opposition of local residents and anti-nuclear activists. Citizen initiatives immediately formed in Wyhl and in 1974, when the licensing procedures were started, they organized a mass demonstration and raised their objections through the public hearing. In February 1975 the Administrative Court advised suspending construction until it could evaluate complaints, but the utilities proceeded. As a consequence several protestors occupied the plant site and fifty of them were arrested by the police. Few days later around 20.000 people occupied the site and the police withdrew. The occupation, during which also a "popular university" was created, lasted till January 1976 when the authorities agreed to consider the expertize provided by citizen initiatives and to wait for a final court decision before starting construction again. In March 1977 the Administrative Court decided to ban construction.

Also in Brockdorf the anti-nuclear opposition was expressed through mass demonstrations, participation to the public hearing, appeals to the court and site occupation. But this time the State government of Schleswig-Holstein and the police decided to show their strenght. Hundreds of people were wounded and arrested during an attempt to occupy the site in October 1976 and during a mass demonstration, which became a sort of battle, in November the same year. According to Dorothy Nelkin and Michael Pollak (1981: p.64), the course of events in Brockdorf was due to contradictory perceptions of political authorities and the anti-nuclear movement; while the latter drew encouragement from the Wyhl experience and tried to repeat it in Brockdorf, the former "learned" from Wyhl that no other site occupations should be allowed if nuclear programmes were to be fulfilled. But while police's interventions were able to prevent site occupation in Brockdorf, they could not prevent mass mobilization and appeals to the Court. The conjunction of these two elements proved to be important since mass mobilization created the condition for making the arguments against siting being carefully heard in the Courts, and these arguments in turn influenced Courts' decisions. In February 1977, just before another planned demonstration in Brockdorf, the Administrative Court decided to withdraw the license on the ground that inadequate provision had been made for waste disposal.

Beside organizing demonstrations [3] and making appeals to the Courts, the anti-nuclear opposition developed a crucial resource, i.e. expertise. Starting from the early seventies a network of

3 Several demonstrations (for example, against the siting and location of the fast breeder reactor at Kalkar, the reprocessing plant at Wackersdorf and the nuclear waste repository at Gorleben) took place in the seventies and in the eighties, both before and after the Chernobyl accident.

"counter-experts" was established to challenge utilities and governmental experts during public hearings, in the Courts and in the media. In the early seventies such counter-experts were mainly scientists working within the University, particularly in the Universities of Bremen, Freiburg and Heidelberg. Since 1977 some independent/alternative research institutes were also created, the first one being the *Öko-Institute* in Freiburg. In addition to conducting research on nuclear matters, these institutes have been working also on other environmental issues providing expertise to the whole environmental movement and the Greens.

Die Grünen party was created at the Federal level in 1980 (see, M. Schroeren, 1990) and entered the Federal Parliament (*Bundestag*) in 1983 receiving well over the 5% threshold established by the German electoral system to obtain seats at the Parliament. The Greens had been also present in the *Länder* Parliament (*Bundesrat*) and in some *Länder* governments. During the Chernobyl fallout a member of the Green Party, J. Fischer, was Minister of Environment in the State of Hessen, runned at that time by a SPD-Greens coalition.

a.3. Legislative and institutional framework.

The regulation of nuclear power in the FRG is based on the *Atomgesetz* (Atom law) and its ordinances, the most important one being the *Strahlenschutzverordnung* (Radiation protection ordinance)[4].

Adopted in December 1959 and modified in 1976, the Atom law is aimed at promoting nuclear power and, at the same time, providing for nuclear safety. With respect to this second aspect, the Atom law provides for licensing procedures to be followed with

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4 For a careful discussion of nuclear legislation in the FRG see Huber, 1991: cap.2. About the *Strahlenschutzverordnung* see also the Introduction by Hans-Michael Veith to the 1989 edition of the text.

respect to the storage and transport of radioactive materials, the construction and siting of nuclear plants, and the disposal of nuclear waste.

Since the early seventies, two decisions are guiding the interpretation of the Atom law. In 1972 the supreme administrative court ruled that of the stated goals of the Atom law safety must take precedence over the promotion of nuclear power. Moreover, in 1976 the legislature introduced an amendment to the Atom law providing that a nuclear facility may be licensed only after all safety precautions have been taken according to the "*Stand von Wissenschaft und Technik*" (the state of science and technology). These provisions give the German Courts the possibility to consider substantive issues about safety -beside procedural ones- during the licensing process [5]. Both proponents and opponents of nucler power try then to provide scientific arguments on these issues when defending their case in the Court.

The issue of safety cannot but be linked to the one of radiation protection: no installation can be considered safe if health and environment are endangered by radiation. As it was already mentioned in previous chapters, this raises controversial questions about the possibility to define a safe threshold and evaluate health risk in the long term. In the FRG radiation protection provisions are established by the Radiation protection ordinance. The first Radiation protection ordinance was adopted in 1960 [6] and was aimed at incorporating into Federal legislation the basic norms established by art. 33 of the Euratom treaty. This ordinance (followed by a second one in 1964 and updated in 1980 and 1984) sets the limit values to the dose levels for workers, population and the environment, limits that cannot be exceeded by utilities applying for a license and by operating

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5 On this point see, Nelkin and Pollak, 1981: cap.11.

6 This ordinance was based on the previous *Röntgenverordnung* adopted in 1941.

installations [7]. These limit values are valid and homogeneous for the whole FRG. However they can be regarded as preventive ones and not valid in case of an actual radioactive contamination as the one caused by the Chernobyl accident. This is why other limits were suggested by radiation protection experts during the fallout, and why some *Länder* decided to set different limits from the ones recommended by the Federal authorities.

The distinction of competences between Federal and State authorities with respect to nuclear matters represents a special case of Federal-State relations. According to the general principles (established in the Basic law) on which the German Federal system is grounded [8], the Federal Government and Parliament have the bulk of legislative power, but the implementation of both Federal and State laws is responsibility of the State authorities. With respect to nuclear power this would mean that *Länder* authorities should be responsible for licensing, and that the licensing procedures must be followed according to the criteria (for example, regarding safety requirements) provided for in the Federal legislation, i.e. in the Atom law and in the connected ordinances. Instead, the State authorities act in this field on the basis of the *Bundesauftragsverwaltung* which means that the main responsible for deciding about licensing is the Federal Government that delegates part of this competence to the State authorities and, in case of contrasts, prevails in the decision process.

However, the State authorities are responsible for two aspects that turned out to be particularly important during the Chernobyl fallout: radioactivity monitoring and emergency management. As far as monitoring is concerned, there are official

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7 Other ordinances and decrees provide for more specific/sectoral aspects like the radiation treatment of foodstuffs.

8 Interesting analyses regarding the development and the features of the German federal system can be found in Ellwein and Hesse, 1987; Johnson, 1973; Mayntz and Scharpf, 1975; Meny, 1990.

measuring laboratories designated by the State governments; these laboratories are required to send their results to the Federal guiding agencies (like the German Weather Service) for the surveillance of radioactivity, however they do not depend on such agencies (SSK, 1988b). With respect to the second point, a recommendation[9] was issued in 1975 by the Ministry of Interior that is also responsible for civil protection and comprehends a civil protection department. The mentioned recommendation deals with catastrophe management -which is instead responsibility of the States- and gives the State administrations a common framework to guide action in case of accident in a German nuclear plant. While providing for several steps to be taken (from the alarm to be given by the plant operator to the decontamination procedures), this framework recommendation leaves room for local variations. Especially in the case of a nuclear accident not provided for by this provision as well as by the whole German legislation, that is an accident occurred outside the borders and causing a transboundary fallout.

On the basis of this short account of the institutional and legislative framework relevant for nuclear risk management in the FRG, figure 3 indicates the relations between the responsible authorities, the main scientific advisory bodies and industry. As in the case of the corresponding figure for the Italian case (figure 1), figure 3 does not include other actors that are very important in influencing the debate on (and actual development of) nuclear power but that are not part of the organization of nuclear safety as defined by law. Also in the case of the FRG a plurality of related actors, or interorganizational/regulatory network, is involved in nuclear risk management. In such network, the "centre-periphery" dimension and the role of the industry appear more important that in the Italian case, while the inter-ministry relations are relatively simpler in the German context. We will

9 "*Rahmenempfelung für den Katastrophenschutz in der Umgebung kerntechnischer Anlagen*", March 1975.

see in the next chapters how the network functioned and how it changed during and following the Chernobyl accident.

Figure 3, here

b. <u>The Chernobyl crisis</u>.

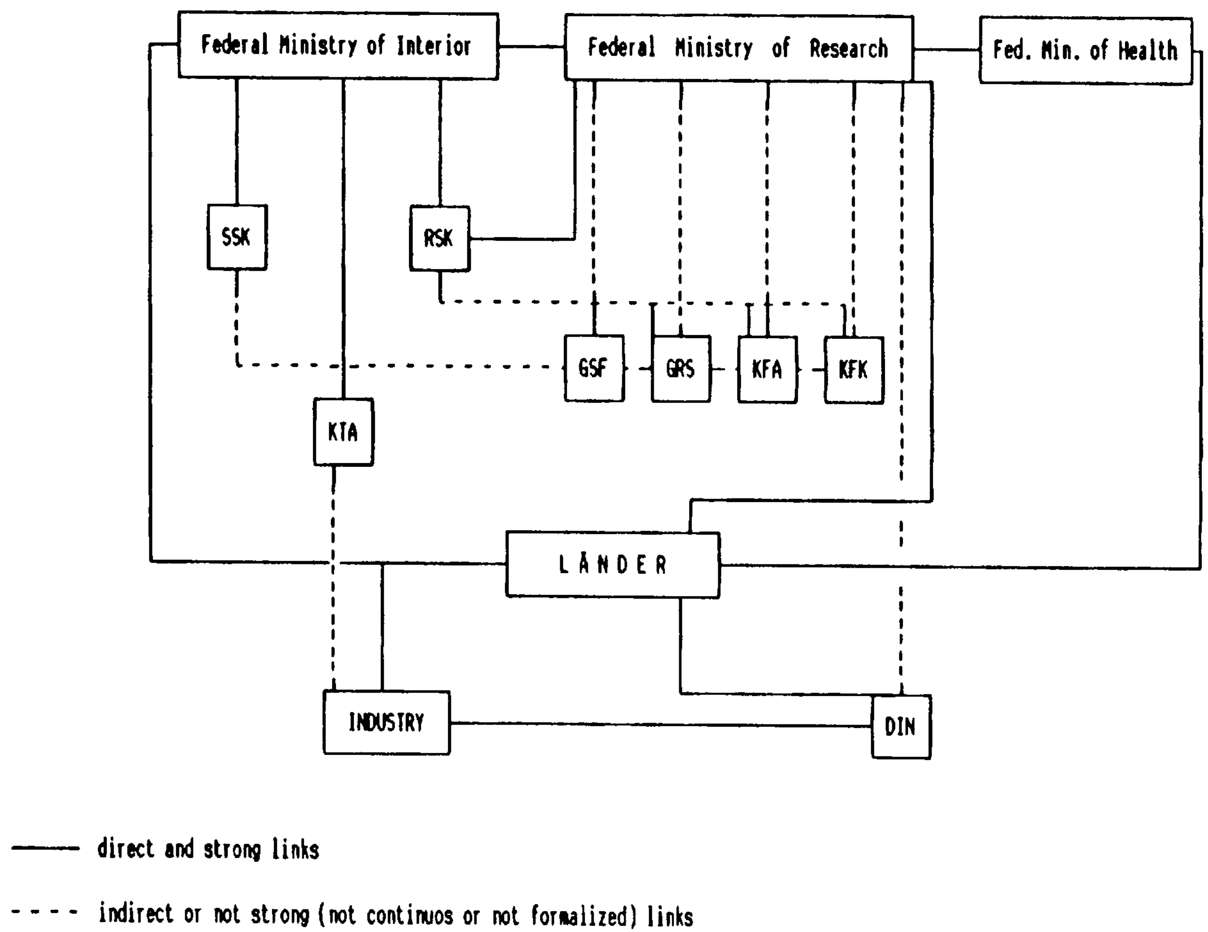
b.1. Chronicle

On the 28th of April 1986, after receiving the news regarding abnormal increases of radioactivity in Sweden, the Federal Minister of Interior, F. Zimmermann, called for periodic measurements of air contamination by Federal and State monitoring institutions. Data were then to be centralized within the *Lagezentrum* (situation centre) of the Interior Ministry.

The following day, the first news on the Chernobyl accident were reported, even if less space was dedicated to them by the German newspapers in comparison with the Italian ones. In the afternoon the Federal Minister of Interior stated, after a meeting with the Radiation Protection Commission (SSK), that there was no danger for the FRG because Chernobyl was far away. He did not mention that, in spite of the distance, increases of radioactivity in air were being detected in the meantime by monitoring stations in (West-) Berlin and in Brunswick, a town in the north of Germany (SSK, 1988b: p.33). Zimmermann also asked the Reactor Safety Commission (RSK) to prepare an analysis and evaluation of the Chernobyl accident with special reference to the problem of the safety of German nuclear plants. A preliminary report prepared by the RSK in collaboration with the GRS was presented the 18th of June. It concluded that in the light of the Chernobyl accident no special measures were needed to improve the safety of German nuclear installations (RSK, 1986). The final report issued two years later confirmed this conclusion (RSK, 1988).

Figure 3

NUCLEAR RISK MANAGEMENT IN THE FRG:
THE INTERORGANIZATIONAL/REGULATORY NETWORK



News and comments about Chernobyl filled the frontpages of the newspapers published on April 30th. Beside emphasizing the appeals for help from the USSR and the peculiarities of the Soviet reactors, some newspapers briefly mentioned that small increases of radioactivity had been detected at the border between the FRG and Denmark (FAZ, p.3). At the same time, remarkable increases in ground contamination were detected in the South of Germany by scientists of the University of Konstanz (Hohenemser et al.,1986). A Deputy Speaker of the federal government, N. Schäger, diffused another reassuring statement about the absence of health hazard for the inhabitants of the FRG.

On the 1rst of May the controversy on German nuclear policy rekindled. The Greens launched a new anti-nuclear campaign characterized by the motto "*Tschernobyl ist überall*" (Chernobyl is everywhere) and the SPD called for a stop of nuclear power development while the CDU accused the anti-nuclear opposition to spread panic.

In the meantime also a "monitoring controversy" started: officials in the state capital of Baden-Württenberg, Stuttgart, as well as in Bonn were skeptical about the measurements and reports made by independent experts in the South East of Germany. It was not until the 5th of May that the University of Konstanz group was officially designated as a monitoring station by the state government of Baden-Württemberg. More in general, the communications between the measuring laboratories of the *Länder* and the guiding monitoring agencies runned by the Federal government had been rather problematic during the fallout (SSK, 1988b: p.28).

On the 2nd of May, the Federal authorities decided, on advice of the SSK, to control and limit the imports of fresh foodstuffs from eastern European countries, excluding the German Democratic Republic. Moreover the SSK recommended a limit value of 500

Becquerel/litre Jodite 131 for milk. This recommendation did not prevent *Länder*'s authorities from referring to lower limit values and implementing stricter measures in comparison with the ones decided at the Federal level. On the same day, for instance, the County president of Konstanz (a member of the CDU) asked the dairy industry not to process supplies of milk with contamination exceeding 100 Bq/litre and the Minister for Environment of Hessen (a member of the Green Party) recomended the citizens of his State not to drink milk.

These were the first signs of a problem that characterized the Chernobyl emergency in the FRG: the conflicts between the federal authorities and some *Länder* in deciding about countermeasures.

Two days later the SSK recommended additional limit values for leafy vegetables (250 Bq per kilogram of iodine-131) and other fresh food (100 Bq per kilogram of cesium-137).

Starting from the *Bundestag's* session held also on the 4th of May, the information policy of the Federal government was heavily criticized by the SPD and the Greens for being secretive and incomplete regarding disclosure of data on the fall-out (officials within the Ministry of Interior were bound to "confidentiality" rules) and for being too much reassuring on the "absolute" safety of German nuclear plants. Beside that, the SPD argued for a moratorium and for a gradual abandonment of the german nuclear programme, while the Greens suggested an immediate "*Ausstieg*" and the anti-nuclear movement organized mass demonstrations in Hamburg, Berlin, Stuttgart, Munchen, Hannover and at the Wackersdorf site asking for the closure of all german plants. The Minister of Interior and the Prime Minister H.Kohl (both member of the CDU) defended instead the federal management of the Chernobyl fallout and the overall German nuclear policy. Concerning the issue of safety of nuclear installations, the Prime Minister suggested to held in Bonn an international meeting on nuclear safety with the participation of all countries producing nuclear power.

In the meantime different and sometimes conflicting recommendations were given to the population concerning both behaviors and limit values. To let children play outdoor was declared unadvisable by the authorities of Hessen while it was regarded as safe by those of Baden-Württemberg where radioactive contamination was higher. The State authorities of Berlin, Schleswig-Holstein and Hessen set lower limits than the ones recommended by the SSK -Hessen, for instance, set a limit value of 20 bq/l. Jodine 131 for milk- and also the government of Nordrhein-Westfalen complained that the thresholds recommended by the SSK were too high.

In the attempt to control such situation (and while anti-nuclear demonstrations were multiplying), on the 8th of May the Federal government required the State governments to stick to the new advice of the SSK that suggested to have a normal lifestyle and a normal diet. The reassuring statements of the government and the SSK were debated, and in many case criticized, during public meetings and in media reports regarding the issue of short- and long-term risk due to radiation.

On May 15 and 16 the SSK debated the potential health impacts of the Chernobyl accident in the FRG, including the effects upon pregnancies. With respect to this point, a particularly sensitive matter of public (particularly women) concern, the SSK argued that there was no health risk for the fetus. In April the following year the SSK had to address this problem again (and reached the same conclusion) due to a report of the Institute for Human Genetics of the Free University of Berlin which linked the observed rise in the incidence of mongolism in Berlin to the radiation exposure caused by the Chernobyl fallout (SSK, 1988b).

While the debate on nuclear policy (extensively covered by the media) was becoming increasingly "hot", also due to the closeness of some State elections, the Federal government decided -on the 21st of May- to provide for financial compensations for the farmers damaged by the restrictions imposed as a consequence of the Chernobyl accident.

The 4th of June 1986 can be regarded as the symbolic end of the Chernobyl emergency. On this date, i.e. 40 days after the Chernobyl accident, it was officially announced the establishment of a new federal Ministry for Environment, Nature Protection and Nuclear Safety. Such Ministry was given the task to deal with the consequences of the Chernobyl fallout and with environmental problems more in general.

b.2. Analysis

On the basis of the reconstruction offered above, it can be noticed that there are both similarities and differences between the Italian and the German response to the Chernobyl fallout. But before examining the similarities and differences between the two cases and "test" the hyphothesis I previously suggested (see Introduction and cap.2) it can be useful to summarize the relations between the main actors -and actions- involved in the management of the Chernobyl fallout in the FRG.

Figure 4 indicates (as does figure 2 in relation to the Italian case) the action-set that emerged during the fallout and the countermeasures that were taken. It can be noticed that the Minister of Interior took a leading role at the Federal level. This was not only due to the concentration of responsibility in the field of nuclear regulation -together with the presence of a civil protection department- within the Ministry of Interior. It was also due to the possibility for such Ministry to rely on specialized technical personnell (like the staff working in the *Lagezentrum*) and on an influential in-house advisory body such as the SSK (Landfermann, interview). On the other hand, the SSK was the only scientific body having both the competence and the authority to issue official recommendations, i.e. the only legally and politically feasible measures that could be taken (beside import restrictions) by the Federal authorities in the given circumstances. Also *Länder* authorities -advised by experts from local scientific institutions (including University departments and the environmental institutes)- had been crucial actors in deciding about measures to be taken. Federal and State authorities (as well as the respective advisory bodies) in several cases disagreed about the definition of the situation: the first ones treating the fallout as a nation-wide problem to be dealt with in a homogeneous way at the federal level, the second ones emphasizing local differences concerning the degree of contamination and/or their competences in the field of catastrophe management.

It is worth pointing out that through the presence of a Minister of Environment of the Green party in a State government (Hessen) and through institutionalized (mainly through the environmental institutes) counter-expertise, the anti-nuclear movement had been not only an external (within the general "public") but also an internal actor in the institutional management of the Chernobyl fallout.

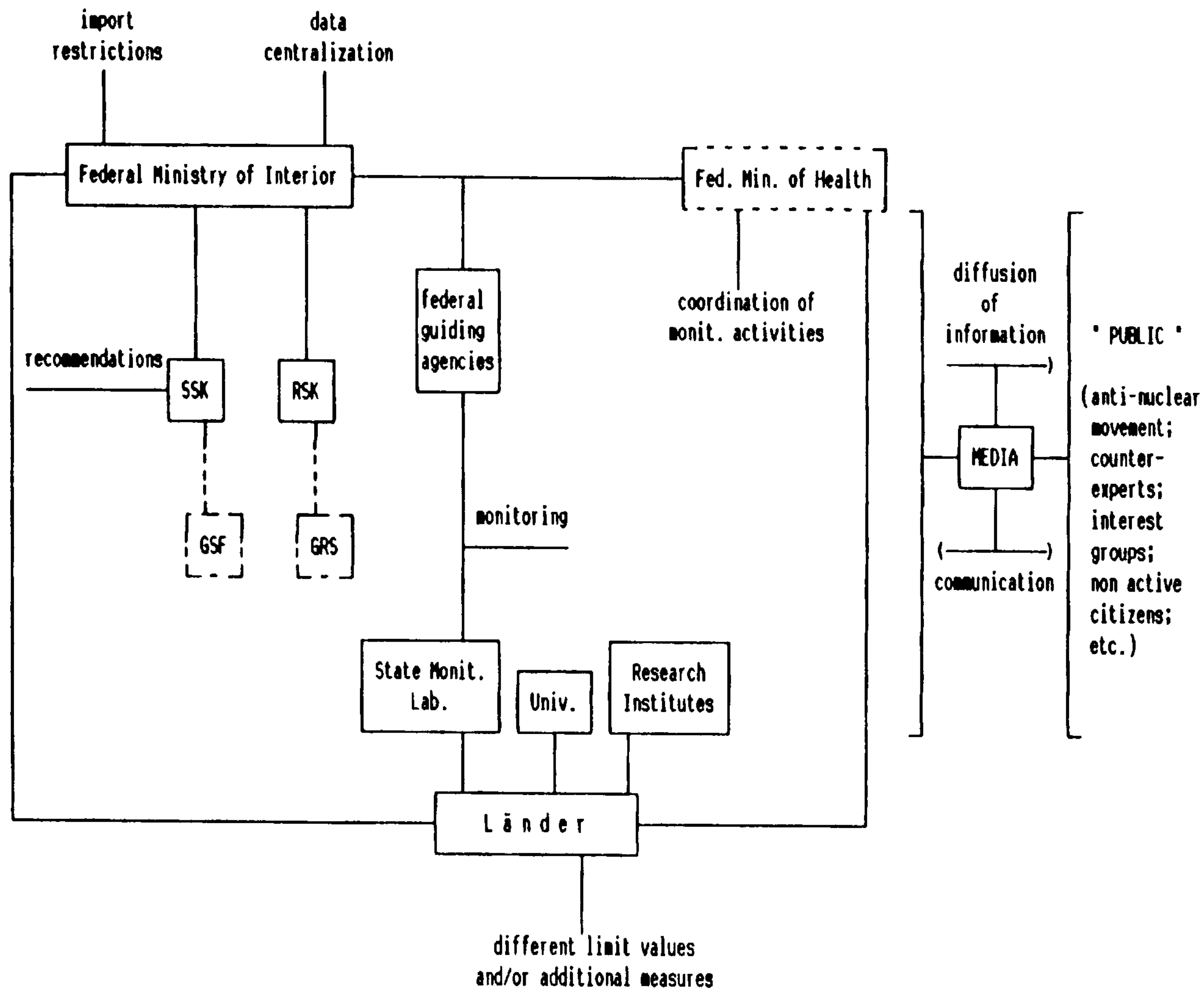
The figure also includes the media that played a main role (as in the Italian case) both in the diffusion of information and in the communication process between the actors involved in the decision making process and the different sectors of society.

Figure 4, here

When comparing the actor-set that emerged in the FRG (figure 4) and the one that emerged in Italy (figure 2) during the Chernobyl fallout, and taking into account the "Chronicle" sketched above, some of the similarities and differences between

Figure 4

THE CHERNOBYL FALLOUT IN THE FRG:
THE ACTION-SET AND THE COUNTERMEASURES



the responses adopted in the two countries to cope with that event can be singled out.

The main similarities can be summarized as follows: 1. in both countries political and administrative authorities reacted quickly and countermeasures were taken in a relatively short time (monitoring was intensified as soon as the news from Sweden arrived and both the decision of the Italian Health Minister to restrict the selling of milk and vegetables and the first recommendation of the SSK were made on the 2nd of May); 2. the media covered the news about Chernobyl since April 29 emphasizing not only what was happening "there" (the accident and its consequences in Ukraine) but also "here" (the fallout in Italy and in the FRG); 3. independent or "counter"-experts challenged the official ones in public; 4. the anti-nuclear movement was very active and visible (particularly through mass demonstrations); 5. the political parties debated the future of nuclear policy and some of them (the Communist and the Socialist Parties in Italy, the Social Democratic Party in the FRG) changed their previous pro-nuclear position.

On the other hand, differences can be found regarding the following points: 1. the political authorities which had a leading role in copying with the fallout (the Minister of Health and the one of Civil Protection in Italy, the Federal Minister of Interior and the *Länder* authorities in the FRG); 2. the different organization -and level of cohesion- of the "in-house" advisory bodies (in the FRG the SSK acted as the most important scientific advisory institution while in Italy the relevant advisory institutions were three -ISS, ENEA and ENEA-DISP- and did not always agree); 3. the type of radiological protection measures which were adopted (in the FRG recommendations were given about activity levels to be taken into account while in Italy a Ministerial decree forbade the selling of certain foodstuffs) and the way they had been implemented (while in the FRG there had been remarkable differences in the way Federal recommendations had been accepted and implemented in the *Länder*, in Italy the measures decided at the national level were generally applied at the local and regional level even if additional measures were decided in several cases).

In few words, both in Italy and in the FRG similar forms of scientific and organizational uncertainties were met but they were dealt with in a partially different manner.

In order to understand why this was the case, it is now time to analyse which shape took the relations between experts, politicians, the anti-nuclear movement and the mass media and how did such relations influenced the response to Chernobyl in the FRG.

b.2.1. Interpreting scientific information to provide policy advice.

As it was already mentioned, the SSK had a leading role in providing political authorities with policy relevant -and usable- knowledge. More than that, the SSK directly formulated the countermeasures (which took the form of recommendations) to be taken. This process of formulation -while uncontroversial within the SSK- was not easy. Beside that, in some cases both its premises and its conclusions were criticized by external experts.

Also in the FRG the actual composition of the radioactivity emission was not known by the end of April-beginning of May 1986 due to restrict information from the USSR. The first recommendations of the SSK had then to be formulated on the basis of the results of radioactivity monitoring in the FRG and in some other affected countries. Unfortunately also in this respect restriction of information proved not to be a peculiarity of the USSR; in fact the German authorities were not allowed to know the results of monitoring from the neighbouring Eastern countries and France (Oberhausen, interview). Even if in the FRG no serious gaps were found in the monitoring network (as it was instead the case in Italy), additional laboratories had to be integrated into the monitoring programme at the federal and state level. The areas of emphasis in the monitoring programme were selected by each state in a partially divergent manner (SSK b, 1988: p.30) in this way adding inhomogeneity to the already not very homogeneous distribution of laboratories specialized on different monitoring domains (air, water, food, etc.). Beside that, the communication of data between the state laboratories and the federal guiding agencies were problematic due to the great volume of work arising from the event. In these conditions, the experts of the SSK (like their collegues in other affected countries) had to make choices concerning the isotopes and the relevant food matrix to be selected in order to formulate their recommendations.

The need for specific recommendations arose from the fact that it was not possible to apply in a direct manner the dose limits set down in the Radiological Protection Ordinance. Such limits were of concern in planning the construction and operation of installations and the technical measures against accident; but they did not refer to actual accidents. Taking this legal "gap" into account, the SSK inspired its recommendations to the principle that, "(..) also in a crisis of this type, the radiation exposure to persons should be held (...) at such a low level as can reasonably be attained" (SSK a, 1988; p.48). Obviously principles can be interpreted and applied in different ways. After specifying that according to Section 45 of the Radiological Protection Ordinance a thyroid dose of 90 mrem per year is not to be exceeded for a population in the vicinity of nuclear facilities, the SSK decided (unanimously) that a standard value of 3 rem (3 rem = 3000 mrem) of thyroid dose was acceptable for infants "under prevailing conditions" (SSK a, 1988; p.50). The limits to activity levels in milk and other foodstuffs were set on the basis of this decision.

While the limits set by the SSK had been lower -and therefore more protective- than those applied in other countries (like France) [10], they were criticized by many German scientists outside the governmental advisory bodies. Among them, called by the SSK "would-be" or "self-appointed" experts (SSK b, 1988: p.vii and p.236), one can mention the scientists working within the Öko-Institute of Freiburg who argued against the decision to consider "acceptable" the limits set by the SSK (SZ, 10.5.1986) and those of the Institute for Energy and Environmental Research of Heidelberg (IFEU, 11.5.1986) who recommended the adoption of limit values also for meat and to pay attention to contamination of breast milk, an issue lately addressed by the SSK in its recommendations of May 15-16.

Independently from judgements regarding who was eventually right -the experts within the SSK or their critics- on a "purely" scientific ground, it is interesting to point out that the last ones exercized a sort of non-official "peer review" on the work of governmental experts. In this way non-governmental scientists stimulated (or even obliged) the members of governmental advisory bodies to give reasons for their advice both in their documents and directly in public, particularly through the mass media. In other words, what could have been a close and technocratic decision making process was instead a partially public and adversarial one. This element, together with the environmental awareness -and worries- widespread among the German citizens, also encouraged a relatively strict application of the *Vorsorgeprinzip* (precautionary principle) by the experts of SSK in setting limit values.

It is worth noticing that the polarization between governmental (mainly the members of SSK) and non governmental experts that characterized the interpretation and utilization of

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10 France initially set a limit value of 3700 Bq/l and then 2000 Bq/l of Iodine 131 in milk, while the limit of 500 Bq/l set in the FRG was/is adopted also in Italy. Interestingly enough the "record" of the higher admitted limit values for Iodine 131 belongs to UK (14000 bq/l for adults, 5200 for children and 2000 for babies) followed by Poland (10000 for adults and 1000 for children). The lowest limit values are set in Greece (250) and Austria (370). For a complete "list of numbers" see SSK, 1988 b; p.186).

knowledge for policy purposes during the Chernobyl fallout is rather unusual in the German context. A context (usually referred to as "corporatist system") where decisions are usually made thorugh negotiations between interest groups and where experts linked with the most powerful interest groups, in the nuclear case those working within the nuclear industry, play an important role in policy decisions. During the fallout, the nuclear industry took part in the debate only indirectly, that is through those members of governmental advisory bodies (SSK and RSK) who are also members of bodies aimed at promoting nucler power such as the German Atomic Forum [11].

The relatively low profile kept in public by German industry experts concerning the management of the Chernobyl fallout can be attributed to the predominance of health protection and emergency management aspects in deciding about measures to be adopted. This predominance meant, on the one hand, that public authorities were responsible according to the law, and were held responsible by citizen initiatives, for taking action; on the other hand, the nuclear industry and its experts had no interest in getting publicly involved in controversial health and emergency management issues and thus avoided to do so. Also the matter that was most important for them, that is the "defence" of German plants against the argument put forward by the anti-nuclear movement that all nuclear plants are unsafe, was mainly dealt with by the RSK, i.e. a governmental advisory body, and by (nuclear) research institutions such as the Karlsruhe and the Jülich centres. This can be regarded as an indicator of both government and nuclear industry willingness to keep the reactor safety issue as "neutral" as possible against its "politicization" by the anti-nuclear movement and to cope with the generalized distrust towards nuclear industry by the German public [12].

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11 For instance, Prof.R.Neider of SSK (source, Die Grünen im Bundestag informieren: SSK, Bonn). On the affiliations of members of SSK and RSK over time, see Huber, 1991: cap.5 and Anhang IV.

Given the low profile kept in public by industry experts, the polarization between governmental experts and counter-experts emerged [13]. And the fact that in the Chernobyl case the latter (and the anti-nuclear movement) played a major role in framing the scientific and political debate and in contributing to the formulation of the corresponding policy options represented a challenge to corporatists arrangements. In face of an unprecedented event and in dealing with a single issue, a more pluralistic process seemed to prevail [14].

b.2.2. Federal and state countermeasures, or the political management of uncertain knowledge.

Beside the disagreements between official and counter-experts, problems arose concerning the utilization of scientific advice -and by whom- to take practical actions at the national as well as at the local level.

At the national level, no significant inter-ministry conflict took place and the Minister of Interior emerged immediately (due to the already mentioned reasons) as the chief federal authority responsible for the management of the fallout. He relied on the advice of its advisory bodies and tried to utilize the recommendations of the SSK to impose a definition of the situation as a nation wide problem to be dealt with in a centralized and homogeneous way. The Minister of Health, especially through its Institute of Radiation Hygiene, played a role only in the coordination of monitoring activities and in supporting the recommendations of the SSK.

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12 On this last point see the survey made by Peters et al., 1987 (also quoted in the next paragraph).

13 This polarization indirectly included industry since several counter-experts and the Greens (Lindemann, interview; Wollny, interview) accused governmental experts to be on the side of the nuclear industry.

14 On the prevailing of pluralist politics over corporatist arrangements in German nuclear policy see also, Hatch, 1991.

The most important inter-organizational uncertainty to be dealt with in the German case was not the one between different Ministries as in the Italian case, but between Federal and State authorities (and in some cases also between State and local authorities).

While most *Länder* followed the recommendations issued at the federal level, some did not; moreover, in some cases there had been differences in the adoption and implementation of countermeasures also within the same State. Generally these federal/state and intra-state differences were not linked to differences in the problem, i.e. different levels of radioactive contamination, to be dealt with. In fact stricter measures (including lower limit values) with respect to the federal ones had not been adopted in the States most affected by the fallout (like Bayern) but in areas where the radioactive contamination had been relatively low (like Hessen). Let us see some reasons for this.

Access to scientific expertise had been an important determinant of administrative action. The lack of independent scientific institutions or in-house advisory bodies to resort to was a main element that made most *Länder* authorities follow the recommendations of the SSK (Prokop et al., 1989: cap.2, par.4). On the other hand, the availability of/access to expertise from local universities and research centres increased the rapidity and duration of administrative measures at the state level (Czada, 1990).

But an even more important element to be taken into consideration is the way scientific advice -when available- was utilized. In Konstanz, for instance, the County President accepted the advice of independent experts -who discovered and stressed the high contamination of the Konstanz area- in order to act quickly and in a "legitimate" way (thanks to the independence of experts), and thus responding to the citizens initiatives which were starting in his town. In these circumstances he took measures (the 100 Bq/l limit value for I 131) that were not looked favourably by the State (Baden-Württemberg) and the Federal government, even if he was a member of the party (CDU) ruling both these governments. In general, however, the way scientific advice was used to take action was very much influenced by political considerations. In the State of Hessen especially restrictive measures were taken mainly because of the Green affiliation of its Environment Minister; in this case, the most precautionary criteria in the selection and interpretation of scientific evidence were looked for and applied. Similarly, the *Länder* runned by the SPD were more critical towards the measures decided by the SSK and the Federal Minister of Interior and defended their right to act autonomously; the advice of counter-experts was in this case useful in issuing different or additional countermeasures. Most *Länder* ruled by the CDU were instead "faithful" to the federal recommendations and to the overall management of the Chernobyl emergency and did not look for -or did not listen to- scientific advice coming from non-official sources.

It can then be concluded that inter-organizational uncertainties concerning the responsibilitie of Federal, State and local authorities where managed through party politics channels and through the resort either to official or to non governmental experts by the various political and administrative actors.
Two issues were at stake in the federal/state and intra-state controversies that characterized the response to Chernobyl in the FRG. On the one hand, whether it is preferable to have a centralized or a decentralized disaster management, and how the two levels could be possibly be coordinated. On the other hand, whether there are "objective" criteria to be followed in the political management of scientific uncertainty, i.e. in selecting and utilizing experts' conflicting advices to make policy decisions. These issue were addressed in the months that followed the accident.

b.2.3. Mass media and public opinion.

The German mass media covered extensively the news about Chernobyl during the fallout and in the following months.

A content analysis of the German press (Merten et al., 1990) shows that the thematic bandwidth of the reporting on Chernobyl centers around the event and its direct consequences (44.7%), followed by the nuclear power controversy and energy policy (28.6%), and that the geographical focus shifted in few days after the accident from the Chernobyl area and its surroundings to the FRG (Mertens et al.,1990: pp.5,8).

The mentioned study also indicates that generally the German media oscillated between offering alarming or reassuring information and that they reported much more diffuse (like opinions) than concrete (i.e.factual) information (Merten et al., 1990: pp.8-9). These two phenomena can be regarded as reflecting the contradictory information (also concerning the countermeasures to be taken) coming from Federal and State authorities, experts holding different scientific views, nuclear industry and anti-nuclear groups.

With respect to experts as (contradictory) sources of media information, it has to be mentioned that difficulties were met -as in the Italian case- in the process of communication among experts, journalists and the public. The official spokesmann and chairmann of the SSK during the Chernobyl emergency complained, for instance, that "if you say *no acute risk*, you will be translated by the journalists *no risk*" (Oberhausen, interview). On the other hand, the journalists had a difficult time in "translating", selecting, organizing and reporting scientific-technical matters (including the often not explicit or rather subtle points of disagreements between different experts) according to both the rules of scientific and media communication.

Interestingly enough, a survey conducted 6-7 months after Chernobyl (Peters et al., 1987) shows that in spite of the contradictions in the information provided by different sources, all these sources -with the exception of the nuclear industry (regarded as not credible)- were considered more or less equally credible. While discarding too radical judgements about information sources (which were regarded as completely credible or, on the contrary, completely untrustworthy by less than 10% of the interviewees), the majority of interviewees said to consider them partly credible (Peters et al., 1987: p.19). Also journalists were included among these partly credible sources (beside acting as "vehicles" or "translators") of information. On the other hand, the perception of the threat linked with Chernobyl was highly influenced by the contradictory and, at the same time, partly credible information spread by the media. As emerges from the same survey, a considerable proportion of the interviewees answered "don't know" -in this way expressing subjective uncertainty- to the questions about possible damages to personal health and to the health of one's own children as well as concerning the presumable number of fatalities in the FRG owing to the reactor disaster at Chernobyl (Peters et al., pp.9-11). Also in the FRG then, the pro and cons of pluralistic and contradictory information were experienced.

The mass media played an active role in reporting news about the accident, its consequences and the measures decided by the federal and state authorities. Moreover, they provided an arena of communication between different sectors of society concerning risk and safety issues, energy policy and other related socio-political problems. And this public dimension, together with the pressures exercized by the anti-nuclear movement, the informal "peer review" provided by counter-experts and the competition between the major political parties (CDU and SPD), favoured a relatively high degree of responsiveness (for example, in terms of the precautionary measures taken and the explanation of reasons for issuing them) of political authorities and their advisers.

However a diffused "half-trust" attitude towards the various information sources and a "don't know" feeling (that contrasted with the impressive quantity of information disseminated by the media) were experienced by lay people. These reactions were the result of the oscillation between alarmistic and reassuring tones together with the diffusion of "contradictory certainties" expressed by different sources (no danger/serious danger, German plants are absolutely safe/no nuclear plant is safe, ect.) accompanied with scarce and uncertain evidence (about the causes of the accident, about the composition of the radioactive "cloud", about the risk for health due to low doses of radiation, etc.).

Forms of centralized risk communication have been suggested in the FRG to deal with these problems. They will be discussed in the following pages.

b.3. Concluding remarks

Summing up, the German response to the Chernobyl fallout can be understood on the basis of the patterns of interactions between policy makers, experts, the anti-nuclear opposition and the media, and the way information and knowledge (resources that proved to be crucial in the Chernobyl case) were utilized in defining the problem and responding to it. These elements also explain the similarities and differences between the German and the Italian cases.

Regarding the first point, relatively (in comparison with other countries) strict and timely precautionary measures were taken at the Federal level due to:

a. the advice of governmental experts (mainly those of SSK) who adapted existing norms -i.e.the Radiological Protection Ordinance- to the Chernobyl case on the basis of the principle that also in crises of that type radiation exposure should be kept as low as can be reasonably (a key word in evaluating options) attained.

b. The activism of the anti-nuclear opposition (including a political party, the Greens, sitting in the *Bundestag* and participating in some State and local governments) and several counter-experts who constantly "monitored" and challenged SSK's recommendations.

c. The initiatives decided by some State authorities that could undermine the authority of the Federal Minister of Interior in the field of nuclear policy in case he would not be able to take a leading role in the management the crisis.
d. The media coverage of the event as a domestic -beside foreign- problem and the visibility given by the media to conflicting views expressed by different experts and politicians.

Also the inhomogeneous implementation of Federal recommendations can be explained by the above mentioned elements, but "filtered" through party politics since the way experts' advice was utilized and the way public concerns were dealt with were heavily influenced by the competition between political parties.

As far as differences and similarities between the Italian and the German cases are concerned, the main differences are mainly due to two elements: the different features of centre-periphery relations in the two countries (German *Länder* have much more responsibilities and authonomy than the Italian Regions), and the quasi-monopoly of responsibility in the field of nucler policy within one Ministry (the Ministry of Interior) in the FRG against the fragmentation of responsabilities between different Ministries (Industry, Health, Civil Protection, Interior) in Italy. The similarities can be instead regarded as the result of the following factors: a. the bargainings between governmental authorities (between different Ministries in Italy, between Federal and State authorities in the FRG); b. the presence in both countries of a strong anti-nuclear movement; c. the public dimension of both scientific and political uncertainties and controversies (and the corresponding need for experts and politicians to make arguments and take actions to preserve their credibility in the eyes of the public [15]) through media coverage.

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15 On the issue of credibility in the context of the response to the Chernobyl fallout in the FRG see, Krohn and Weingart, 1986.

As we will see in the next chapter, an almost successful attempt to partially hide and partially play down uncertainties -due to very different patterns of interaction between policy makers, experts, anti-nuclear groups and the media- brought about a very different response to the Chernobyl fallout.

c. The years after.

Following the immediate response to Chernobyl, remarkable changes occurred in the FRG with respect to nuclear risk management. A new Ministry was established only forty days after the accident, a new law in the field of radiation protection was passed some months later, new framework recommendations concerning catastrophe management were adopted in December 1988. Other changes aimed at standardizing legal and institutional settings in the field of nuclear regulation are in progress following the German reunification. Beside that, also changes in the nuclear policy debate took place. The Greens formulated a programme for an immediate opting out, while the SPD announced a programme for a gradual abandonment of nuclear power during its Congress in summer 1986 and presented a bill on the same subject in February 1987. However there had been no substantial changes in German nuclear policy.

c.1. Post-Chernobyl events

c.1.1. The Ministry for Environment.

The establishment of the Federal Ministry for Environment, Nature Protection and Reactor Safety (*Bundesminister für Umwelt, Naturschutz und Reaktorsicherheit*, BMU) was a direct political consequence of Chernobyl. Since its announcement in the newspapers on the 4th of June 1986, it has been widely recognized[16] that the quick creation of the Ministry for Environment was a tactical move of the Federal government -mainly of Chancellor H.Kohl- to contrast the SPD opposition and gain credibility in the eyes of the public. Especially following the criticisms (not only from the opposition) addressed against the restrictive information policy and the authoritarian management of the emergency by the Minister of Interior.

Even if tactical rather than substantive reasons underly the creation of the new Ministry, it has to be noted that such Ministry -while not being among the most powerful and rich ones (as it is always the case with Environment Ministries)- is not merely a "*façade*". Beside being responsible for important matters, the new Ministry is in fact expanding its funding and personnel and developing in-house technical resources.

The BMU assumed responsibilities previously resting on three different Ministries: reactor safety and radiation protection from the Ministry of Interior, nature protection activities from the Ministry of Agriculture, radiation higyene and control of food contamination from the Ministry of Health. These fields of activity are dealt with by different sections of the BMU, with the section on nuclear safety and radiation protection working in relative isolation from the others (Landfermann, interview).

Concerning radiation protection, the BMU is responsible for the publication of an yearly report (till Chernobyl prepared by the Health Ministry) on radioactivity levels in the environment and in food. Moreover, in November 1989 a Federal Office for Radiation Protection was established within the BMU. Such office, that includes the Institute of Radiation Hygiene previously within the Ministry of Health and a section on plants safety which substitute the GRS, conducts and coordinates research and monitoring activities; moreover it organizes the meetings of the advisory commissions (SSK and RSK).

16 See, for instance, the first page of *Frankfurter Allgemeine Zeitung* of the 4.1.1986 and Weidner, 1989. Interviews confirmed this view.

The creation of the new Ministry and its subsequent development may have had one unintended side effect, i.e. the institutionalization of citizens'concerns about the safety of nuclear facilities within the government, as indicated by a statement by CDU's leader and Minister for the Environment K.Töpfer who said that it was part of his task to create a future without nuclear power (see, Hatch, 1991: p.93). Even if this statement (as any statement) can be just a component of a symbolic politics [17], the possibility that institutional conflicts may arise between a Ministry having the task of guaranteeing environment protection -including protection from ionizing radiation- and supervising nuclear safety and Ministries (beside interest groups) aimed at promoting nuclear industry and/or research should not be underestimated. And those conflicts could involve and involve serious consequence for the overall German nuclear policy.

c.1.2. The Radiation Protection Precautionary Act.

In December 1986 the *Strahlenschutzvorsorgegesetz* [18] (Radiation Protection Precautionary Act) -StrVG- was passed.

Also the StrVG can be regarded as a direct consequence of Chernobyl. Not only because this act is aimed at complementing the already mentioned Radiation Protection Ordinance by establishing tasks and responsibilities in case of nuclear accidents, including those occurring outside the FRG. But also because it addresses specifically the issue of the distinction of federal and state responsibilities in the field of monitoring and information and in setting limit values in cases of nuclear accidents.

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17 On the creation of the BMU as part of the "*renaissance der symbolischen Umwltpolitik*" see Weidner, 1989. Also on the BMU, but from a different perspective, see also Pehle, 1988.

18 See, *Strahlenschutzvorsorgegesetz*, Kommentar von Dr.jur. H.Roewer, Heymanns Verlag KG, 1988.

According to the StrVG, both the responsibility for evaluating and disseminating data and for issuing limit values rest on the Federal Ministry for Environment. The clear intention underlying the Act is then to solve the problem of possible federal-state conflicts in these fields (like those experienced during the Chernobyl fallout) by centralizing responsibility.

In this respect it can be argued that it is certainly useful, especially in emergency situations, to have a centralized source of data: this allows decision-makers to have a basis to guide action, and gives citizens the possibility to ask for information by knowing where most data are actually gathered. However, as far as the second point is concerned, citizens should have not only the possibility to ask but also to obtain access to data (including raw data) otherwise the source cannot be regarded as reliable and trustworthy. Because of this, and also due to technical problems that can hamper the quick centralization of data in case of unforeseen and catastrophic events, it seems advisable not to undermine but to take benefit from a plurality of independent and decentralized sources.

Moreover, the decision to centralize within a Federal Ministry the responsibility for setting limit values and issuing recommendations to be followed by the States rises controversial questions. For instance, whether centralized and homogeneous measures or decentralized and differentiated ones should be preferred -especially in the first days, when local conditions can be very important- in case of a radioactive fallout.

c.1..3. Framework recommendations in case of nuclear accidents.

The previously mentioned Framework recommendations for disaster management in case of nuclear accidents, firstly issued in 1975, were updated in December 1988 [19] .

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19 *Rahmenempfehlungen für den Katastrophenschutz in der Umgebung kerntechnischer Anlagen*, 1.12.1988, GMBl,1989.

While not modifying most of the already detailed provisions (from alarm to evacuation) contained in the original recommendations, in the introduction of the updated version it is emphasized that the plans, recommendations and measures for disaster management have to be agreed upon at the federal and state level according to the new provisions of the StrVG.

Also this emphasis on federal-state coordination can be regarded as a result of the Chernobyl experience. However the form of this coordination, which favours (being based on the StrVG) a center-focused relation, raises again the issue of the preferability of centralized and homogeneous or decentralized and differentiated disaster measures in case of fallout.

c.1.4. Adaptation to the new political situation.

Since the beginning of 1990 a commission formed by officials and experts of East and West Germany has been discussing the problems of nuclear safety and radiation protection within the FRG and the GDR, and then in the reunified Germany (Landfermann, interview).

First of all it has been decided that, starting from the 1st of July 1990 until the reunification, the Atom Law and the Radiation Protection Ordinance and Act would be valid also in the GDR. Beside the extended validity of the FRG's legislation also in the GDR, also some specific measures had been taken. For instance, following an analysis of the safety of nuclear plants in the GDR, the decision was made to shut-down four of them within 1990. A radiation protection project was also launched regarding workers and population exposition to radon in the South of former GDR where there are mines of uranium.

Many other problems are being faced in harmonizing nuclear risk management regulations and practices in the context of the reunified Germany especially due to the different economic conditions between the *Ländern* that belonged to former West and

East Germany and the differences (and deficiencies) in the administrative setting.

c.1.5. Nuclear policy debate.

Following Chernobyl, an increased anti-nuclear attitude spread among the public in the FRG as well as in many other countries [20].

With respect to political parties not only the Greens, who always opposed nuclear power, but also the SPD asked for a modification of German energy policy and the abandonment of nuclear power over a transition period [21]. The Greens suggested an immediate withdrawal from nuclear energy (see, Das Parlament, 31.5.1986) while the SPD formulated a plan for a gradual withdrawal and presented a bill on this subject (Deutscher Bundestag, Drucksache 11/13, 19.2.87). Immediate withdrawal was favoured in 1987 by 9% of a survey's respondents (Peters et al., 1987: 16) and gradual withdrawal by 31%; moreover, 31% of interviewees were against the building of new nuclear plants.

As far as other political paries are concerned, CDU and FDP maintained their support to nuclear power but started experiencing internal conflicts on this issue [22].

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20 Regarding the increased opposition to nuclear power after Chernobyl in eleven countries (including the FRG, France and Italy) see Hohenemser and Renn, 1988: p.11.

21 Oscillations and internal conflicts regarding nuclear issues characterized the SPD before Chernobyl; in some States (for instance, Hessen and Schleswig-Holstein) SPD representatives took a stand against nuclear power already in the early eighties but this was not the official position of the party. The Direction of SPD called for a gradual abandonment of nuclear power in the evening of 29 April 1986 and this policy orientation was confirmed during the SPD congress held in Summer 1986 (see, Hatch, 1991; Krohn and Weingart, 1986).

22 Beside the mentioned remarks by CDU's leader and Minister for Environment K.Töpfer, it can be remainded that following Chernobyl a group against nuclear power was formed within the CDU (*Christlische Demokraten gegen Atomkraft*) and that the FDP's

In spite of increased anti-nuclear opposition and controversies within the parties supporting nuclear power, no substantive changes occurred in German (Federal) nuclear policy; the SPD bill was rejected and the FRG (before and even more following the reunification) remains among the larger producers of nuclear power. However, some *Ländern* governments initiated steps to shut down the reactors operating in their territory (Schleswig-Holstein, Hamburg) or refused to issue licenses for new plants (for instance, North Rhine-Westphalia refused to license the Kalkar fast breeder reactor) and important projects such as the Wackersdorf reprocessing plant were cancelled for economic and political reasons [23].

c.2. Learning from Chernobyl?

The differences between the changes that occurred in Italy and in the FRG as a consequence of Chernobyl are remarkable.

First of all, an increased anti-nuclear opposition (including the changed position of some previously pro-nuclear parties) was experienced in both countries. But while such opposition had a direct impact on Italian nuclear policy, it did not cause major changes in the German one.

Moreover, and partially as a consequence of the previous point, different kinds of legal, organizational and technical adaptations had been made.

Reasons for these differences can be found in the patterns of interactions between actors -also due to the different weight of nuclear policy in the two countries and the difference between the

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General Secretary H.Haussmann called for a graduated *Ausstieg* (see, Hatch, 1991).

23 Giving as reasons the rising estimated costs for the facility, the uncertainties surrounding the license process and the continuous anti-nuclear opposition, the German companies concluded an agreement with the French company COGEMA to reprocess their fuel (see, Der Spiegel, April 1989; Hatch, 1990).

Italian and the German administrative structure- and in some different features of these actors in Italy and the FRG.

Interactions between actors had been significantly marked by -and channelled through- party politics since in both countries the nuclear issue had been a political issue already before Chernobyl and even more after the accident, when the debate regarding the continuation or suspension of the nuclear programmes rekindled.

Conflicts between parties had been stronger in the German case where the nuclear issue represented a more important point of party competition, especially between CDU and SPD, than in the Italian case where even the ruling Christian Democratic party that always supported nucler power took a moderately "critical" position in the occasion of the anti-nuclear referenda (see cap.4). This different degree of conflict between parties can be understood on the basis of the different weight of the nuclear issue and the different composition of governmental coalitions in the two countries.

Concerning the first point, it is self-evident that the large nuclear programme of the FRG had a more important economic and political weight than the very limited Italian one due to the following elements: the greater economic resources allocated for the German programme, the higher percentage of electricity produced through nucler power in the FRG, the presence of both a strong nuclear industry and a complex network of nuclear technical/scientific bodies (see figure 3) that would collapse or need radical restructurations in case the German nuclear programme would be suspended. With respect to the second point, it must be noticed that in Italy the Socialist Party -that took an anti-nuclear position following Chernobyl [24]- had been within the

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24 It is worth noticing that in this respect the Italian Socialist Party (PSI) was influenced by the position taken by the SPD; it was in fact after the SPD Congress in Summer 1986, and making explicit reference to it, that PSI Direction announced its shift

governmental coalitions during and following the accident, while in the FRG the parties opposing nuclear power (SPD and Greens) were located outside the federal government in 1986 and lost also in some state elections in the following years. As a consequence, the "strategic strenght" of anti-nuclear positions within the party system was higher in the Italian context.

Another actor that played an important role in the political debate that followed the Chernobyl fallout had been the anti-nuclear movement. Such movement had been very strong and visible in Italy and even more in the FRG before, during and after Chernobyl; moreover, in both countries the anti-nuclear positions are represented within the party system by Green parties and, with a different degree of commitment, by other parties. But (a part from the above mentioned differences regarding the strenght of anti-nuclear positions within the German and Italian party systems), while in the FRG the anti-nuclear movement appealed frequently to the Court starting from the early seventies, it could not organize -due to legal constraints- a national referendum like the one promoted by the Italian anti-nuclear organizations. Therefore, while the latter could take advantage of a nation-wide forum of debate as the referenda campaign and could exercize a remarkable political pressure through the referenda regarding the Italian nuclear programme, the German anti-nuclear movement could not challenge the German programme as a whole by using a legal (consultative) instrument. But it continued to influence the shape of the nuclear debate and contributed to the abandonment or delaying of some projects, like Wackersdorf and Kalkar, following Chernobyl.

As far as this last point is concerned, it must be also mentioned that the abandonment of specific projects and the continuation of others and of the overall nuclear programme is made possible by the federal structure of the FRG. Due to such

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from "critical" support to opposition to nucler power (see Ceri, 1987).

structure, the government of a *Land* cannot take decisions regarding the overall German nuclear policy but can boycott/delay certain projects that are favored by the Federal government [25].

The main point to be made on the basis of the remarks offered above is that a similar general [26] framing of the problem in terms of continuation or suspension of the nuclear programmes, gave rise to different "answers" in the Italian and German context due to the different power of pro- and anti-nuclear positions within the political (party) sphere. In turn these different "answers" (the abandonment of the nuclear programme in Italy, its continuation -while with difficulties- in the FRG) gave rise to different kinds of legal, technical and organizational adaptations.

In the following an interpretation of the changes that occurred in the FRG as a consequence of Chernobyl (including the mentioned adaptations) is offered to understand whether they can be reagarded as results of a learning process.

c.2.1. Changes in the framing of issues.

As in the Italian case, the post-Chernobyl debate was framed in the FRG according to the far from new dichotomy "yes/no to nuclear power". Besides, in both cases some shifts of emphasis regarding the issue of the "manageability" of nuclear power occurred within that general frame. However, differences can be noticed regarding these shift of emphasis or even "sub-frames".

During and following the Chernobyl fallout, especially governmental authorities (at the federal and state level) but also

25 It can be noted that, while not being a federal system, also in Italy local authorities played a main role -before Chernobyl- in hampering the implementation of the national nuclear programme. This was due to the relatively important weight (more important than, for instance, in the French case) of Italian regions.

26 Within this general frame, some "sub-frames" can be distinguished. See next paragraph, "Changes in the framing of issues".

experts, anti-nuclear groups and the media pointed to two problems: the distinction of responsibilities in case of major accidents and the management of information.

In face of the controversies between federal and state authorities with respect to the measures to be taken, opposing arguments for centralization or decentralization of responsibilities were suggested. The first ones (put forward by federal authorities and some experts [27]) stressed the need for centralized responsibility at the federal level to avoid that different and uncoordinated measures are taken within the country as happened during the Chernobyl fallout. Others (including some state authorities, other experts [28] and the Greens) emphasized instead the need for decentralized responsibility on the basis of various arguments such as the local variations that occurred during the Chernobyl fallout and that could occur in similar cases, and/or the risk that too many competences are concentrated at the federal level.

Also the information management problem was framed in terms of centralization vs decentralization. The arguments for centralization being based on the assumption that contradictory information is bad and should be avoided, the arguments for decentralization assuming instead that pluralistic information is better than clear but one-sided information.

In other words, the shift towards management aspects within the general frame "yes or no to nuclear power" involved in the FRG the emerging of a "sub-frame" -also dichotomic- regarding the preferability of centralized or decentralized nuclear risk management. It can be noted that the emerging of such "sub-frame" was influenced by the general federal/state dichotomic frame characterizing German policy making; in other words, two previous

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27 This view was expressed, for example, by Mr. Landfermann and by Prof. Oberhausen during interviews done within the framework of this study.

28 As a case in point one can mention the experts of the University of Konstanz (see Czada, 1990).

frames (rather than one as in the Italian case) conditioned the reframing of nuclear issues in the FRG.

c.2.2. Policy, legal, organizational, technical adaptations.

Differently from the Italian case, no "core policy change" occurred in the FRG.

However, the abandonment of the Wackersdorf reprocessing plant project and the very likely abandonment or radical change - for example, to use it for research rather than for energy production- of the Kalkar fast breeder reactor seems to involve an (implicit) policy change. A change that can be regarded as "peripheral" but at the same time could imply a "weakening of the core". In other words, a trade-off seems to be ongoing where specific and especially controversial projects are discontinued in order to smooth the opposition to the nuclear programme as a whole and to continue operating the "normal" plants. While "peripheral", since the continuation of the nuclear programme is pursued as a main policy goal, this change might affect the core of nuclear policy by introducing limitations and specification as regards the type of projects that can be regarded as "safe" in economic and political terms.

Beside this change, other peripheral adaptations (legal, organizational, technical adaptations) were made concerning various aspects of nuclear risk management. They can be summarized as follows.

Emergency planning and **information procedures.**

The already mentioned legal adaptations, mainly the adoption of the StrVG and the new version of the framework recommendations in case of nuclear accidents, provided for a center-focused coordination of emergency measures and for the centralization of information.

Monitoring.

The monitoring network was extended by including other stations and laboratories within the federal and state monitoring programmes. Data are centralized within the BMU. The recently established Federal Office for Radiation Protection of the BMU evaluates them and publishes radiation exposure reports (initially -i.e. in the first months after the Chernobyl fallout- these reports were published monthly, then every three months and then once a year).

Reactor safety.

No major adaptations were made in this field because German governmental experts (mainly those of RSK) agreed with most experts of Western countries that an accident like the one occurred at Chernobyl could never happen in a LWR or PWR reactor; as a consequence no significant changes in design or in safety measures were considered necessary in German nuclear plants in the light of the Chernobyl accident.

c.2.3. Concluding remarks.

On the basis of the previous discussion, it can be argued that learning in terms of (partial) reframing of issues, self-reflection and consequent adaptations took place.

Such learning developed on the basis of reflection on experience (regarding both an external event, i.e. the Chernobyl accident, and the performance of specific organizations and/or politicians) and asymmetrical (also depending on the specific issues at stake) communication between the main actors involved.

Previous policy, bargainings and conflict between political parties and the federal/state dychotomy characterizing German policy making provided both a basis and a constraint to the reframing of nuclear issues and the adoption of certain organizational, legal and technical changes. A basis because they provided some instruments to identify "post-Chernobyl problems" and to design some possible solutions, constraints (which are not to be regarded as necessarily negative features) because they limited the scope of what was conceivable and/or feasible.

REFERENCES

CZADA, Roland (1990), "Politics and administration during a "nuclear-political" crisis. The Chernobyl disaster and radioactive fallout in Germany", in Contemporary Crises, vol 14, pp.285-311.

ELLWEIN, Thomas and Joachim HESSE (1987), Das Regierungssystem der Bundesrepublik Deutschland, Westdeutscher Verlag, FRG.

HATCH, Michael (1991), "Corporatism, Pluralism and Post-industrial Politics: Nuclear Energy Policy in West Germany", in West European Politics, vol.14, n.1, pp.73-97.

HOHENEMSER, Christoph, M.DEICHER, A.ERNST, H.HOFSASS, G.LINDER, E.RECKNAGEL (1986), "Chernobyl: an early report", in Environment, vol.28, n.5; pp.6-13, 30-43.

HOHENEMSER, Christoph and Otwin RENN (1988), "Shifting public perceptions of nuclear risk: Chernobyl's other legacy", in Environment, vol.30, n.3; pp.4-11, 40-45.

HUBER, Michael (1991), Das regulative Netzwerk. Risiko und regulative Politik im bundesdeutschen Kernenergiekonflikt, PhD thesis, EUI, Florence.

JAHN, Detlef (1989), "Changes in the political culture. Challenges to the Trade Union Movement: the Debate on Nuclear Energy in Swedish and German trade Unions", in John Gibbins ed., Contemporary political culture. Politics in a Postmodern Age, SAGE, London.

JOHNSON, Nevil (1973), Government in the Federal Republic of Germany. The executive at work, Pergamon Press, Oxford-New York.

KITSCHELT, Hans (1980), Kernenergiepolitik, Campus, Frankfurt.

KROHN, Wolfgang and Peter WEINGART (1986), "Tschernobyl - das grösste anzunehmende Experiment", in Kursbuch, vol.85, pp.1-25.

MAYNTZ, Renate and Fritz SCHARPF (1975), Policy-making in the German Federal Bureaucracy, Elsevier, Amsterdam-Oxford-New York.

MENY, Yves (1990), Government and Politics in Western Europe. Britain, France, Italy and West Germany, Oxford University Press, Oxford.

MERTEN, Klaus, Hans P. PETERS, Karsten KLOSSE (1990), "Risk information on the Chernobyl disaster in West German mass media. Credibility gaps and their effects on attitudes towards nuclear power" paper at the World Congress of Sociology, Madrid.

MEZ, Lutz ed.(1981), Der Atomkonflikt. Berichte zur internationalen Atomindustrie, Atompolitik und Anti-Atom-Bewegung. Rowohlt, Reinbek bei Hamburg.

NELKIN, Dorothy and Michael POLLAK (1981), The atom besieged. Extraparliamentary dissent in France and Germany, The MIT Press, Cambridge Mass. and London.

PEHLE, Heinrich (1988), "Das Bundesumweltministerium: Neue Chancen für den Umweltschutz ?", in Verwaltungs Archiv, vol.79, pp.184-203

PETERS, Hans P., G.ALBRECHT, L.HENNEN, H.STEGELMANN (1987), Reactions of the german population to the Chernobyl accident. Results of a survey, KFA Jülich GmbH, Jülich.

PROKOP, H., R.GÜNTER, J.BEUCK (1989), Reaktionsmuster der öffentlichen Verwaltung angesichts von Ereignissen mit (bisher) unbekannten Folgen, Speyer Forschungsberichte 80, Forschungsinstitut für offentliche Verwaltung, Hochschule für Verwaltungswissenschaften Speyer.

RADKAU, Joachim (1983), Aufstieg und Krise der deutschen Atomwirtschaft 1945-1975, Rowohlt, Reinbek bei Hamburg.

RUCHT, Dieter (1980), Von Wyhl nach Gorleben. Bürger gegen Atomprogramm und nukleare Entsorgung, Verlag C.H.Beck, München.

SCHROEREN, Michael ed. (1990), Die Grünen. 10 bewegte Jahre, Ueberreuter, Korneuburg, Austria.

WEIDNER, Helmut (1989), "Die Umweltpolitik der konservativ-liberalen Regierung" in Aus Politik und Zeitgeschichte, B47-48/89, 17.11.1989, pp.16-23.

Documents analysed

BMU, Umweltpolitik. Bericht zur Strahlenexposition im Jahr 1986, 1987, 1988, 1989.

BMU (1988), Die Sicherheit unserer Kernkraftwerke, Bonn.

FRANKFURTER ALLGEMEINE ZEITUNG 28.4.1986 - 6.6.1986.

RSK (1986), Zwischenbericht der RSK zur vorläufigen Bewertung des Unfals im Kernkraftwerk Tschernobyl im Hinblick auf Kernkraftwerke in der Bundesrepublik Deutschland, Geschäftsstelle der RSK.

RSK (1988), Abschlussbericht uber die Ergebnisse der Sichereitsüberprüfung der Kernkraftwerke in der Bundesrepublik Deutschland durch die RSK.

SSK (1988 a), Impact of the Chernobyl Nuclear Power Plant Accident on the Federal Republic of Germany, Publications of the Commission on Radiological Protection, vol.5, published by the Ministry for Environment, nature conservation and nuclear safety, Bonn.

SSK (1988 b), Impact of the Chernobyl Nuclear Power Plant Accident on the Federal Republic of Germany, Publications of the Commission on Radiological Protection, vol.7, published by the Ministry for Environment, nature conservation and nuclear safety, Bonn.

DAS PARLAMENT. Die Woche im Bundeshaus aus Politik und Zeitgeschichte, n.22, 31 Mai 1986, Bonn.

DEUTSCHER BUNDESTAG. Drucksache 11/13, 19.2.87.

Interviews

BMU (previously BMI):

Dr. Landfermann

SSK:

Prof. E. Oberhausen

Grünen:

MP L. Wollny
I. Lindemann

6

PAS DE NUAGES ICI !
CHERNOBYL IN FRANCE.

a. Background.

Differently from the Italian and the German cases, the first response to Chernobyl in France was a no-response: no information was spread concerning the extension of the fallout on the country and no precautionary measure was taken. The radioactive cloud that was being detected and was raising concern in the neighbouring countries seemed to have stopped at the French borders. However, two weeks after the accident French citizens discovered that they had been affected both from the radioactive fallout and from restriction of information.

In order to understand the French management of the Chernobyl fallout -and its differences and similarities in comparison with the Italian and German cases- it is necessary to examine the development of the French nuclear programme, the role and scope of the anti-nuclear opposition and the peculiarities of the institutional and legal context.

a.1. Nuclear policy.

The first five-year nuclear plan was approved by the French Parliament in 1952. However, its institutional premises can be traced back to 1945 when the *Commisariat à l'Energie Atomique*

(CEA) was established to promote research and development in the nuclear field [1].

The CEA, at that time under the authority of the President of the Council of Ministers (and then, since 1969, under the Ministry of Industry), was given administrative and financial autonomy and was directed -with respect to scientific matters- by the famous physicist Frédéric Joliot. Few years after the creation of CEA, the issue of the military uses of nuclear energy caused a serious crisis within the *Commisariat*: its scientific director, Joliot, had to resign in 1950 due to his involvement in the Communist Party and in the movement *Partisans de la paix* -both opposing the development of nuclear weapons- and to his public statements against the construction and utilization of the atomic bomb.

Even if the military orientation of French nuclear policy was not yet an explicit point of debate when the first nuclear plan was launched in 1952, Joliot correctly foresaw such orientation. In 1956 a military department (*Direction des applications militaires*) was established within CEA and the freedom of France to develop nuclear weapons was proclaimed by the head of governement, Mollet, during a parliamentary debate on Euratom (Goldschmidt, 1980: p.151). Since then, the French programmes concerning the civilian and the military utilization of nuclear energy have been following distinct but linked paths [2]. The second five-year plan, for instance, included the decision to build an enriched uranium plant (the Pierrelatte plant) wich would benefit both electricity production and military weaponry. Moreover, the decision to build plutonium-producing reactors, the choice (within the second five-year plan) of the graphite-gas reactors and, more

1 Concerning the development of French nuclear policy see, M. Davis (1988); J.C.Debeir, J.P. Deleage and D.Hemery (1986);and B.Goldschmidt (1980).

2 While being a crucial issue, the linkage between civil and military utilization of nuclear energy will be just briefly touched because only indirectly relevant for the analysis of the French response to Chernobyl.

recently, the development of the fast breeder reactor Superphenix were intented to satisfy both civilian and military purposes (Davis, 1988; Schneider, 1987). Beside that, a substantial part of CEA's budged comes from the Ministry of Defence: around 60% of the total CEA's budget in 1964 and 49.4% in 1987 (Gilpin, 1968; Davis, 1988).

In spite of the opposition of some leading figures (as shown by Joliot's *affair*), the development of a military nuclear programme did not met mass dissent. As we will see later on, a strong anti-nuclear opposition emerged only in the seventies; and while being concerned with both the civilian and the military nuclear programmes, the anti-nuclear movement organized its activities mainly with the respect to the first one. According to Robert Gilpin, one reason for the lack of significant dissent with respect to the development of the military plan could lie in the tacit assumption made by many French people that a nuclear weapons capability is both a prerequisite for political independence and an essential tribute to modern nationhood; in other words, a way to preserve and promote the country's *grandeur* (Gilpin, 1968: p.282-284). On the other hand, the issues of national independence (this time with respect to energy production) and national technological progress explicitly underlies also the development of the civilian nuclear programme, the largest in Western Europe. In arguing for nuclear power production, governements leaders - from De Gaulle to Mitterand- frequently stressed the necessity to achieve independence from imports and to promote national science and technology (Fagnani and Moatti, 1984).

This emphasis on the national dimension of the nuclear effort, together with the important role of the public sector (for instance, through nationalized industries) in French economy, can explain the leading role taken by the state in building the country's ambitious programme covering all aspects of the fuel cycle. In this respect, CEA plays a fundamental role. As previously mentioned, CEA was established as a governmental body having the task to promote research and development in the nuclear field. This is done through various CEA's research centres [3] and through a direct industrial involvement of CEA which is a major shareolder of Framatome (the company that builds reactors) and controls through its industrial branches -particularly Cogema- the whole fuel cycle, from enrichment and fuel fabrication to reprocessing and waste management (CEA, 1987).

Besides CEA and its branches, a crucial actor of French nuclear development is *Electricité de France* (EDF), a public industrial and commercial body established according to the nationalization law of 1946. EDF, which acts under administrative surveillance of the Ministry of Industry, is the operator of all French nuclear plants and distributes 96% of all the electricity produced in the country.

The activities of CEA and EDF have been coordinated, since 1957, by a governmental Advisory commission on the production of electricity from nuclear sources (PEON). However in the sixties there had been conflicts between CEA and EDF regarding the choice of reactors, CEA being in favour of continuing the development of graphite-gas reactors while EDF was willing to introduce PWRs on licence of the US firm Westinghouse. Once President De Gaulle (who always supported CEA) left office in 1969, EDF -supported by the new President Pompidou- succeeded in introducing PWRs.

Since then CEA and EDF have been collaborating in developing the French nuclear programme. Following the end of the *guerre des filières* between these two organizations and the oil crisis of 1973, the Council of Ministers decided -in 1974- to extend and speed up the nuclear programme. The decision, especially pushed by the Prime Minister Messmer in consultation with EDF, was debated at the Parliament only one year later and without voting (Colson, 1977). The "aggressive" nuclear programme designed in 1974 was continued also when the Socialist Party, previously critical towards French nuclear policy (the *tout nucleaire*

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3 Within CEA there are five Nuclear Research Centres (CENs), dealing with both civil and military aspects, as well as seven Centres depending on DAM, the military department.

policy), came to power in 1981. While introducing some procedural transparency in the decisional process (for instance, in 1981 the new nuclear plan was debated and voted by the Parliament and Local Information Commissions were established), the Socialist government pursued nuclear expansion in line with the choices of the previous conservative governments.

In 1988 nuclear power provided 72% of French electricity -the largest proportion in the world- produced by 53 reactors (Cartigny, 1988).

a.2. Anti-nuclear opposition.

In 1970 the first local anti-nuclear association (*Comité de sauvegarde de Fessenheim et de la Pleine du Rhin*) was established to oppose a proposed plant in Fessenheim in the region of Alsace at the border with the FRG. The following year another group was promoted by a teacher, Emile Premillieu, and a journalist, Pierre Fournier, against the siting of the Bugey plant. Also in 1971, the first anti-nuclear mass initiatives were held: a peaceful march at Fessenheim, an anti-nuclear festival that attracted around 15.000 people near Bugey and an international meeting in Strasbourg with the participation of activists from several countries [4].

Starting from 1972, some environmental groups organized at the national level (especially *Les Amis de la Terre*) and the counter-culture press (maily *Charlie Hebdo*, *Survivre et Vivre* and *La gueule Ouverte*) took a leading role in promoting nationwide anti-nuclear campaigns. Beside opposing the siting of nuclear plants for energy production, they also organized initiatives against the military programme; for instance, a protest expedition

4 Information and analysis regarding the French anti-nuclear movement can be found in Chaudron and Le Pape, 1979; Nelkin and Pollak, 1981; Rucht, 1989.

took place in 1973 near the area where the French nuclear weapons tests were performed.

In 1975 two important groups joined the anti-nuclear opposition. 400 scientists signed a widely circulated appeal against nuclear power and some of them established the Group of Scientists for the Information on Nuclear Energy (GSIEN), based in Paris and with members in several other towns. The GSIEN, still one of the most active public-interest science groups in France, has been publishing (since its foundation) a periodical entitled *La Gazette Nucleaire*. Also in 1975, the French Democratic Labour Confederation (CFDT) -linked with the Socialist Party- published a book, *L'electronucleaire en France*, aimed at diffusing information (the book was prepared by CFDT's members working within the CEA) against the restrictive information policy of the government (CFDT, 1975: Préface). In the book a very critical position was expressed concerning the extension of the French nuclear programme as adopted by the Ministerial Council's decision of 1974. While not opposing nuclear power *per se*, CFDT opposed the mentioned programme due to the serious and various risks (economic, environmental, health, political, social risks) it involved and suggested to slow down -instead of speeding up- the programme and to pay more attention to safety and information aspects (CDFT, 1975; Tassar, interview). On this ground, and also to oppose privatization projects in the reprocessing sector, in 1976 CFDT organized a long (four months) strike at the reprocessing plant of La Hague [5].

It is worth mentioning that the other main labour organization, the General Labour Confederation (CGT), linked with the Communist Party, always and strongly supported the civilian nuclear programme regarded as necessary to provide workplaces and to push economic growth. In spite of the previously mentioned

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5 An interesting analysis of the La Hague case, with special respect to the (fatalistic) response of the local population to the huge project imposed from "Paris", can be found in Zonabend, 1989.

opposition of the Communist Party to the military utilization of nuclear energy, this party and the CGT are not only reluctant to connect civilian and military aspects but also less sensitive than CFDT to safety aspects. As a consequence they never joined the anti-nuclear opposition.

Anti-nuclear mass demonstrations continued in the meantime (again in Fessenheim and Bugey and against the proposed nuclear plants near Braud-et-Saint Louis and Flamanville) and culminated in the largest demonstration of all at the site of the Superphenix fast breeder reactor in Creys-Malville in July 1977. Such demonstration followed an unsuccessfull attempt by the ecologists to stop the project by appealing to the court and other initiatives, including an appeal against Superphenix signed by 1.300 scientists and technicians of the European Centre of Nuclear Research, CERN. Around 60.000 peoples (coming also from the FRG, Italy and Switzerland) participated in the demonstration which ended in clashes with the police; several hundred demonstrators were wounded and one of them, Vital Michalon, died the next day.

The violent repression of the Creys-Malville demonstration caused both depression and divisions (mainly concerning the need to continue or abandon the practices, like demonstrations, that could involve direct confrontation with police) within the French anti-nuclear movement. Movement that was also confronted with the growing pervasiveness of nuclear power in the French economy and society. Such pervasiveness is expressed in a very clear way in the words of an inhabitant of La Hague (but the same is true in many other areas), "*COGEMA c'est une affaire de famille, mon père, ma tante, mon cousin, mon frère y sont..Alor moi aussi je cherche à y entrer* [6]" (in Zonabend, 1989: p.67). These elements, together with the very limited impact (especially in comparison with the German case) of resorting to the courts due to their inability to

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6 "COGEMA is a family business; my father, my aunt, my cousin, my brother are all there...Thus I also try to get in"

confront the administration on substantive grounds (Nelkin-Pollak, 1981: chapter 11) brought about a decline of the movement.

When the first government with a majority of the Socialist Party was formed following the Presidential election of François Mitterand in 1981, the already weakened anti-nuclear opposition appeared to be almost totally soothed by the pacification -and cooptation- policy pursued by the socialists (Fagnani and Moatti, 1982).

Even the birth of the Green Party in 1984 did not "reanimate" the anti-nuclear movement. Beside being on the fringe of the political arena (*Les Verts* entered the European Parliament -but not yet the French one- in 1988 and succeeded in national elections only in 1992 even if divided in two lists), the Greens adopted a rather pragmatic attitude and did not emphasize very strongly -at least till Chernobyl- their opposition to the nuclear programme, i.e. the "holy cow" of French energy, economic and defence policy. It is also worth pointing out that while some leaders of the previously or still existing anti-nuclear associations joined *Les Verts*, others joined the Socialist Party and where integrated in the governmental establishment. Brice Lalonde, former leader of *Les Amis de la Terre* and then apponted as Minister for Environment, being the most famous case in point.

The weakness of the anti-nuclear movement due to the above mentioned factors (the divisions following the repression at Creys-Malville, the unsuccessfull attempts to resort to the courts, the pervasiveness of nuclear power, the "pacification" and cooptation policy started in the early eighties by the Socialist government) became especially evident when the Chernobyl accident occurred.

a.3. Legal and institutional framework.

No framework law (like the Italian Law 1860 of 1962 and the German Atom Law of 1959) regulates nuclear power production in

France. This exceptional situation (France is the only "nuclear" OECD country lacking such a law) creates difficulties with respect to the division of competences between different Ministries, the Parliamentary control and the role of the Courts (see CFDT, 1975; Colson, 1977; Nelkin and Pollak, 1981). Each Minister can in fact emanate decrees -eventually contrasting- with respect to his/her specific competence (health, environment, transport, industrial safety, etc.). Decisions are taken by the Executive while the Parliament -in the rare occasion it debates or even votes them- cannot evaluate the overall nuclear policy on the basis of a framework law. Finally, the Courts cannot base their judicial review on a comprehensive law and limit themselves to the consideration of specific procedural aspects; mainly whether applications for construction permits are prepared according to th relevant decree on nuclear installations.

Several decrees form the basis of French legislation on nuclear matters. The most important ones are the Decree n.63-1228 of December 11, 1963 (updated in March 1973, April 1985 and January 1990) on nuclear installations, the Decree n.66-450 of June 20, 1966 (updated in April 1988) on radiation protection principles and the Decree n. 67-228 of March 15, 1967 (updated in October 1986) on the the protection of workers from ionizing radiation.

The decree on nuclear installations establishes the licensing procedures. According to the updated version of the Decree, the operator, i.e. EDF, must submit a provisional safety report to the Central Service of Nuclear Safety Installations (SCSIN), a technical body of the Ministry of Industry established in 1973 and presently formed by around 50 persons. SCSIN prepares an authorization decree specifyng the technical norms -designed by one of the permanent experts groups within SCSIN- to be followed by the operator; SCSIN also ask for a report by the Institute for Nuclear Safety and Protection (IPSN) of CEA. After conferring with the Minister of Health (who has the right to give a binding *avis conforme*) and asking for advice the High Council on Nuclear

Safety (CSSN) and the Interministry Commission on Basic Nuclear Installations (CIINB), the Minister of Industry and the State Secretary for Environment and the Prevention of Technological and Natural Hazards give the authorization. Once the installation is in operation, inspections are made by members of SCSIN (often accompanied by engineers of ISPN) and/or members of the Regional Directions of Industry and Research (DRIR), i.e. SCSIN's regional branches (see, SCSIN, 1989).

According to the Decree on radiation protection principles, the yearly equivalent dosis for the population should not exceed the limit of 5 rem recommended by the ICRP in 1962. The Decree also establishes that, in case of accidents involving the risk of population exposure to ionizing radiation, the Central Radiation Protection Service (SCPRI), a technical body of the Ministry of Health established in 1956, suggests the health measures to be adopted (see, Moroni et al., 1988). SCPRI is also responsible for environmental monitoring activities; it coordinates around 130 monitoring units in the whole national territory and has one laboratory, in Vesinét, where samples are analysed. Since 1968, the monitoring of radioactivity levels in food is also performed by the Central Service of Food Hygiene, a technical body of the Agriculture Ministry, and its 19 regional sections. Also the plants' operators -EDF- and CEA's institutes (particularly IPSN) and research centres perform monitoring activities, and their data must be sent to SCPRI where they are centralized and evaluated. Beside that, SCPRI is the only institution responsible for the diffusion of the monitoring data and for informing the population in case of accidents. Or better it was. Due to the information problems that emerged during the Chernobyl fallout some changes were in fact made with respect to data collection and diffusion. To conclude with SCPRI, such service is also responsible, according to the Decree on the protection of workwrs from ionizing radiation, for individual and collective dosimetry and for verifying the health protection measures within nuclear installations.

With respects to accidents at French nuclear plants (also in France the possibility to cope with the consequences of an accident occurring abroad had not been taken into account by legislators), a departmental [7] plan -plan Orsecrad- is provided for by an interministerial instruction of 1963 (Deslandes, 1988).

According to the plan, EDF can adopt an Internal Emergency Plan (PUI) for each plant and must inform the Prefect of the affected department about the nature and the possible evolution to the accident. The Prefect, who works in strict collaboration with the Department of Civil Protection of the Interior Ministry [8] and is advised by SCPRI about the measures to be taken, adopts the measures regarded as necessary to guarantee civil protection and public order. He is also responsible for coordinating information and assistance exchanges with neighbouring departments and countries.

On the basis of this account of the legislative and institutional framework, figure 5 summarizes the highly differentiated interorganizational/regulatory network of nuclear risk management in France.

As we will see in the next paragraph, the action-set that emerged during the Chernobyl fallout can be regarded as a drastic "semplification" of the network represented in figure 5.

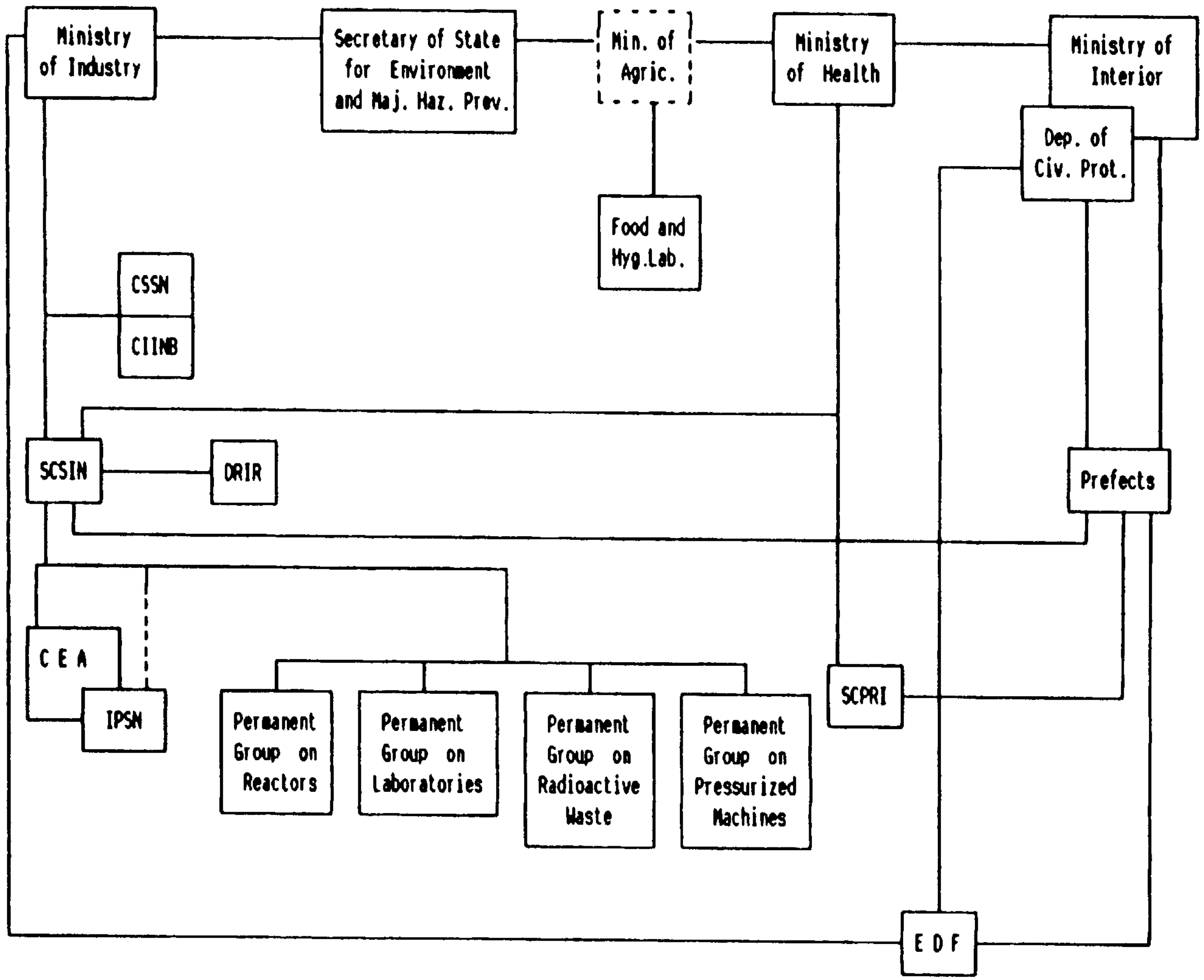
Figure 5, here

7 France is divided in three kinds of administrative units: regions (22), departments (95), communes (36.000).

8 Such Department operates through a Stable Control Unit (within the Prefecture) aimed at centralizing information as well as through Operational Units having the task to collect measurements made in the affected area.

Figure 5

NUCLEAR RISK MANAGEMENT IN FRANCE :
THE INTERORGANIZATIONAL/REGULATORY NETWORK



b. <u>The Chernobyl fallout</u>

b.1. Chronicle

Chernobyl reached the front pages of French newspapers on the 30th of April. Beside the first news concerning the accident, the opinions of some french experts were reported: according to them, there was no risk of radioactive fallout in France. With respect to reactor safety, a representative of EDF -M.J.Leclerc- pointed out that *la plupart* (most) of French plants have external confinement systems.

On the 1rst of May the SCPRI announced that a negligible increase of radioactivity in air had been detected in the south-east of France and stressed that this was not relevant for public health (see, WISE, 1986). The same opinion was expressed by experts of CEA and EDF.

On the 2nd of may and in the following days criticism of the attitude to secrecy, regarded as a peculiarity of the Soviet sources, were made by French journalists and public authorities.

Beside reporting news from Ukraine, newspapers also published articles -usually interviews with representatives of EDF- on the safety of French nuclear plants. In the meantime, the regional sections of the Central Service of Food Hygiene were asked by the Central Service to increase their "attention".

On the 3rd of May, the newspapers reported that radioactivity levels had increased in the neighbouring countries. They also briefly mentioned that small increases, to be regarded as not dangerous for health, had been detected by the Laboratory of Marine Radioactivity of the IAEA based in Monaco.

In the following days, news regarding the countermeasures decided in some Western European countries -including the neighbouring Italy and FRG- were reported. These measures were attributed by French commentators to panic and to governmental weakness in face of environmentalists' pressures. At the same time a not too heated debate on the safety of French plants began.

The CFDT and the Greens criticized the statements made by the general safety inspector of EDF, Pierre Tanguy (see, *Le Monde*, 4.5.1986, p.6) who maintained that an accident like Chernobyl could never happen in the French graphite-gas reactors, not to speak about the PWRs. The Greens, *Les Amis de la Terre* and other environmental associations also started denouncing the silence of French authorities with respect to the exact extent of the fallout on the country.

In its *communiqué* of May 5 the director of SCPRI, Pierre Pellerin, set a limit value of 3.700 bq/l for milk. This value was a very high one in comparison with the limit -500 bq/l- recommended by the EC Commission the following day (Recomendation of the EC Commission, 6.5.1986), limit value already adopted in the FRG and Italy and never applied in France.

Moreover, while also the limit set by SCPRI was considerably exceeded in Corsica, no measure was taken even in that area (see, *La Gazette Nucléaire*, 1987). It is interesting to notice that the first measures concerning milk contamination in Corsica were made by SCPRI only on May 12 and revealed a concentration of 4.400 bq/l. According to calculations put forward by the director of IPNS (Response to Dr. Denis Fauconnier of 8.12.1986, published in *Le cri du rad*, 1987: p.17), the initial average concentration had been 15.000 bq/l and the tyroid dose absorbed by a child in the first two weeks of May 1986 was around 9 rem. That is almost the double of the maximum yearly limit value (5 rem) set by the ICRP and referred to in the French Decree of 1966 on radiation protection principles.

With respect to radioactive contamination in other French areas, a study on the Var basin -in the south of France- by the CEN of Cardache (partially reprinted in, *La Gazette Nucléaire*,

1988) reveals -to give an example [9]- that Caesium contamination above 60.000 bq/m2 had been detected. This would have justified the inclusion of France among the EC countries classified as including highly contaminated areas (> 10.000 bq/m2) in the report prepared by the British National Radiological Protection Board for the EC Commission (NRPB, 1986). Instead in the contamination map draw in that report, and based on data provided by national authorities, the highly contaminated areas stop at the south and east borders of France.

On the 6th of May the Ministry of Agriculture declared in a press release that the controls made by some EC countries (like Italy and FRG) with respect to French foodstuff were absolutely unjustified given the fact that France had been totally spared by the fallout.

Three days later, France restricted imports of foodstuffs from Eastern countries.

During an OECD meeting held in Paris also on the 9th of May, the director of IPSN, François Cogné, was asked by journalists (see, *Le Monde*, 11-12 May, p.6) why in France, differently from most neighbouring countries, no protective measures had been decided. He answered that this was consistent with a recommendation given by the experts of the WHO three days before and stating that no measure was reasonable under the value of 2.000 bq/l in milk or rain water. Cogné did not mention the value of 3.700 bq/l set by SCPRI, and appeared sure that the value of 2.000 bq/l had not been met in France. Asked by the Paris office of WISE whether WHO issued such recommendation, the WHO's office of Geneva answered that this was not the case (WISE, 1986b).

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9 Another study (unfortunately not available) -also by the CEN of Cardache- on the Moselle Valley (at the border with the FRG) probably shows that contamination levels in that Valley were similar to those detected in the bordering German area (see, La Gazette Nucléaire, 1988).

Beside that, in the report of the WHO meeting held on May 6 in Copenhagen, it is written that as far as countermeasures are concerned "..differences may then only reflect ways of applying the limits. For example, in some countries 2.000 bq/l is used as an action level for I-131 in milk.." (WHO, 1986: p.26). It is worth pointing out that there is a significant difference between an example and a recommendation.

On the 10th of May the director of SCPRI showed during a TV programme the maps of radioactivity levels in France between the 30th of April and the 5th of May. He noted that such levels were 400 times higher than the ones detected before Chernobyl, but emphasized once again that they did not involve any health risk.

When asked by Monique Sené, president of GSIEN and a guest of the same TV programme, why such data had not been disclosed earlier, Pellerin answered that there had been two weekends and that SCPRI was not a public relation agency (see, WISE, 1986).

In the following days the information policy of French Authorities was harshly criticized by environmental groups and by many journalists: the front page of *Liberation* of May 12 is dedicated to *Le mensonge radioactif* (The radioactive lie) and *Le Monde* of May 13 denounce la *Desinformation nucléaire* (Nuclear disinformation). The accusations previously addressed against the secretive attitude of Soviet authorities were now directed also to the French ones.

The Minister of Industry, Alain Madelin, tried to find remedy for this situation. On his initiative an Interministry Information Structure was established on the 14th of May to guarantee "transparency of information". However, only journalists had access to such Structure. Few days later, a phone line called *Spécial Tchernobyl* was open at the Industry Ministry. Around six operators were instructed to reassure the public by answering "*tout va bien*"(everything is okay) or that "*les mesures* *sont prévues, et il vaut mieux ne pas y penser*" (measures have been taken, and it is better not to think about it, quoted in *Le Monde*, 21.5.1986). The Minister of Industry also announced that, starting from the 13th of May, the selling of spinach from Alsace was forbidden. But this protective measure, the only one adopted by French authorities, raised even more suspicion and questioning about the reasons why just the spinach from Alsace had been "incriminated". Symptoms of diffused worry and distrust appeared: for example, the selling -and the price- of many vegetables decreased in few days even if declared safe by public authorities (see, *Le Monde* 20.5).

During a programme broadcasted on May 18, the Minister of Environment Alain Carignon suggested to re-establish the Information Council on Nuclear Safety that had been created in 1978 and abolished in 1982. Such Council had the task to advice the government about information policy.

The end of May was the beginning of new worry for French citizens due to disclusure of information on two accidental events. The first one was an accident occurred in April 1984 at the Bugey plant and the second one was the irradiation suffered by five workers of the reprocessing plant of La Hague on the 20th of May 1986. These news contrasted with the reassuring statements given by governmental experts and by representatives of EDF [10] about the safety of French plants.

On the 24th of May around 5.000 people -greens, environmental associations, extreme leftist groups- demonstrated in Paris against nuclear power. The number of participants, which was far from impressive in comparison with similar demonstrations held the

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10 An important exception must be mentioned at this point: Pierre Tanguy, general safety inspector of EDF, admitted that the Bugey accident was due to *une erreur de conception* (design mistake) concerning the plant's control system (quoted by Le Monde, 23 May 1986).

same month in Italy and the FRG, showed that the French anti-nuclear movement was rather weak. However the demonstration also indicated that, in spite of their attempts to understate the extent of the Chernobyl radioactive fallout, the French authorities and nuclear industry were not completely spared by the Chernobyl political fallout.

b.2. Analysis

Before analysing the reasons for the peculiar response to Chernobyl in France and for its similarities -but especially differences- in comparison with the Italian and German cases, it can be useful to look at the action-set that emerged during the Chernobyl fallout. Figure 6 shows the main features of such action-set.

Figure 6, here

On the basis of this figure and the chronicle reconstructed above, some interesting elements can be noticed.

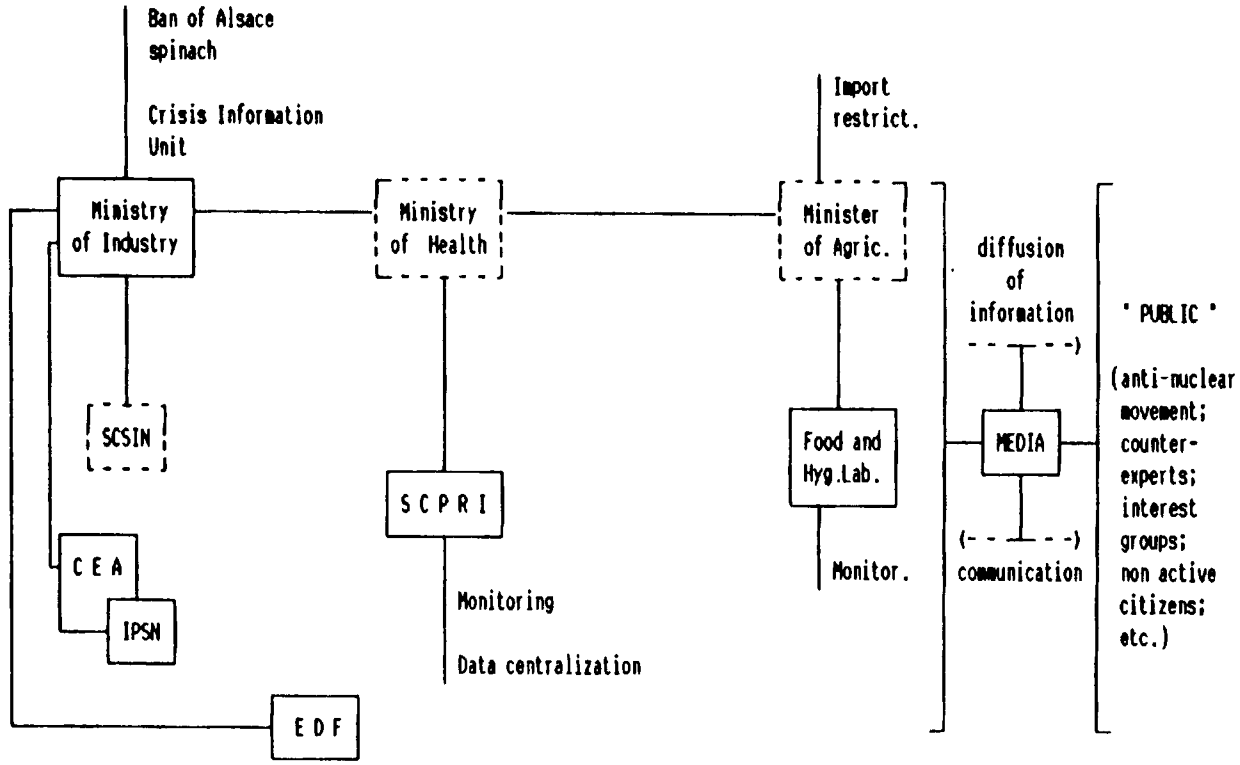
First of all, the action set that emerged in France during the Chernobyl fallout represents a drastic semplification of the interorganizational network for nuclear risk management shown in figure 5. Beside that, such action set is much "simpler" (fewer actors involved, fewer measures taken) than the action sets that emerged in Italy and the FRG in the same period.

A technical body (SCPRI) -rather than one or more political authorities- had been the central actor of the French governmental response to Chernobyl. It was the director of SCPRI, P. Pellerin, rather than the Minister of Health the person who took responsibility -at least in the eyes of the public- for taking decisions; including the decision to retain information.

Differently from Italy and the FRG, in France there had been no involvement of the Civil Protection authorities. Moreover the local authorities and the Prefects did not take any action (a part

Figure 6

THE CHERNOBYL EMERGENCY IN FRANCE:
THE ACTION-SET AND THE COUNTERMEASURES



from the Prefect of Alsace who eventually ratified a measure put forward by the Minister of Industry), nor in collaboration nor in contrast with the central authorities.

This was consistent with the general attitude -by French governmental authorities and experts- to define the Chernobyl fallout as an "external" problem having an absolutely negligible "internal" impact.

With respect to the broader social response to Chernobyl, critical attitudes toward the government and the nuclear industry had been weaker in France in comparison with Italy and the FRG, and the anti-nuclear movement only became visible almost a month after the accident. During the fallout (the situation changed afterwards) also counter-experts played a much more marginal role in France than in Italy and Germany.

Moreover, the role of the media had been quite problematic. For two weeks (a long period, especially for actors expected to give "news") the media were vehicles of almost no information on the fallout in France. Furthermore, they were only scarcely able to be arenas of communication between different sectors of society.

Beside the above mentioned aspects, a main difference between the French case and the Italian and German ones must be pointed out. That is, the difference concerning the countermeasures taken in the three countries.

In contrast with the restrictions on the selling and consumption of milk and vegetables adopted in Italy and the FRG, only the ban of Alsace spinach, that is a marginal and tardy protective measure, was decided in France. Even if it can be reminded that also imports' restrictions were implemented, it has to be pointed out that this measure regarded that "outside world" which had not been spared -as was instead declared to be the case of France- by the radioactive fallout. Monitoring and data centralization were performed also in France, but gaps and delays (at least if it is true that the first measures in Corsica were made by SCPRI only starting from the 12th of May) were more remarkable there than in the FRG and Italy. This in spite of the fact that Italy (also due to the presence of few nuclear plants in the country) was certainly less equipped than France in this respect, and that Federal/State cleavages made sometimes difficult the collection and organization of data in the FRG. Even more important, as far as the information to the population (but also to neighbouring countries) was concerned, France was a unique case of almost total blockage of such information.

In order to understand why the institutional and social response to Chernobyl in France was characterized by the above mentioned features and why did it differ almost totally from the response to the same event in the neighbouring Italy and FRG, it is necessary to analyse the relations between experts, politicians, the anti-nuclear movement and mass media. Particularly it must be examined how was scientific evidence and information selected by experts, how was it utilized by politicians, how was it asked and/or produced by anti-nuclear groups, and how was it worked out and diffused by the media in farming issues and in making decisions or non-decisions.

b.2.1. Science as power.

The French governmental experts who took a leading role in the response to Chernobyl managed scientific uncertainty by denying it. They seemed to be absolutely certain that radioactive contamination was negligible and that no health risk was at stake.

As an example of this "abolition of uncertainty", one can take a statement by the director of SCPRI. With respect to a controversial (trans-)scientific issue like the health risks due to low doses of radiation, Pellerin declared without esitation that "In my opinion, the concept of the absence of a thresold belongs to the cathegory of imaginary problems..." (interview by

Alexandre Sidorenko published on 1.9.1989 in *Biélorussie Soviétique* and quoted in *La Gazette Nucléaire*, 1990). On the other hand, with respect to the (also very controversial) definition of "low doses", Pellerin aknowledged that such definition is a matter of convention. In fact he said (in the same interview), "The answer to this question depends on your profession (...). If you are a radiologist, one could calculate that a dose of 20 rad is a low one. But if you were an official of the radiological protection services, one would consider it dangerous, almost mortal".

This mix of certainty and conventionality has been crucial with respect to the experts' management of the Chernobyl fallout in France. On the one hand, scientists were -or pretended to be- sure that no uncertainty underlies the selection and interpretation of data, nor the assessment of health risk. At the same time, they defined themselves -beside being appointed as such within governmental bodies- as the experts having the authority to establish the relevant conventions. Mainly the conventions that regard the acceptability of risk and guide the decisions about countermeasures.

SCPRI's scientists appeared to be so certain about their knowledge and so confident about their authority to establish conventions [11], that set limit values which were very high in comparison with those adopted in the neighbouring countries and refused to re-examine their position in the light of the recommendations by the EC Commission. A relatively more prudent position was taken by IPSN as shown by the reference made by its director, Cogné, to the WHO's meeting and its (supposed) recommendations. But IPSN's experts too did no express any doubt about the lack of health risk for the French population. With

11 Due to the refusal of the whole equipe of SCPRI to be interviewed, it is not possible to reconstruct the debate within SCPRI and see whether such certainty and confidence had been shared by all its members.

respect to nuclear safety, also the engineers of SCSIN and EDF showed no uncertainty in maintaining that an accident like Chernobyl was impossible in France and that no specific measures were to be taken to improve the safety of French plants.

However, a report written by the general safety director of EDF, Pierre Tanguy in 1989, seems to indicate a changed -less certain and "optimistic"- attitude [12] (Tanguy, 1990).

If one compares this sort of "monolithism" (at least in public) of French governmental experts with the role played by governmental experts in Italy and Germany, some interesting differences emerge.

In Italy disagreements between experts working within different governmental advisory bodies as well as between official experts and independent ones were experienced and expressed in public. Such situation did not prevent decisions to be made; on the contrary measures were taken and implemented in a relatively short time. In the FRG governmental experts, under the "leadership" of SSK, agreed about the interpretation of the available evidence as well as about the advice to be given. Deep controversies arose instead between governmental and independent experts. Also in the German case controversies favoured the adoption of protective measures and a relative openess of the decision process since governmental experts, challenged by counter-experts, had to justify/find arguments for their recommendations. In France not only governmental experts appeared to share the same certainties, but these certainties were challenged -during the fallout- by very few independent experts. In this context, no protective measures were adopted apart from an "external oriented" (import restrictions) and an absolutely marginal one (the ban of Alsace spinach).

12 Unfortunately also members of EDF working in the field of safety refused to be interviewed, therefore the process leading to this changed attitude can be only partially induced from Tanguy's report. The report, meant to be confidential (but parts of it were quoted in newspapers), was obtained from sources external to EDF.

This was not due (as maintained by French authorities and widely believed abroad) to the "objectively" different extension of the fallout in France in comparison with other countries; as previously mentioned, some French areas were as highly contaminated as some Italian and German ones. Rather it was due to three main elements: 1. the presence of a closed scientific nuclear community/corporation; 2. the centralized management of scientific information; 3. the closure of the political and administrative system with respect to nuclear issues.

As far as the first point is concerned, the training of the scientist working in the nuclear field is similar and is mainly done within the *Ecole Polytechnique*; in turn such school opens to its most successful students entry into a number of elite corporations called *grand corps* [13]. Members of such *corps* lead all of most important organizations involved in French nuclear sector: for example, CEA is a "domain" of the engineers of the *corps des Mines* and EDF of the engineers of the *corps des Ponts et Chaussées* (Davis, 1988). In spite of its health oriented task, also SCPRI is lead by an engineer of the influential *corps des Mines* and previously working within CEA. A statement of Pellerin can be taken as an example of the fact that the change of place and legal task does not necessarily cause a change of attitude, in this case toward a more "precautional" (in radiation protection terms) one. After being within SCPRI for already eight years, Pellerin reccomended -in the *Annales des Mines*- "not to develop excessively safety measures in the nuclear plants in order not to create an unjustified anxiety" (article published in *Annales des Mines*, January 1974, and quoted in *La Gazette Nucléaire*, 1990).

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13 Systematized by Napoleon, but already existing before him, the *corps* and especially the (most prestigious) *grand corps* were supposed to have a spirit of their own which would mark them differently from other branches and would give them a desire to excel. The 1945 reform of the civil service did not abolish the *grand corps* which are presently formed by few (but powerful) hundred members each (see, Blondel, 1974: pp.179-181). On the role of *grand corps* in French administration and politics see also, Crozier, 1963 and Hayward, 1982.

In general terms, the similar training and the affiliation to similar elite corporations (an element that involves a certain closure of the scientific nuclear establishment) give raise to a rather homogeneous point of view among scientists working in the nuclear field.

Concerning the second point, the French response to Chernobyl was characterized by the legally formalized monopoly of monitoring data by one governmental service (SCPRI), the secretive attitude of such service's director, the lack of access to data held by SCPRI and other governmental bodies, and the lack of independent monitoring units. Due to these conditions, SCPRI acted as an "absolutist" authority able to exercise its power both over other governmental scientific bodies and over independent scientists. The first ones being legally bound to send data to SCPRI and not interfere with its recommendations/decisions in the field of health protection (Brenot, interview); the second ones lacking the means to challenge -through independently gathered data- SCPRI's reassuring statements. If one links this power of SCPRI with the tendency shown by its members to understate the risk involved by nuclear power (for example, by indicating as "safe" limit values regarded as too high by many other scientists at the international level), it is not surprising that no protective measures were suggested by French governmental scientists.

b.2.2. The discreet charme of nucleocracy

The third element to be analysed in order to understand why no protective measures were taken in France is the closure of the political and administrative system with respect to nuclear issues. The strenght of the French nuclear industry and, more in general, the "untouchability" of nuclear power -regarder as a pillar of French economic, military and technological *grandeur*- are good reasons for hiding or understating any event that could raise doubts about the safety of nuclear technology. And this can be done only if the political and administrative system is able to keep everything (including dissent) "under control".

With respect to Chernobyl, the centralized and technocratic organization of the French bureaucracy had been initially successful in imposing a definition of the fallout as an "external" problem having a negligible "internal" impact. And therefore, in defining the situation in France as a "normal" one, as a "non-emergency".

Local authorities and even the usually powerful Prefects (that is the representatives of the central state at the local level) had no say: everything was decided in Paris. And this is consistent with the model of centre-periphery relations generally referred to as the French model; that is a model close to a hierarchical pyramid and characterized by a quasi-militar concept of organization (Mény, 1990: p.246). This model -together with the fragmentation of the French local system, the marginal role of local authorities with respect to nuclear issue and the lack of pressure from citizen initiatives- can explain the passiveness of French local powers during the Chernobyl fallout. However, the problem remains of explaining the decision process at the central level.

As previously noticed, a technical service -rather than a political authority- took a leading role in the first phase (till the 12-13 of May) of the management of the Chernobyl fallout. This sort of delegation of authority from political to technical bodies is not peculiar to the Chernobyl case; in general, technicians have a very high influence within the French bureaucracy. The French public administration is run, starting from the Ministries, by people who are trained in the *grandes écoles* [14] and are members of *grands corps*: and the fact that technicians are in charge justify the widely used expression of "technocracy" (Blondel, 1974; Meynaud, 1960; Meny, 1990). Beside

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14 With respect to the system of recruitement through the *grandes écoles*, a former student of the *Ecole Polytechnique* introduced the term *Polytechnique mafia* (quoted in Meny, 1990: p.284).

taking some "weight" off politicians' shoulders, the creation of a sort of technical caste within the administration can also be an important tool for copying with internal and external pressures so that possible crisis can be controlled and eventually eliminated (Crozier, 1963; 1970).

According to some scholars, the role of technicians is even more important with respect to nuclear power, "It is not the government that designed nuclear policy, but the technical bodies of the state; especially the CEA, and -in second place- the EDF" (Debeir et al., 1986, p.310). Given the influence of nuclear technicians/experts both as a rather closed and (especially in the military sector) isolated caste and, at the same time, as a caste within the caste running the public administration, one can speak of "**nucleocracy**".

The delegation of responsibility to "nucleocrats" during the Chernobyl fallout is shown not only by the preeminent role of SCPRI's director, but also by the manner the official definition of the situation was built.

Concerning the first point, it must be pointed out that one reason given by the director of SCPRI for his secretive management of information was that he was not allowed to release certain data. Even if in other occasions, like the *affair* of the Mont Louis [15] of 1984, he did not resort to this argument and "gave good TV performances" (Brenot, interview), it is true that a Decree of 1983 could be used by SCPRI experts as a ground for retaining information. The Decree 83-100 of 10.2.1983 establishes in fact that the people in charge for the control of nuclear materials are obliged (through an oath) not to disclose information known while in service. A juridical discussion of the relevance of this decree in the case of Chernobyl as well as the possible contrast between this decree and the decree of 1966 giving SCPRI the task to inform the population in case of accident goes beyond the scope

15 The French ship Mont Louis, that was carryng uranium exafluoride, sank near Ostende causing serious sea pollution.

of the present work. What is of interest here is to notice that, whatever the case, the Minister of Health let the director of the technical service decide whether to speak or keep silence.

Regarding the way the official definition of the situation was built, for around two weeks politicians kept a low profile and let the experts of CEA, EDF, SCPRI, and SCSIN draw the picture of a country which political borders had been able to stop the fallout, where people were running no radiation risk and where nuclear plants were absolutely safe. Only when this reassuring picture collapsed (that is, following the media campaign started after Pellerin's disclosure of data about the fallout in France), some politicians tried to recover direct control over the situation.

The Minister of Industry was the most active governmental authority in this respect. First of all he tried to remedy the most evident and "hot" issue, i.e. information, by establishing the interministry information structure and the special phone line on Chernobyl. Then he decided a measure, the ban of Alsace spinach, aimed at showing that public authorities were taking care of public health. Interestingly enough, in this case the Minister of Industry took an action that was theoretically within the competence of the Agriculture Ministry and/or (in emergency cases) of the Prefects in collaboration with the Ministry of Interior. Even if the Alsace Prefect (Haut Rhin department) ratified the ban of spinach, the procedure was at least original (as remarked also in *Le Monde*, 15.5.1986, p.8).

The explanation for this can be twofold. On the one hand, the Ministry of Industry is the most important French governmental authority with respect to nuclear power and then prevailed over other Ministries such as Agriculture in taking decisions. On the other hand it was unthinkable, for practical and political reasons, to start emergency procedures with almost two weeks delay; therefore Prefects were only marginally involved and an unusual (in between routine and emergency) procedure was adopted.

The tardy and partial information efforts and the decision to ban just the poor Alsace spinach were not effective in regaining credibility in the eyes of the public. As already mentioned, the selling of vegetables decreased in a few days in the month of May. Beside that, an opinion poll conducted in 1987 showed that 79% of interviewees held the opinion thet politicians tell lies with respect to nuclear issues (opinion poll made by Gallup in February 1987 and quoted by Davis, 1988: p.8).

b.2.3. Nuclear disinformation

The French media had been full of Chernobyl news starting from the 30th of May. However they gave the "news" about the fallout in their country with almost two weeks delay. This was primarily due to the restrictive information policy by official sources (i.e. SCPRI) and the lack of independent (and able to make their voice heard) monitoring sources. Beside that, some observers suggest that two characteristic of the French mass media -i.e. the almost total absence of investigative journalism and the links between many journalists and the nuclear lobby- played a role too (Schneider, interview).

A brief examination of the articles published by the very influential French newspaper *Le Monde*, in the period 30 April-13 May 1986 can be useful at this juncture.

First of all, the first news on Chernobyl reached the front page of *Le Monde* only on the 30th of April, i.e. one day later than the Italian *La Repubblica* and the German *Frankfurter Allgemeine Zeitung*. Underestimation of the event as "worthwile news"?

Beside that, the divide between what was happening "there" (Ukraine, USSR and, later on, neighbouring European countries) and "here" (France) was more remarkable in the French newspaper(s) than in the German and Italian ones. The news were only about "there" and also most comments were about the problems "there", especially concerning information problems. Brief references to the situation "here" started appearing in *Le Monde* on the 2nd and the 3rd of May, when articles about "here" were already filling newspapers' half-pages in Italy and the FRG.

Reassuring statements by official sources were reported in all three countries; but while in Italy and the FRG public statements were given especially from politicians, in France they were reported almost exclusively from experts' sources.

Like the Italian and German newspapers, *Le Monde* emphasized energy policy and safety issues, and gave some room to the positions of the Greens and other environmental associations.

But, while reporting some criticism toward the non-disclosure of data, the newspaper's editorial line never raised doubts -till the 13th of the May- about the reliability of official sources. On the contrary it suggested/supported the view that people and authorities of the neighbouring countries were irrational in asking for and taking protective measures. *Panique générale en Italie* is the title of an article published on May 6 (p.14) where the disagreements between different Italian Ministers are rightly pointed out but an anti-measures opinion is implicity favoured (for example, by reporting that even the Communist newspaper *L'Unità* was critical -without explaining why- toward the measures adopted and suggesting thet they could be revoked before their term). Also the reactions in the FRG are attributed to *panique* in the editorial *Les retombées politiques de Tchernobyl* ("The political fallout of Chernobyl", 9.5.1986) where the German panic is contrasted with the French *parfaite sérénité* justified by *des raisons techniques*. Technical reason regarded with suspicion outside the borders only due to the traditional *incompréhension* between the (emotional) FRG and the (rational) France. The article *La France seule sereine* (10.5.1986, p.1) emphasizes again the contrast between the serenity (term used also to denote "objectivity") of French (non)response in contrast with the response in Italy, the FRG and Holland.

Three days later, the editorial *Désinformation nucléaire* accuses the government for not taking the responsibility to inform the population about the fallout and provides the following comment, "*Lorsqu'il s'agit de l'atome, les responsable français sont comme tètanisès. Prise entre les ècologistes -devenus pourtant bien sages- et les "ayatollahs du nuclèaire" -comme disent certain industriels pour dèsigner les ingèniers chargès du programme française, le gouvernement a fait le gros dos et s'est cantonnè dans le silence.*[16]"

The problem is the following, why did *Le Monde* (and most French newspapers) realize only so late that governmental authorities were silent and that SCPRI's director was withholding data? Did journalists never have the curiosity to get "numbers" to verify the qualitative ("negligible level" and so on) statements by Pellerin?

French mass media can be hardly regarded as "worse" than the Italian and German ones as far as the usual timeliness, quality and pluralism of the information provided is concerned [17]. It is then probably the case that some "case specific" (or "nuclear specific") elements prevented the "curiosity" of most French journalists to arise or to be expressed. These elements regard the specific sort of customers, sources and public the French media were working for/with during the Chernobyl fallout.

With respect to all three elements (but especially the customers' side), the pressure of -or direct links with- the powerful nuclear lobby had a "discreet" role in making the media

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16 "When the atom is at stake, the French authorities suffer from lock-jaw. Caged between the ecologists -who became wiser in the meantime- and the 'ayatollah of nuclear power', as some industrialists calls the engineers responsible for the French programme, the government .. took refuge in the silence".

17 Studies concerning the features and the role of the mass media usually deal with problems like the ways of constructing the news, setting the agenda, etc. in a rather general, "supra cultural" perspective (see references of Chapter 7; for an informed bibliography see, Wolf, 1985: pp269-288). While this may represent a shortcoming of such studies, it is likely that in three countries sharing similar political and economic systems the mass media follow -broadly speaking- similar rules.

keep a low profile with respect to news that could be dangerous for the French nuclear programme. For instance, in suggesting/imposing a reassuring (for the French) and indirectly pro-nuclear interpretation of the responses to Chernobyl in the neighbouring countries.

Regarding the information sources, the role of experts must be pointed out. Beside the diffused attitude to "delegate" problems to experts within the French society, a more general tendency to resort to experts by non-experts on scientific and technical issues made not only French but also Italian and German journalists rely on experts as main sources of information. The main differences being that in Italy and the FRG more room was given (at least comparing the three mentioned newspapers) to the opinions of independent experts.

In turn this was due to the scarcity of independent experts in France (only few scientists of GSIEN provided counter-expertise during the fallout), and to the weakness of the antinuclear opposition. A main aspect of such weakness being, in turn, the underestimation by French anti-nuclear groups (till Chernobyl) of the importance to develop and utilize scientific expertise (Boyer, interview; Schneider, interview). This situation explains why in France -differently from Italy and the FRG- no effective pressure was exercized by NGOs to get a more comprehensive and precise information from governmental sources and from the media.

On the other hand, when the "sin" (secrecy) and the "sinner" (Pellerin) were "discovered", the media became highly critical (but also representatives of CEA-INPS, SCSIN and EDF criticized Pellerin) and gave more room to the opinions and initiatives of ecologists and counter-experts. In this respect, the media played a crucial role in "breaking" the official definition of the fallout as an external issue, and therefore a non-issue within the borders, and in favouring a shift from non-response to the adoption of some measures (tardy and symbolic but nevertheless measures).

The changed attitude of the media was not so much the result of a "discovery of the truth"; in fact, as mentioned already, the "truth" had not been intensely looked for by journalists. Rather it was due to the need/intention of the French media to dissociate themselves from the secretive management of the fallout by governmental authorities; secretive management which was being increasingly criticized both within the country (by independent experts, anti-nuclear groups, the CFDT, some politicians) and outside the borders (as reported, for example, by Italian and German newspapers). Since the media have the task to give information, to participate in the withholding of information contradicts the very function -and the credibility- of the media. Thus French media had no choice (which does not mean that several journalists were not also sincerely motivated in doing so) but start a "transparency campaign" and provide room for a more balanced communication between different points of view. This in turn favoured some governmental responses -even if tardy and merely symbolic- and some reactions from "below", from distrust implicitly expressed by consumers who avoided buying vegetables to explicit protests.

Information aspects proved to be crucial also in the medium- and long-term changes that occurred after Chernobyl.

b.3. Concluding remarks.

Arguments and evidence were presented in the previous paragraph to explain why the French response to the Chernobyl fallout was so different in comparison with the responses in the neighboring Italy and FRG.

The first point that emerged is that, contrary to what was maintained by French governmental authorities, the decision to take no protective measures was not due to the "objectively" different extension of the fallout. In fact, according to data gathered from CEA's research centres and SCPRI itself, some French areas were as highly contaminated as some Italian and German ones (Corsica being the most striking case in point).

The reason why protective measures were not taken and information was withheld could be then the importance of nuclear power (and the nuclear lobby) in the French economy, politics and society. Certainly the size and pervasiveness of the French nuclear programme played a major role in making all those involved (from industrialists to politicians and even sectors of the public) to understate the seriousness of the Chernobyl fallout; however, this is not sufficient to explain the French response. After all, also the German nuclear programme and lobby are very important and the military utilization of nucler power, which is part of the French but not of the German programme, was not at stake in deciding about how to respond to the Chernobyl fallout.

The French response can be understood only by taking into account the relationships between experts belonging to a rather closed scientific community/corporation, politicians who often delegate responsibility to technicians, a weak anti-nuclear movement, and mass media that initially did not dare to challenge the official "truth". The patterns of interaction between these actors and the use they made (or were not able to make) of a crucial resource, i.e.information and knowledge, make us understand not only why protective measures were not taken and why a definition of the fallout as an "external" problem was successfully suggested/imposed for a relatively long period; it also explain why such definition of the situation was then challenged and some symbolic measures were taken after two weeks.

Also in the French case, the management of uncertainty had been at the core of the response of the fallout. But differently from what happened in the Italian and German context, where controversies among experts and politicians emerged and were made public through the media, in France uncertainty was mainly dealt with by denying it. For about two weeks scientific uncertainties regarding the possible consequences of the radioactive fallout were prevented from becoming an issue by stating that the fallout did not affect France; this definition of the situation also prevented organizational uncertainties to arise since conflicts of responsibilities can hardly arise regarding non-actions or non-decisions. When the *"parfaite sèrènité"* allowed by such situation was troubled by the "discovery" that France had not been spared by the fallout, only one certainty remained. That nuclear secrecy was not a pecualiarity of the Soviet system.

c. The years after.

The delayed/"second degree" responses to Chernobyl in France mainly concerned information problems.

The first initiative aimed at dealing with a major problem met during the Chernobyl fallout, i.e. "monopoly" of data, came "from below". An independent monitoring network, CRII-RAD, was established by the end of May 1986.

On the governmental side, some institutional adaptations were made to address information management issues.

Also the Parliament became active and commissioned to the Parliamentary office for the Evaluation of Scientific and Technical Choices a report on the consequences of Chernobyl. The Parliament also debated energy policy in 1989; however, in that occasion the members of the Parliament were not provided with a report (Rouvillois Report) commissioned by the government and moderately critical toward the French nuclear programme.

Last but not least, information issues (beside safety problems) were addressed also by EDF.

c.1. Post-Chernobyl events

c.1.1. Independent monitoring network.

By the end of May 1986 some scientists working in collaboration with the University of Lyon established the CRII-

RAD, Independent Commission for Research and Information on Radioactivity.

Main purpose of CRII-RAD is to break the SCPRI monopoly of data by performing independent monitoring and analysis and to diffuse as much as possible the results. Monitoring is performed by various decentralized CRII-RAD groups, 14 in 1989, and other associations collaborating with CRII-RAD, 14 in France plus one in Catalunya -Spain- also in 1989 (see, *Le Cri du Rad*, 1989). The central laboratory of CRII-RAD, based in Montelimar (South of France), carries out the analysis of the measurements. As far as the dissemination of data is concerned, information is diffused through public meetings, training-sessions, radio and TV broadcasting and a bi-montly magazine called *Le cri du Rad*. With respect to both its scientific and information activities, CRII-RAD collaborates with other French independent experts, mainly those of GSIEN.

CRII-RAD has been supported by several elected representatives, local governments and journalists (Rivasi, 1990). Thanks to such support and to the quality of its work, CRII-RAD gained both a wide audience and official credibility.

Recently (since 1990) also the Ministry for Environment - which desires to participate more actively in the control of environmental quality, including radioactive contamination- started supporting CRII-RAD. This is also due to the still crucial centralizing role of SCPRI and the related interministry conflict. A conflict is in fact going on (Brenot, interview; Schneider, interview) between the Ministry of Environment, wanting data on radioactivity, and the Ministry of Health and its service which are unwilling to provide not only the public but also another Ministry with not already selected and organized data. The present Minister for Environment tries then to find a remedy for this situation by resorting to data provided by CRII-RAD. Interestingly enough, a governmental authority has to rely on an independent information structure in order to obtain data that should be made available by another governmental body.

c.1..2. Institutional adaptations

Some institutional adaptations were also made after Chernobyl to deal with information and communication problems.

First of all, according to a Prime Minister Directive (Ministry of Industry, 1987: p.15) the information structure established within the Ministry of Industry in May 1986 with the task of coordinating public information (including information through the mass media) must be put into action again in case of accidents.

Moreover, a Decree adopted on the 2nd of March 1987 modified the composition (by including some journalists) of the National Council for Nuclear Safety (CSSN), an advisory body of the Minister of Industry, and renamed it National Council for Nuclear Safety and Information (CSSIN). Since 1987 CSSIN is then formed by 41 members: the previous 35 ones -representatives of various Ministries, CEA, EDF, trade unions, scientific institutions- plus 6 journalists.

These adaptations show the intention by governmental authorities (especially the Industry Minister) to improve their management of information on nuclear matters through better interministry coordination and the inclusion of experts/practictioners in mass communications (that is journalists) as governmental advisers. However, this does non necessarily involve a more pluralistic and transparent information to the public.

Another institutional adaptation to be mentioned concerns SCSIN. Since June 1988, SCSIN -while remaining a technical body of the Ministry of Industry- is at disposal of the Ministry for Environment (Poyou, interview). The Minister for Environment is pushing for obtaining the control of SCSIN, but the opposition of the much more powerful (in economic and political terms) Minister of Industry makes this change very unlikely.

c.1.3. The Parliamentary Office report and the Rouvillois report

Also in May 1986, the Parliament asked the Parliamentary Office for the Evaluation of Scientific and Technological Choices (from now on referred to as *Office Parlamentaire*) to provide a report on the consequences of the Chernobyl accident and the safety of French nuclear installations. Such report, completed in Decembre 1987, analyses the consequences of the accident in USSR and in France as well as the possible lessons to be drawn with respect to institutional and technical aspects.

Concerning the consequences of Chernobyl in France (*Office Parlamentaire*, 1987: pp.89-121), the report utilizes only data provided by SCPRI; interestingly enough, Corsica is never mentioned nor included in the maps and the studies of CEA -CEN of Cardache- are not taken into consideration. On the basis of SCPRI's data, and on the basis of the argument that intervention levels (lower in other countries) are set on the basis of extra-scientific resons, the decision not to take protective measures is substantially supported.

What is instead (even if moderately) criticized is the governmental management of information. But in spite of these criticisms, the report suggests to keep a centralized information structure in order to assure a coherence of the messages diffused (*Office Parlamentaire*, 1987: p.120). On the other hand, the report stresses the need not to leave information only in the hands of nuclear experts. In this perspective, the Office supports the decision to enlarge the CSSN, but notices that the silence of CSSIN about two accidents (at Creys-Malville and at Pierrelatte) that occurred just after its establishment raises doubst about its role (*Office Parlamentaire*, 1987: p.121).

Concerning the lessons to be drawn in France from Chernobyl, the report emphasizes that the double role of the Industry Minister and CEA, both promoters and regulators (through SCSIN and IPSN, particularly with respect to licensing procedures) of nuclear energy should be addressed. In order to overcome such situation, regarded as extremely negative, the *Office Parlamentaire* recommends the establishment of a Nuclear Safety and Information Agency (p.149, p.217). Such Agency has never been created. Other lessons to be learned, according to the *Office Parlamentaire*, regard the development of a "safety culture" in the management of nuclear installations (p.189) and the improvement of emergency management procedures both at the national and the local level (pp. 194-201).

Less than two years after the presentation of the report of the *Office Parlamentaire*, another report -this time on the perspective of the civil nuclear sector in France- was commissioned by the Minister of Industry to three experts (H.Guillaume, R.Pellat, P.Rouvillois). Such report, meant to be "confidential" was made public in March 1990 by CFDT in order to "break the conspirancy of silence" (CFDT, 1990; Tassar, interview) and to protest against the fact that even the Members of Parliament who discussed energy policy in Decembre 1989 had not been allowed to read that report.

The Rouvillois report, offers a substantially positive evaluation of the French nuclear programme but stresses two very sensitive issues, that is the *surdimensionnement et rigidité* of such programme (Rouvillois, 1989: p.32-57). With respect to the first point, especially EDF is called to account for its expensive overproduction of nuclear energy, in spite of the fact that EDF's energy consumptions forecasts are taken -according to some critics- as *argent comptant* (see Troglic, CFDT representative, quoted in *Le Monde*, 11-12 March 1990). As far as the second point is concerned, especially the double role of CEA, the rigidity of its structure and its influence on governmental decisions are considered alarming. In order to put remedy to this situation, the Rouvillois report suggests to reduce the personnel of CEA (21.500 employees in 1988), to distinguish more clearly the tasks of its main branches (industry, military application, research, control) and to put IPSN under the responsibility of

SCSIN (Rouvillois, 1989: pp.103-104). Some steps, especially regarding the first point, have been taken by CEA; however, the reorganization of such an enormous, complex and powerful organization is a very difficult process (Brenot, interview).

c.1.4. EDF and the issues of information and safety

On the 14th of February 1990, *Le Canard enchainé* published an article concerning an internal report by the General Safety Director of EDF, P.Tanguy. The "scoop" of *Le Canard* (later on the news was published in other French and foreign newspapers) pointed to the fact that, according to Tanguy's report, the probability for a major nuclear accident to occur in France is *quelques pour cent dans les dix ans à venir*.

This is in fact what is written in the report (Tanguy, 1990: p.7). Such worrying estimate, that contrasts with the previously accepted probabilistic assessment (1 on 1 million per year reactor), is argued for on the basis of the analisys of accident occurred at French plants and the examination of problems like the ageing of installations and various organizational/control difficulties.

In order to face the far from negligible risk of accidents, Tanguy suggests both technical and organizational measures. With respect to the second ones, he recommends -among other things- to improve internal communication procedures in order to develop a "safety culture" (p. 14) and to make visible all the decisions made by EDF in the field of safety in order to keep the consensus of politicians and the public (p. 3).

c.2. Learning from Chernobyl ?

Comparing the changes that occurred in France with those occurred in Italy and the FRG some interesting points emerge.

In all these three countries the management issues were addressed, but at different levels and with different consequences.

In Italy the whole management of nuclear power technology was re-examined in various fora (parliamentary inquiry, national conference on energy, referenda) and was very much "politicized"; due to reasons already analysed, various "peripheral" adaptations and a "core" policy changed followed. In the FRG, especially the issue of the distinction of responsibilities between federal and state authorities in the management of nuclear accidents was addressed; organizational and legal adaptations were then adopted in the direction of a more centralized management at the federal level. In France the "hot" issue of information vs secretiveness in the nuclear field was regarded as crucial by governmental authorities and non-governmental organizations as well; the initiatives "from below" and the "cosmetic" institutional adaptations that were taken/made following Chernobyl deal exclusively with this aspect of nuclear risk management.

As it was suggested in the case of Italy and the FRG, to understand whether the changes made in France can be interpreted as parts and results of a learning process two main aspects will be analysed, i.e. the changes in the framing of issues and the adaptations which had been made.

c.2.1. **Changes in the framing of issues.**

Differently from the Italian and German case, the French post-Chernobyl debate was only marginally framed according to the dichotomy "yes/no to nuclear power"; the weakness of the anti-nuclear movement and the lack of anti-nuclear positions within political parties prevented a strong politicization of the debate based on such dichotomy.

Rather the (also not new) dichotomy secrecy vs information/transparency became central together with the linked issue of the credibility of institutions. A common frame -that is the need for information and transparency, also as a condition for credibility- was shared by actors holding different views regarding the yes/no dichotomy, from the Greens to critical supporters of nucler power (such as CFDT), the Director General for Nuclear Safety of EDF, and certain governmental authorities.

This emphasis on information aspects, was also not new. In fact (as mentioned earlier) already in the early eighties the need for transparency was acknowledged by the Socialist Party when it went to power. And this position allowed that party to change its previously very critical attitude towards the French nuclear programme without "losing face" thanks to the introduction of some procedural transparency.

It can then be argued that not only no new frame emerged regarding nuclear power and its management, but also no substantive shift or new emphasis within the existing frames followed the Chernobyl accident. Rather, a previously experimented emphasis on information aspects was suggested. The main difference being that this time such emphasis was put forward by several actors (rather than one) who partially introjected the already successful frame.

With respect to this point, the role of existing frames in constraining reframing must be stressed. In the French case, it can be also noted that not only the strenght of the nuclear policy paradigm per se, but also the mentioned pervasiveness of nuclear power in the French economy and society produce a strong resistance to "radical" reframing.

c.2.2. **Policy, organizational, legal, technical adaptations.**

The emphasis on information aspects was reflected in the adaptations made in France in the months following Chernobyl.

No core policy change took place, and also the peripheral changes that were made were much more marginal than those adopted in the FRG and Italy. No new institutions (like the BMU) were established, but rather new units were formed within existing ones (mainly the information unit within the Industry Ministry); the reform of existing institutions, like CEA, is going on, but such process was not accelerated by the Chernobyl accident as it happened in Italy with the reform of ENEA. A new Law on the prevention of major -natural and technological- hazards (Law 87-565 of 22 July 1987) was issued, but it does not deal with nuclear hazards.

The adaptations made in the field of nuclear risk management can be summarized as follows.

Reactor safety.

No major adaptations were made in this field since French experts agreed (as experts in other western countries) that an accident like the one occurred at Chernobyl could not occur in Western rectors due to the confinement system of LWR and PWR reactors. However, some measures were suggested by EDF's safety director to cope with the risks involved by the ageing of nuclear plants. In few cases reactors were temporarily closed due to incidents, the most famous one being the Superphènix that could be even closed for ever (as suggested by French newspapers on 30.1.1992); and this caused tensions between the Division of nuclear installations safety (DSIN) of the Minister of Industry and EDF (Poyou, interview; *Le Monde*, 30.1.92). Tensions that, in case they develop, could bring important shifts or even changes in French nuclear policy.

Radioactivity monitoring.

The main change in this field came from non-governmental experts who established an independent monitoring network to contrast the centralized and secretive management of data by SCPRI. Moreover, contrasts are going on between the Ministers of Health and Environment regarding the accessibility of raw data on radioactivity in the environment and the possibility to re-examine the distinction of competences between governmental bodies in the field of radioactivity monitoring.

Emergency planning.

The emergency plans to be adopted in case of nuclear accidents at the departmental level (Orsecrad) -plans introduced in 1963 and modified in 1972 and 1981- were not modified after Chernobyl; for instance, by Law 87-565 of 22 July 1987. Such Law provides however for an integration of specialized emergency plans (like Orsecrad) and the specific intervention plans (*Plans Particuliers d'Intervention*, PPI) within the context of civil protection policy by the Interior Ministry. No debate, as in the Italian case, about national emergency plans in case of radioactive fallout emerged.

Information and communication.

This was the main point of debate in France following the Chernobyl experience and institutional adaptations were made (the establishment of a special unit within the Industry Minister and the inclusion of some journalists in its advisory body CSSIN) to improve the governmental management of information.

These ("cosmetic") adaptations do not affect the most important feature of the French information system in the nuclear field, i.e. the centralized management of data by SCPRI. However, they can be viewed as an attempt by the Industry Ministry to gain some control as far as the information to the public is concerned; and in case of different opinions about the kind of information to be released, contrasts between governmental authorities officially responsible for information aspects could arise.

Also in the field of information and communication the most remarkable change is represented by the establishment of an alternative monitoring network committed to "transparency".

c.2.3. Concluding remarks.

Also in the French case (as in the previous ones), it is possible to trace "learning" in terms of framing and understanding/reflection on issues and in terms of the adaptations made as a consequence.

The much more limited extent of both reframing and actual adaptations can be explained by the strenght of pre-existing frames (policy paradigm) and consensus (among the main political parties and at the broader social level) regarding nuclear issues. Moreover, the resistance to change by hierarchical organizations such as CEA further constrained the scope of conceivable (according to dominant frames) adaptations. In this respect, the main feature of learning (in this case mainly governmental learning) in the French case seems to be the ability to learn not to give room to possible radical changes.

On the other hand, adaptations like the establishment of independent monitoring networks indicates the emergence, or re-emergence, of a movement willing to challenge the "ownership" by governmental authorities and experts of the problem of nuclear risks and to suggest different (from the dominant ones) ways of seeing how that problem should be dealt with.

REFERENCES

BARNY, M.H., S.BONNEFOUS, J.BRENOT, J.P.PAGES (1989), "The evolution of French opinions about nuclear matters before and after Chernobyl" in B.Segertsåhl and G.Krömer ed., Policy Responses to Large Accidents, IIASA, Laxenburg, Austria

BLONDEL, Jean (1974), The Government of France, Methnem & Co.Ldt, London

CARTIGNY, J, (1988), "Sécurité nucléaire et coordination interministérielle", in Revue Generale Nucléaire (RGN), n.5, pp.392-394

CHAUDRON, Martine and Yves LE PAPE (1979), "Le mouvement écologique dans la lutte anti-nucléaire", in F.Fagnani and A.Nicolon ed., Nucléopolis. Materiaux pour l'analyse d'une societé nucléaire, Presses Universitaires de Grenoble, Grenoble

COLSON, Jean-Philippe (1977), Le nucléaire sans les Français. Qui décide, qui profite?, François Maspero, Paris

CROZIER, Michel (1963), Le Phénoméne bureaucratique, Editions du Seuil, Paris

CROZIER, Michel (1970), La société bloquée, Editions du Seuil, Paris

DAVIS, Mary (1988), Guide de l'industrie nucléaire française, WISE-Paris, L'Harmattan

DESLANDES, Philippe (1988), "Gestion de crise: plans d'urgence radiologique de la sécurité civile", in RGN, n.5, pp.419-423

DEBEIR, Jean-Claude, J.P. DELEAGE, D.Hemery (1986), Les servitudes de la puissance: une histoire de l'énergie, Flammarion, Paris

FAGNANI, Jeanne and Jean Paul MOATTI (1982), "Politique energetique du gouvernement socialiste Français et marginalisation de l'opposition anti-nucléaire",paper at the ECPR Jont sessions of workshops, Berlin

FAGNANI, Jeanne and Jean Paul MOATTI (1984), "The politics of French nuclear development", in Journal of Policy Analysis and Management, vol.3,n.2, pp.261-275

GILPIN, Robert (1968), France in the Age of Scientific State, Princeton University Press, Princeton

GOLDSCHMIDT, Bertrand (1980), Le complexe atomique. Histoire politique de l'energie nucléaire, Fayard, Paris

HAYWARD, Jack (1982), Mobilising Private interests in the Service of Public Ambitions: the salient element in the dual French policy style? in RICHARDSON, Jeremy ed., Policy Styles in Western Europe, G.Allen & Unwin, London

MENY, Yves (1990), Government and Politics in Western Europe. Britain, France, Italy and West Germany, Oxford University Press, Oxford

MEYNAUD, Jean (1960), Tecnocratie et politique, Etude de Science politique n.2, Lausanne.

MORONI, J.P., J.CHANTEUR, G.LEMAIRE et P.PELLERIN (1988), "Le rôle du SCPRI en cas d'accident nucléaire", in RGN, n.5, pp.411-416

NELKIN, Dorothy and Michael POLLAK (1981), The atom besieged. Extraparliamentary Dissent in France and Germany, The MIT Press, Cambridge Mass.

RIVASI, Michèle (1990), "Information and radioactivity. The CRII-RAD", paper at the WHO's Consultation on risk communication dealing with the spectrum of environmental and health risks in Europe, Ulm (FRG)

RUCHT, Dieter (1989), "Environmental movement organizations in West Germany and France: structures and interorganizational relations", in International Social Movement Research, vol.2, pp.61-94

SCHNEIDER, Mycle (1987), Superphénix. L'Echec d'une filiere, INESTENE, Paris

TANGUY, Pierre (see, List of documents: EDF)

ZONABEND, Françoise (1989), La presqu'île au nucléaire, Editions Odile Jacob, Paris

Documents analysed

CEA (1987), Rapport annuel 1987, CEA, Paris

CFDT (1975), L'electronucléaire en France, Editions du Seuil, Paris

CFDT (1990), Conference de presse de Jean Kaspar sul le "Rapport Rouvillois", le 9 mars 1990, CFDT Paris

CFDT, Syndacalisme. Hebdo CFDT, Mars 1990

CRII-RAD, Le cri du rad, n.4. 1987; n.11, 1989

EDF (1990), Rapport de synthese. La sureté nucléaire à EDF à fin 1989, by Pierre Tanguy, Inspecteur Général pour la Sureté Nucléaire

GSIEN, La Gazette Nucléaire, n.78-79, 1987; n.88-89, 1988; n.98-99, 1989; n.100, 1990

LE MONDE, 28.04.1986 - 31.05.1986

LES VERTS (1990), Les Verts et l'énergie, Paris

MINISTERE DE L'INDUSTRIE, DES P&T ET DU TURISME (1987), La sureté nucléaire en France, La documentation Française, Paris

NATIONAL RADIOLOGICAL PROTECTION BOARD (1986), Health Impact of the Chernobyl Accident, Report COM 86 (607), EC Commission, Brussels.

OFFICE PARLAMENTARIRE D'EVALUATION DES CHOIX SCIENTIFIQUES ET TECHNOLOGIQUES (1987), Rapport sur les conséquences de l'accident de la centrale nucléaire de Tchernobyl et sur la sureté et sécurité des installations nucléaires, n.1156 Assemblée Nationale et n.179 Sénat

ROUVILLOIS Philippe, R.PELLAT and H.GUILLAUME (1989), Rapport sur le bilân et les perspectives du secteur nucléaire civil en France

SCSIN (1989), Rapport d'activité 1989, Ministère de l'Industrie, Paris

WISE (1986), Bullettin International, n.8-9, 1986, "Special Tchernobyl", WISE, Paris

WISE (1986b), Communiqué du 20.05.86, "Une récommandation de l'OMS qui n'en est pas une", WISE, Paris

Interviews

CEA-IPSN:

Dr. Jean Brenot

CFDT:

Mr. Jean Tassart

EDF:

interview refused (reason given: lack of time)

Ministry of Industry, SCSIN:

Mr. Poyou

Les Verts - Comité Stop-Nogent sur Seine:

Claude Boyer

SCPRI:

interview refused (reason given: lack of time)

WISE (World Information Service on Energy, Paris Office):

Mycle Schneider.

7

BONN, PARIS, ROME... AND BRUSSELS ?
THE EUROPEAN COMMUNITY AND CHERNOBYL.

While showing that nuclear risks are transboundary, the Chernobyl fallout challenged the ability of the individual states and the international community to cope with this transboundary dimension.

As discussed in the previous chapters, in face of an accident occurring beyond the borders and causing a similar threat, different responses between and within neighbouring European countries emerged. These different responses were an indicator of the weakness of the existing international settings and agreements in the field of transboundary nuclear risk management. In particular the fact that Italy, France and the FRG are all members of such a strong setting as the European Community (EC) did not prevent different criteria being followed and different measures being applied.

Let us see why this was the case.

a. Background: the atomic community.

The Treaties establishing the European Economic Community (EEC) and the European Atomic Energy Community (Euratom) were both signed in Rome in March 1957 by the foreign ministers of Belgium, Federal Repubblic of Germany, France, Holland, Italy and Luxembourg, joined in the following years by the other present EC Member States. Ratification of the Treaties was rapidly achieved and the EC institution were able to set to work in Brussels on the 1st of January 1958.

Since its establishment, the EC has been fostering economic integration (more recently also political integration is being focused on) and has been developing a common legislative framework. In this respect it should be stressed that, differently from international organizations like the OECD or the UN, the EC can issue provisions wich are not only politically but also legally binding for its Members States [1]. However the responsibility for implementing EC provisions rests with the Member States, and inputs from and negotiations between Member Countries (especially within the EC Council) remain the "prime mover" of EC policy. In spite of this, the EC and its istitutions have a crucial and distinct role [2]. In particular, the EC Commission may be viewed as a unique case of supranational regulatory body and the EC Court of Justice as a supranational instrument for ensuring observation of EC law by the Member States; moreover, proposals are being made to increase the power of another prominent EC institution, i.e. the European Parliament.

While bargainings or even conflicts frequently occur within and between these different EC institution (also as a reflection of different national interests), such institutions form a distinct political pole. The interplay between such pole -"Brussels"- and the Member States represents a fundamental characteristic of EC policy making.

By signing contemporaneously the Treaty establishing the European Economic Community and the Euratom Treaty, The Ministers of the first six Members Countries showed the intention to link economic development and nuclear energy. The reason why the European Economic Community was born as an "atomic community" too

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1 According to Article 189 of the EC Treaty, the Community may use five forms of action: 1.**regulations**, which are binding in their entirety and directly applicable in all member state; 2.**directives**, wich are binding only as to the result to be achieved, leaving national authorities to choose forms and methods of implementation; 3.**decisions**, which are binding upon those to whom they are addressed (member countries, legal persons, private institutions, etc.); 4.**recommendations** and **options**, which have no binding force; 5.**resolutions** and **declarations**, of a political nature.

2 There is a plentiful literature on the role of the EC and the working of its institutions. Interesting analyses can be found, for example, in Lodge, 1983; Pryce, 1973; Wallace et al., 1983; Rehbinder and Stewart, 1985; Majone, 1989.

lies in the belief (especially strong during the nuclear euphoria of the fifties) that nuclear energy, as written in Euratom Treaty's preamble, "represents an essential resource for the development and invigoration of industry and will permit the advancement of the cause of peace".

Responsibilities concerning the promotion as well as the regulation of nuclear power are then accompanying the EC from its very beginning.

According to Article 2 of the Euratom Treaty, the Community must -among other things- promote research, facilitate investment and create a common market in the nuclear sector; but it must also establish uniform safety standards to protect workers and population health. This last point is specifically addressed in Chapter III of the Treaty on "Protection of Health and Safety".

Article 30 establishes that, "basic standards shall be laid down within the Community for the protection of the health of workers and the general public against the dangers arising from ionizing radiation". These standards are worked out by the EC Commission after obtaining the opinion of a group of experts (usually referred to as the group of experts art.31) appointed by the Commission's Scientific and Technical Committee. Firstly laid down in 1959, the basic safety standards were revised and modified in 1962, 1966, 1979, 1980 and 1984 taking into account the recommendations issued by the International Commission for Radiological Protection (ICRP). However, no revision of such standards followed the ICRP's recommendation of 1985 stating that, for members of the public, an annual dose limit of 0,5 rem (as set by the EC Commission in 1984) is only permissible for a limited number of years (see, EC Commission, 1986b and 1990).

Article 33 deals with the obligation of the Member States to ensure compliance with the basic safety standards by means of legislation, regulation or administrative action, while articles 34 and 37 require that Member States obtain the opinion of the EC

Commission before certain nuclear projects which may have detrimental health effects can be carried out.

With respect to monitoring activities, art. 35 and 36 require the Member States to monitor radioactivity in air, water and soil and to communicate the results to the EC Commission in order to demonstrate compliance with the basic safety standards; moreover, the Commission shall have the right of access to such monitoring facilities.

In case of urgency, the Commission has at its disposal a unique legal instrument which has no parallel in the whole of Community law (Grunwald, 1988: p.39). According to art.38, "In case of urgency, the Commission shall issue a directive requiring the Member States concerned to take, within a period laid down by the Commission, all necessary measures to prevent infringment of the basic standards and ensure compliance with regulations". As we will see later on, this article was never applied; not even in the case of the Chernobyl accident.

In spite of its optimistic start, the European Atomic Community has not been successful in its main aim -that is establishing a common nuclear market- because of the prevailing of national nuclear policies (Goldschmidt, 1980; Holdsworth and Lake, 1988). And there are also difficulties in the formulation and implementation of the actions specified in Chapter III of the Euratom Treaty, i.e. health and safety standards, harmonized information and monitoring procedures and coordinated emergency measures [3]. For instance, the lenght of time needed to agree on revisions of basic safety standards is so long that such revisions are already out of date before being implemented by the Member States [4]. Beside that, while the communication of monitoring data

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3 On this point see, EC Commission, 1986b; Grunwald, 1988; Leroy, 1986; Liberatore, 1989.

4 A case in point is the revision of the 1976 directive on basic safety standards. Work was started in 1977 to draft amendments in the light of new ICRP recommendations. Altough the experts and

is regarded as unsatisfactory by the Commission, the Commission itself has not been exercising its right of access to monitoring facilities for almost twenty years due to lack of resources (EC Commission, 1986b: p.6-7).

A crucial problem regarding the regulation in the nuclear sector, i.e. the regulation of radioactive waste disposal, is not covered by the Euratom Treaty. However, the EC Commission, beside promoting and conducting research activities in this field, is carrying on an action plan (1980-1992) aimed at examining the situation and suggesting solutions and measures to be taken at Community level (EC Commission, 1986a).

Another important aspect of nuclear risk management, that is the regulation in the field of plants safety, is beyond the scope of EC competence. Safety requirements for nuclear installations are established by each Member State and the EC Commission has a merely coordinating role in the attempt to harmonize criteria of reactor safety (Council Resolution of 22.7.1975, Official Journal C 185, 14.8.1975). Moreover, in spite of the general orientation of EC environmental regulation towards the setting of emission standards, at present there is no binding EC standard concerning radioactive emissions into air and water. And this is a major issue in the case of plants located in border areas like the French plant of Cattenom (see, Leroy, 1986).

Finally, as far as emergency management is concerned, apart from article 38 of the Euratom Treaty, it is worth noting that a systematic evaluation of the possible off-site radiological consequences of nuclear accidents was started with the MARIA project, Methods for assessing the Radiological Impact of Accidents, a project launched in 1982 within the 1980-1984 radiation protection research programme (see, EC Commission 1986c). A variety of countermeasures to reduce immediate exposure and

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the Commission completed the work in 1978, the amendments were adopted by the EC Council only two years later and the new provisions became binding only in 1986. But in the meantime, in 1984, a new directive had been approved (see, EC Commission, 1986b, p.5).

long-term doses following an accidental release of radioactivity were examined within the MARIA project. Beside that, in August 1983 the Commission submitted to the Council a Communication and a draft Resolution (EC Commission, 1983) concerning emergency planning and contamination of rivers and seas. This resolution was never adopted and the Council maintained that the Commission should not duplicate work done in the Member States or in other international bodies. Such standpoint of the Council, which reflected the attitude of most Member Countries to limit EC copetence in the nuclear field, constrained the work that the Commission could undertake (EC Commission, 1986b).

This was the Community's regulatory "landscape" when the Chernobyl cloud arrived.

b. **The Community and the cloud**.

b.1. Chronicle

Three days after the accident at Chernobyl, the EC Commission started receving data on radioactive contamination from some of the Member Countries. On the 2nd of May 1986, that is a week after the accident, the Community system for rapid alert in cases of food contamination was put into effect.

On the same day, restrictions on consumption and internal trade of certain foodstuff began being applied in Member Countries like Italy and the FRG while no countermeasure were even taken into consideration in other Member Countries such a France.

Beside that, most Member Countries adopted imports' restrictions by the first week of May.

These different national measures, particularly those concerning intra-Community and external trade (that is, commercial policy measures that fall within the exclusive jurisdiction of the

EC according to art. 113 of the EC Treaty), called for a "harmonizing word" from Brussels (Grunwald, 1988: p.34).

Such "harmonizing word" was uttered by the Commission on 6 May by issuing a Recommendation (Recommendation of 6.5.86, Official Journal L 118 of 7.5.86) calling on Member States to set certain maximum levels for Iodine 131 in milk and milk products (500 bq/l) and in fruit and vegetables (350 bq/l).

On 7 May the Commission also addressed external trade problems and issued a Decision (Decision of 7.5.86, Official Journal L 120, 8.5.86) banning imports of meat from Eastern Countries. This decision did not cover the whole range of contaminated products since the import of all relevant agricultural products could only be suspended by the Council.

This occurred on 12 May by way of a Council Regulation (Regulation of 12.5.86, Official Journal L 127 of 13.5.86) temporarily suspending the import of certain agricultural products originating in the Eastern Countries. It is worth mentioning that East Germany was excluded from the final draft of the Regulation at West Germany request while Yugoslavia was added to the list on suggestion of Italy (BEUC, 1986: p.20).

These EC measures were however decided according to a reasonable but arbitrary criterion (i.e. banning, without assessing the actual contamination, imports from Countries regarded as more affected by the fallout than the EC ones), rather than being based on provisions concerning maximum permitted levels of radioactivity in foodstuff. A part from being necessarily provisional with respect to external trade, the adoption of this criterion could not lead to any "harmonization" with respect to intra-Community trade and to the equal protection of public health in the EC Member Countries. As far as this last aspect is concerned, it must be mentioned that the recommendation issued by the Commission on 6 May was not implemented in several Member Countries, including France and United Kingdom.

The Commission realized the need for common standards and, following discussions with Member States, sought urgent advice from the group of experts article 31 (EC Commission, 1989).

On 23 May the experts recommended provisional limits, specific for the Chernobyl case, for Caesium isotopes.

A week later the Council adopted a Regulation (Regulation of 30.5.86, O.J. L 146 of 31.5.86) which replaced the previous import ban and fixed the maximum permitted levels of Caesium 134 and 137 in foodstuffs. The Regulation imposed a limit af 370 bq/Kg for milk products and food preparations for infants, and 600 bq/Kg for all other foodstuffs.

Interestingly enough, the text adopted was remarkably different from the one proposed by the Commission (on advice of the experts art.31) on 23 May. Lower levels (100 bq/Kg for milk products and infants' foodstuffs and 500 bq/l for other foodstuffs) had been suggested, but were strongly opposed by some Member States: France, Greece and United Kingdom wanted in fact much higher maximum levels. Finally, with the pressure from the Dutch Presidency, the limits of 370 and 600 bq/Kg (higher limits than the ones originally suggested by the Commission but much lower than the ones desired by France, Greece and UK) were adopted (see, BEUC, 1986: p.21).

The regulation issued on the 30 May was extended twice (Council Regulations of 30.9.86 and 27.2.1987) and was due to expire on 31 October 1987, the intention being to erect a permanent system laying down maximum permitted levels of radioactive contamination of foodstuffs in the event of a nuclear accident. By the end of October 1987, however, two political problems had arisen. In the first place, the Council failed to agree upon the permanent system and, secondly, the majority of Member States did not wish to extend the Regulation of May 1986 for the third time (Grunwald, 1988: p.35).

After a legislative *vacuum* of two months, a Council Regulation laying down maximum permitted levels of radoactive contamination of foodstuffs and feedingstuffs following a nuclear accident or any other case of radiological emergency was adopted (Regulation of 22.12.1987, O.J. L 371 of 30.12.1987). The limit of 500 bq/Kg I-131 for dairy products was kept while higher limits were set for I-131 in other foodstuffs (2000 bq/Kg) and for Cs 134 and 137 (1000 bq/Kg for dairy products and 1250 for other foodstuffs).

b.2. Analysis

Several elements must be taken into consideration to understand the Community's response to the Chernobyl fallout.

As soon as such a crucial EC matter as trade was affected by Member States'initiatives, Brussels decided to utter a "harmonizing word" and then to take binding actions. But in order to define the Chernobyl fallout as an EC problem (rather than a national one), scientific and organizational uncertainties had to be managed. In particular, difficulties in the collection and evaluation of data as well as in the choice of the relevant legal framework and instruments had to be dealth with.

Concerning the first point, practical difficulties played a role in delaying and constraining EC action.

First of all, the communications channels between national authorities and the competent Commission's service had not been intended (under the terms of article 35 and 36 of the Euratom Treaty) for emergency situations [5]. Thus, it is not surprising that they proved to be inadequate (EC Commission, 1989: p.14). Furthermore, problems in gathering and evaluating data at the national level (due to gaps in the monitoring networks, lack of

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5 This can be regarded as another indicator of the generalized underestimation, before Chernobyl, of the risk of major nuclear accidents with large scale consequences.

coordination between local and central authorities and/or secretive attitude of central information sources) caused delays or even "holes" in the making of a Community wide -beside a global one- map of the fallout.

Beside these problems, different points of view concerning the evaluation of data emerged and had to be negotiated within the group of experts art.31 and within the EC Commission (Campos Venuti, interview; Ciani, interview; Oberhausen, interview).

Only by the end of May 1986 the Community was able to partially overcome the mentioned difficulties and reached the scientific and political agreement needed to adopt a Council Regulation on maximum permitted levels of Caesium in food.

As far as the management of organizational uncertainties is concerned (especially regarding Community/Member States relations in dealing with the fallout), it is important to examine how EC legal competences had been interpreted and utilized. In this respect, three main points can be made.

1) The Community resorted -much in the way of a "conditioned reflex"- to those legal instruments which it had grown accustomed to (that is the regulation of trade), and realized only with delay that it was necessary to turn to the Euratom Treaty, rather than the EEC Treaty, in order to deal with the Chernobyl challenge (Grunwald, 1988). 2) Once the Euratom Treaty was turned to, the Commission complained that, "Following Chernobyl the application of article 38 was difficult as the Commission did not receive adequate data in order to evaluate whether Basic Standards had been, or were likely to be, infringed" (EC Commission, 1986b: p.9). 3) Finally, giving the lack of EC provisions concerning limits for radiation in foodstuffs, each Member State defined and applied its own rules.

Summing up, it can be noted that the Community, while having at its disposal two Treaties and binding legal instruments, was not able to fully and timely utilize them in order to impose a "harmonized" response to Chernobyl.

This was partially due to problems within the EC institutions, like the relative slowness (in comparison with Member States) in realizing the possible scope and choosing the instruments for Community action. These problems can be viewed as the results of the marginal role and the lack of experience and resources of the EC institutions in the nuclear sector. In turn this situation is due to the diffused tendency among Member States to regard nuclear issues as national affairs; tendency that prevented the creation of a common nuclear market and that contributed in hampering the implementation of Chapter III of the Euratom Treaty.

Such tendency emerged also during the Chernobyl fallout as shown, for instance, by the reluctance of some Member States to push for and comply with EC provisions.

But the EC institutions showed to be unwilling to step aside.

c. <u>After Chernobyl: towards a transnational management of nuclear risk.</u>

c.1. EC regulations.

At its plenary session of May 1986, the European Parliament passed two resolutions requesting, inter alia: 1. that radioactivity limit values applicable to foodstuffs be established uniformly by the Member States at a level which would unquestionably guarantee that such foodstuffs were harmless to human health; 2. that these limit values would be applicable both to foodstuffs produced within the Community and imported foodstuffs. In this perspective, the Parliament requested the Commission to report on the Chernobyl accident and its consequences for public health and environment within the Community. The Parliament also requested the Member States and the Commission to arrive at a common position with a view to negotiating rapidly international standards which would make it binding to report any accident immediately to the IAEA and to set up effective inspection systems at the international level (EC Commission, 1986a: p.5).

In June 1986 the EC Commission presented an action plan to deal with the problems encountered as a consequence of the Chernobyl accident (EC Commission, 1986a). Such plan covered five areas: Health protection, nuclear safety, emergency procedures, international action, research.

With respect to health protection, the Commission pointed out two main needs: the need to accelerate, standardize and automate the collection of data on radioactivity levels and to publish regularly the results; and the need to establish permissible maximum limits for radioactive contamination in advance of accident, so as to avoid controversy in the event of an emergency (EC Commission, 1986a: pp.10-11). Concerning nuclear safety, the Commission stressed the need to examine the possibility of setting EC emission standards for radioactivity, to harmonize plant safety criteria within the Community, and to address the problems of transport and disposal of radioactive waste (ibidem: pp.13-20). Emergency procedures, especially regarding rapid information and mutual asistance in case of accidents, were addressed by the Commission taking into consideration that two IAEA conventions on these subjects were going to be negotiated in the following months and that Community's internal negotiations should be started in such perspective (ibidem: pp.20-22). The need to reinforce international organizations (like the WHO and the NEA [6]), is stressed in the Commission's action plan (ibidem: pp.22-23). Finally, the adaptation of research programmes in the light of the Chernobyl experience is suggested (ibidem: p.23).

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6 The NEA (Nuclear Energy Agency), a technical agency of the OECD, was formed in 1958 to promote cooperation between 23 participating Western countries on the production and use of nuclear energy.

In the following period various activities had/have been undertaken by the Commission in the above mentioned fields, especially concerning health protection and emergency procedures.

New EC provisions had been adopted and the EC Member States as well as the EC Commission participated in the working out of important post-Chernobyl international agreements.

As far as health protection measures are concerned, an EC regulatory system laying down maximum permitted levels of radioactivity in foodstuffs was established by the already mentioned Council Regulation passed in Decembre 1987. Such provision was then amended in July 1989 (Council Regulation 2218/89 of 18.7.1989, O.J.L 211 of 22.7.89) and supplemented by other Regulations: one concerning minor foodstuffs (Regulation 944/89 of 12.4.1989, O.J.L 101 of 13.4.1989), another concerning feedingstuffs (Regulation 770/90 of 29.3.1990, O.J.L 83 of 30.3.1990) and other two concerning foodstuffs export (Regulation 2219/89 of 18.7.1989, O.J. L 211 of 22.7.89) and imports (Regulation 737/90 of 22.3.1990, O.J.L82 of 29.3.90) in case of nuclear accidents.

These Regulations were worked out by the Commission on advice of the group of experts art. 31 and taking into account the recommendations of a Committee of high-level independent experts (see, EC Commission, 1988) convoked by the Commission following Chernobyl [7]. The Commission also participated in the discussions on the WHO/FAO *Codex Alimentarius* regarding radioactivity limits in food with a view to harmonizing such limits at the broader international level (EC Commission, 1989: p.13).

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7 Formed by six scientists from radiation protection institutions of EC and non-EC countries, the Committee was asked to assess the scientific evidence in view of the Chernobyl accident, to consider the possible implications for the Basic Safety Standards and emergency reference levels, and to advice the Commission on future actions in the field of radiological protection. The Committee supported the work done by the group of experts art. 31 and added some recommendations on radiation protection research issues.

With respect to the activities needed ion order to implement these new Regulations and to guarantee compliance with the Basic Safety Standards, the Commission asked the Member States authorities to provide for the arrangements required to exercise the Commission's right to inspect facilities for radioactivity monitoring (EC Commission, 1989: p.20); inspections, with a very limited personnell, were started in 1991. Moreover, after Chernobyl a computerized data bank called REM (Radioactivity Environmental Monitoring) was set up at the Joint Research Centre of Ispra to collect the results of environmental radioactive contamination in the Community. However such results are provided by national authorities on a voluntary basis, therefore it is possible (or even likely) that not all relevant information "reach" REM (Girardi, interview; EC Commission, 1991)[8].

c.2. IAEA Conventions.

With respect to emergency management, the EC Member States and the EC Commission participated in the negotiations of two international Conventions on early notification and assistance procedures in case of nuclear accidents. These Conventions (Convention on Early Notification of Nuclear Accidents and Convention on Assistance in the Case of a Nuclear Accident or a Nuclear Emergency) were promoted by the Board of Governors of the IAEA that decided, on 21 May 1986, to establish groups of governmental experts having the task to produce drafts of the two international agreements before September of the same year [9].

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8 It is worth mentioning that by June 1991 France provided the highest number of measurements of radioactivity in air but failed (together with Greece and Ireland) to report measurements on the foodstuffs included in REM; only Great Britain, Italy and Luxemburg provided measurements on all environmental samples and foodstuffs included in REM (EC Commission, 1991: p.18).

9 About the two IAEA Conventions see Adede, 1987; Bodea, 1989; Cameron et al., 1988; Linnerooth, 1989; Pestellini, 1989; Sands, 1988.

Experts from 62 IAEA Member States [10] and representatives of ten international organizations (including the EC Commission) met at the headquarters of IAEA in Vienna, and four weeks after the commencment of negotiations they adopted by consensus the two drafted Conventions. The texts (which are modelled on IAEA Guidelines prepared before Chernobyl [11]) were then submitted to teh IAEA Board of Governors that decided to transmit them for the IAEA General Conference which was to be held on 24-26 September 1986. After being adopted by the General Conference, the two Conventions were opened for signature on 26 September and were immediately signed by more than fifty States (54 the Notification Convention and 52 the Assistance Convention), later on joined by others. All the EC Member States signed the Notification Convention while Luxembourg did not sign the Assistance Convention. In December 1987 the EC Council decided that the Community would accede the notification Convention while no decision was taken -in spite of the favorable opinion of the EC Commission- concerning the Community's accession to the Assistance Convention (EC Commission, 1989: pp.14-15).

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10 Established in 1957 as an autonomous intergovernmental organization, altough it is administratively a member of teh United Nations, the IAEA has 113 Member States. Its main objectives are to promote civilian nuclear energy development and to ensure, so far as it is able, that nuclear material is not illegally diverted for military purposes. In this respect, a system of safeguards had been developed. The IAEA deals also with safety aspects. Through the OSART teams (Operational Safety Review Teams) the Agency gives advice to national authorities in the safety field; however it has no authority to formulate internationally binding safety standards.

11 See Guidelines for mutual emergency assistance arrangements in connection with a nuclear accident or radiological emergency (IAEA, 1984) and Guidelines on reportable events, integrated planning and information exchange in a transboundary release of radioactive material (IAEA, 1985). The Chernobyl accident provide the momentum for shifting from mere Guidelines to more binding Conventions.

According to the Notification Convention, in case of accidents the States which are or may be physically affected must be notified "fortwith" -directly or through the IAEA- and provided with specific information listed in art.5. However, the participants to the negotiations on the Convention were unable to agree on a particular threshold for reportable events; this means that if an accident occurs, it is up to the particular State whether to report a nuclear accident (see, Bodea, 1989; Hancher and Cameron, 1988). Beside that, the Convention does not establish any obligation on States giving or receiving information to make it available to the public. Concerning the scope of the Convention, most States were in favour of a "full-scope coverage" while some of the nuclear weapons States opposed the inclusion of accidents caused by nuclear weapons and their testing. Finally a compromise was reached by including an article (art.3) which establishes that States Parties may notify nuclear accidents other than those specified in art.1 covering only civil use of nuclear energy (Bodea, 1989; Sands, 1988).

The Assistance Convention does not require any State to provide assistance, but provides for a general obligation on States to cooperate among themselves and with teh IAEA to facilitate prompt assistance. The Convention requires (as the Notification Convention) that points of contact [12] for the coordination of activities are designed and made known by the States Parties; moreover it establishes an important role for the IAEA as a channel for the provision of information and assistance.

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12 Points of contact may be technical or political bodies. Taking the case of Italy, the FRG and France, the points of contacts for the two Conventions are respectively: the Italian Minister for Civil protection and ENEA-DISP (the last one only for the Notification Convention), the German Federal Ministry for Environment, the French Ministry of Foreign Affairs and the Interministry Committee for Nuclear Safety. It is worth noting that some countries did not provide points of contact and in some cases the points of contact are only "façades"; this situation (together with other problems) may hamper the implementation fo the Conventions (Weiss, interview).

Even if is an important contribution to international cooperation, the Convention has been criticized on a number of grounds; especially concerning the question of responsibility, not only of the assisted but also of the assisting State. In fact on the one hand, assisting States apparently do not assume any responsibility for any damage that they might cause; on the other hand, a State which had caused an accident and agrees to assist another affected State may require remiboursement of assistance costs (see Sands, 1988: p.47).

Beside favouring the accession of the Community to both Conventions, the EC Commission suggested two additional EC provisions in the field of information. The first one concerning Community arrangements for the early exchange of information and the other concerning public information in the event of a radiological emergency. Both proposals were approved by the Council which adopted a Decision on Community arrangements for the early exchange of information in the event of a radiological emergency (Decision of 14.12.1987, O.J.L 371 of 30.12.87) and a Directive on informing the general public about health protection measures to be applied and steps to be taken in the event of a radiological emergency (Directive of 27.11.1989, O.J. L 357 of 7.12.89). It can be noticed that it had taken much more time for the twelve EC Member States to adopt a system for early notification which is wider in scope but does not add significant elements (no threshold level for reportable events is set and military facilities are excluded also from the EC Decision) to the similar system agreed within few weeks by more than fifty States, including the EC ones.

The approval of the Directive on public information had been an even more long and controversial process; but at least this Directive provides for aspects that are not taken into consideration in the Notification Convention [13]. That is, the information to be given prior and in the event of a radiological emergency (i.e. in situations likely to result in members of the public being exposed to doses in excess to the limits set in the Basic Safety Standards) about health protection measures.

c.3. International learning.

It can be noticed that post-Chernobyl legal developments at the EC and the broader international level mainly focused on cooperation in the field of accident management. This is hardly surprising given the fact that Chernobyl "tested" existing (national) management procedures, that these procedures were found wanting, and that -as a consequence- a need for stronger international cooperation to deal with transboundary nuclear risk emerged.

Harmonization of emergency procedures and health safety standards has been pursued for mainly practical (need to have quick and reliable data, to rely on previously set standards, etc.) and political reasons (need to show the concerned public that action was taken at "high level"). However such harmonization has also important implications concerning equity aspects; to lay down maximum permitted levels of radioactivity in foodstuffs at the Community and the broader international level or to call for intergovernmental as well as public information imply that all States and citizens of any State must/should be treated according to the same, general rules agreed upon.

The adoption of the above mentioned regulations and agreements at the international level results from a change in the perception and framing of nuclear risk management issues. While previous to Chernobyl the management of nuclear power was regarded as a national affair (with the exception of nuclear weapons tests

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13 The principles and procedures of this Directive are similar to those stated in Article 8 of the Seveso Directive concerning public information with respect to major industrial hazards (see Directive 88/610/EEC amending the Seveso Directive of 24.6.1982).

and illegal trade of nucler material), after the accident the need for a transboundary management was acknowledged.

This change was made possible by the interaction of several elements: the experience of the Chernobyl accident and fallout, the reflection on such experience by several actors on the basis of existing "frames" (national policies in the field of nuclear power but also foreign affairs and others [14], Treaties -like Euratom-, guidelines -like those of IAEA, etc.) and on the basis of the communication going on in the social, political and scientific arena. In other words a process of learning took place where certain aspects of previous knowledge were "unlearned" (like the assumption that a major accident with transboundary release of radioactivity could not really happen), others were modified and new knowledge was produced through experience and reflection on such experience constrained by existing policies, norms and scientific evidence. All this in a context of communication between politicians, diplomats, experts and non governmental organizations in various fora (such as mass media, governmental and scientific circles, EC and IAEA institutions).

The actions taken/adaptations made with respect to the transboundary management of nuclear risk were the result of such learning process.

If one takes, for instance, the EC Directives and Regulations issued after Chernobyl, it is clear that they were the result of a process characterized by the interaction of experience (mainly experience of the controversies within and between member countries and between them and EC institutions about mesures to be taken), reflection on experience (within the EC Commission, the group of experts art.31, NGOs, etc.) constrained by existing "frames" (EC trade policy and usual EC law making first, and then

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14 One can think, for example, about the new attitude towards external relations of former USSR which emerged in the mid-eighties due to Gorbachev's *perestroika*, and about how this new attitude influenced the more collaborative position of USSR within IAEA and the reaching of agreement on the IAEA post-Chernobyl Conventions.

the Euratom Treaty and other Directives -such as the Seveso Directive on information aspects-) and in a context of communication among actors holding different views about scientific, political and information issues.

The fact that learning took place and had some results does not mean however that "the best of all possible worlds" had been reached.

If it cannot but be acknowledged that important steps had been taken to fill existings gaps in international law and improve international cooperation -especially at the technical level- in case of major nuclear accidents, several shortcomings (including those mentioned in the previous paragraph) hamper the implementation of the EC provisions and the international Conventions approved after Chernobyl. Moreover, the links between civil and military uses of nuclear power and the insulation of the regime regulating the nuclear sector from those concerning other sectors (for example, regarding environmental pollution or waste disposal) prevented and still prevent the evolution of more binding norms at the EC level and at the broader international one.

These mentioned shortcomings must be taken into consideration when trying to evaluate the adaptations made after Chernobyl in terms of both policy consistency and effectiveness. In this respect some scholars argue that if an accident similar to the one of Chernobyl were to occur today, the international and European regimes for the peaceful use of nuclear energy would be found wanting in almost every respect (Hancher and Cameron, 1988: p.195). If one think, for instance, of the discretion left to governmental authorities regarding the threshold for reportable events and the possibility to exclude military installations, it is possible that in case of a major accident the same problems about obtaining quick information at source would arise. As far as countermeasures are concerned, the setting of limit values of radioactivity in foodstuffs in form of EC Regulation provides a good basis for preventing that actions are not taken in EC countires when these limits are exceeded; however, the choice and implementation of measures could be again a matter of controversy.

Beside that, the focus on accident/emergency management procedures raises some intriguing issues.

On the one hand, the post-Chernobyl emphasis on harmonization and standardization of emergency response at the international level seems to contrast with the need for flexibility and local discretion which were considered desirable in the aftermath of the TMI accident (see Lathrop, 1981). In this respect it can be argued that while harmonization efforts in form of warning systems, basic safety standards and assistance procedures are needed to cope with transboundary hazards, decentralized emergency management is also important to deal with the immediate local variations that may occur. The two aspects are not in contrast with each other: harmonized standards and procedures can be regarded as the general framework to be put in practice according to accident-specific and local circumstances.

Another intriguing issue to be addressed regards the implications of the very focus on emergency management. Even if it is understandable the fact that the Chernobyl accident set international organizations into motion toward improving emergency management given the poor response(s) to the fallout, it should not be taken for granted the relative lack of attention toward preventing a major accident in Western countries. While following TMI many activities were started to improve the safety of nuclear reactors and the so-called "man-machine interface", this was not the case following Chernobyl due to the generally (but far from "universally") agreed assumption that a similar accident could never happen in a Western reactor. As Joanne Linnerooth points out, "after Chernobyl, little attention was given to reexamining the nuclear option or to more rigorous, binding safety rules backed by an effective international inspectorate. In a sense, by de-emphasizing prevention and emphasizing response, the burden of nuclear risk is shifted from the industry to the public"

(Linnerooth, 1989: p.26). Of course, accident prevention and accident management are both needed; and to improve the latter is more than reasonable, especially if one agrees with Charles Perrow that accidents are "normal" (Perrow, 1984). However, the mentioned burden-shift raises a problem of fairness since responsibility is partially transferred from those who may cause an accident, and should take all possible measures to prevent it, to those who may be affected from it and therefore should ask for information and comply with countermeasures.

c.4. Concluding remarks.

On the basis of the discussion offered above, it can be noted that at the EC and at the broader international level a shift of/increased emphasis (or partial reframing) on the transboundary dimension of nuclear risk and on the possibility (rather than almost impossibility) of major nuclear accidents took place following Chernobyl. As a consequence, legal and technical instruments to cope with transboundary nuclear risk were adopted.

This happened on the basis of reflection on experience within some major institutions (like the IAEA and the EC Commission) and on the basis of "transboundary communication" in international fora (such as the negotiation of the IAEA Conventions) and through the mass media.

Independently from the problematic aspects mentioned above, it can then be said that a collective learning that went beyond political borders (or international learning) took place.

REFERENCES.

ADEDE, A.O. (1987), The IAEA Notification and Assistance Conventions in Case of Nuclear Accidents, Graham & Trotman, London.

BODEA, Sorin (1989), The Conventions on Early Notification and on Assistance in the Case of Nuclear Accidents, manuscript

CAMERON, Peter, L.HANCHER and W.KUHN eds. (1988), Nuclear Energy Law After Chernobyl, Graham & Trotman, London.

GOLDSCHMIDT, Bertrand (1980), Le complexe atomique. Histoire politique de l'energie nucleaire, Fayard, Paris.

GRUNWALD, Jürgen (1988), "The role of Euratom", in CAMERON, Peter, L.HANCHER and W.KUHN eds. (1988), Nuclear Energy Law After Chernobyl, Graham & Trotman, London.

HANCHER, Leigh and Peter CAMERON (1988), "After Chernobyl: Has Anything Changed ?", in CAMERON, P. et al., cit.

HOLDSWORTH, D. and G.LAKE (1988), "Integrating Europe: The New R&D Calculus", in Science and Public Policy, Vol.15, n.6.

LEROY, Olivier (1986), Securitè nucleaire: la Communautè Europeenne face a l'aprè s-Tchernobyl, Impact Europe, Kraainem, Belgium.

LIBERATORE Angela (1989), "Closed laboratories and open societies. The case of radiation risk assessment and management in the European Community", paper at the Conference "Experts are categorical. Scientific controversies and political decisions in the environmental field, Arc-et-Senans, France.

LINNEROOTH, Joanne (1989), "The International response to Chernobyl. Prospects for an International Nuclear Safety Regime", paper at the Second Conference of the European Section of the Society for Risk Analysis, IIASA, Laxenburg, Austria.

LODGE, Juliet ed.(1983), Institutions and Policies of the European Community, Frances Pinter Publ., London.

MOLLE, Willem (1990), The Economics of European Integration: Theory, Practice, Policy, Aldershot, Gower.

MAJONE, Giandomenico (1989), Regulating Europe: Problems and Prospects, EUI Working Paper, Florence.

PESTELLINI, Francesca (1989), Profili della responsbilità internazionale degli Stati per danni all'ambiente, tesi di laurea, Florence.

PRYCE, Roy (1973), The Politics of the European Community, Butterworths, London/Boston.

REHBINDER, E. and R.STEWART (1985), Integration through Law, De Gruyer, Berlin/New York.

SANDS, Philippe (1988), Chernobyl: Law and Communication, Grotius Publications Limited, Cambridge.

WALLACE, Hellen, W.WALLACE and C.WEBB (1983), Policy Making in the European Community, John Wiley & Sons, New York.

Documents analysed.

BEUC -Bureau Europeen des Unions de Consummateurs- (1986), Chernobyl. The Aftermath, BEUC/118/86, Brussels.

EC Commission (1986 a), Outline Communication from the Commission to the Council on the consequences of the Chernobyl accident, COM (86) 327 final, Brussels.

EC Commission (1986 b), The development of Community measures for the application of chapter III of the Euratom Treaty "Health and Safety", COM (86) 434 final, Brussels.

EC Commission (1986 c), Methods for Assessing the Off-Site Radiological Consequences of Nuclear Accidents, Joint Report by the KFK Karlsruhe and the NRPB, EUR 10243, Luxembourg.

EC Commission (1987), Radiation Protection in the European Community. Evaluation and Suggestions, by a Committe of High-Level Independent Scientists, EUR 11449, Luxembourg.

EC Commission (1989), Report on activities undertaken by the Community following the Chernobyl accident, COM (89) 203 final.

EC Commission (1990), Community Radiation Protection Legislation, DG XI, Doc. XI-3539/90 EN.

EC Commission (1991), Environmental Research Newsletter, n.7.

IAEA (1985), Safeguards in Europe, Vienna.

IAEA (1986), Final Document, Resolutions and Conventions adopted by the First Special Session of the General Conference 24-26 September 1986, Vienna.

IAEA (1987), One Year after Chernobyl, Vienna.

Interviews

EC Commission:

Dr. Vittorio Ciani, DG XI
Dr. Georg Gerber, DG XII
Dr. Yves Capuet, DG XVII

EC Experts Art. 31:

Prof. Gloria Campos Venuti (ISS)
Prof. Erich Oberhausen (SSK)

EC Joint Research Centre, Ispra

Dr. Massimo Girardi

IAEA:

Dr. Bernard Weiss

8

CONCEPTUAL MODELS AND THE CHERNOBYL CRISIS: INTERPRETING RESPONSE AND LEARNING PROCESSES.

One threat, many responses and adaptations.

These few words summarize the core of what has been described and analysed in the previous pages.

And now, after making explicit in the first chapter some "key words/concepts" and the hypothesis that partially oriented and partially emerged from the empirical research, and after reconstructing some case studies and analysing their specific features, it is time to try to make sense of the overall "picture". In this last chapter an interpretation is therefore suggested concerning two linked but distinct problems addressed in the present work, that is why there had been different short-term responses and why there had been different medium/long-term adaptations following the same (Chernobyl) event.

By using the word "**interpretation**" I wish to emphasize that subjective elements always influence both the selection of evidence and the way of "making sense" of it. Moreover, any attempt to interpret "facts" and to answer why-questions (especially in the social sciences but also in the natural ones) is -as Mary Hesse writes (Hesse, 1974)- "theory laden". In other words it can be said that any explanation -and even any description- is interpretation because the identification of the key features and explanatory variables (in terms of cause-effect relationships, functions or other elements) does not depend on the objective analysis of objective facts but on the way we assemble and look at the evidence. As Graham Allison points out, what each analyst sees and judges to be important is a function not only of the evidence about what happened but also of the "conceptual lenses" through which he or she looks at the evidence (Allison, 1971: Introduction). Similarly, Erving Goffman (1974) and other sociologists point to the importance of frames (including analytical frames) in "seeing" things.

This does not mean that "everything goes"[1], that any interpretation is equally sound. On the contrary, the utilization of some "lenses" can reveal to be insufficient, useless or even misleading -like the use of a microscope to look at the moon- in analysing why certain events did occur. On the other hand, also the reference to conceptual models that are not able to explain all the aspects that we regard as important ones can provide useful insights. For instance, by making us aware of theoretical gaps to be possibly filled (or at least to be taken into account) in order to interpret/make sense of the evidence those models helped us to assemble.

On the basis of this premise, the "lens"/hypothesis that was put forward in the Introduction and was developed in the second chapter will be reassessed in the light of the case studies and by confronting it with alternative interpretations based on the conceptual models also discussed in the second chapter.

One way to approach the problem of interpreting response and learning processes by confronting different models could be to engage in a sort of "multiple lenses exercize". As in Allison's book, in Kurosawa's film "Rashomôn" or in the "Exercices de style" of Queneau the same story could be narrated in different ways depending on the different points of view/conceptual lenses referred to. But, differently from these examples, such exercise could turn out to be rather boring for the reader who already went through seven chapters. Such exercise would also run the risk of ending in a narrative that could be of limited help in identifying what we can see and what we eventually miss by using different conceptual lenses. Therefore three different and very simplified

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1 This motto of Paul Fayerabend (see Fayerabend, 1975) has been often used to indicate a radically relativist attitude and it is used also here in this sense. However it must be mentioned that Fayerabend's idea of "everything goes" is much more complex than its popularization.

"stories" concerning the responses to Chernobyl will be tentatively sketched, according to the models selected by Allison, for those who are interested in seeing how such "stories" could look like; but they are left as Appendixes.

With respect to the reconstruction and interpretation of the responses to Chernobyl according to the Rational Policy Model, the Organizational Process Model and the Bureucratic Politics Model, some points (partially anticipated in the second chapter) must be made [2].

The "story" based on the Rational Policy Model suggests a logical explanatory sequence, from goals to decisions/responses, but it fails to provide an empirically grounded interpretation of the Chernobyl case due to various elements. 1) It assumes that national governments and the EC acted as unitary actors, in this way neglecting intra-governmental conflicts (at the horizontal, inter-ministry, level and at the vertical, center/periphery, one) and conflicts within and between the EC institutions. In this respect the "rationalist story" seems credible only in the French case where a sort of "monolitism" (at least in public) was observed; but also in this case the Rational Policy Model fails to explain the reasons for such "monolitism" by taking it for granted. 2) Moreover, the passage from goals to decisions -based on the supposedly systematic and consistent evaluation of all options- does not account for the oscillations and shifts observed (for instance, from the issuing of reassuring statements to the adoption of relatively strict countermeasures in Italy and the FRG, or from no measure to some symbolic measures in France). Those oscillations and shifts indicate the presence of not totally clear and stable goals and/or the difficulties in identifying the best means to achieve certain ends (for example, whether to hide the extension of the fallout or show efficiency in dealing with it

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2 The "stories" offered in the Appendixes do not deal with the long-term changes occurred after Chernobyl; however most of the points/criticisms regarding the treatment of response processes within those "stories" also apply to learning processes.

in order to safeguard national nuclear programmes from anti-nuclear opposition). 3) If one takes long-term changes, it is even more difficult than in the case of short-term responses to realistically conceive them as the result of a long sequence of rational and intended choices.

The "story" reconstructed with the help of the Organizational Process Model provides us with useful elements (which will be discussed in the next paragraph) to interpret the responses to Chernobyl. What appears problematic in that "story" is that, by focusing only on organizational features, constraints and processes, it neglects social and political dynamics that proved to be very important in the Chernobyl case. The conflicts between political parties, the public trust or distrust in institutions, the relative political strenght of actors that are weak in organizational terms (like environmental groups) being cases in point.

Finally, the "story" based on the Bureaucratic Politics Model covers many important elements regarding the response processes that followed Chernobyl, including the "politics of issues" and the processes of mutual adjustment in making choices. The Bureaucratic Politics Model offers then useful "lenses" (which will be mentioned later on) to understand our case, however its reliance on individual personalities, goals and skills is rather problematic. Certainly individuals like Zamberletti, Zimmermann or Pellerin (just to mention some important and visible actors) played an important role in shaping the responses to Chernobyl also due to their personal skills; but they could only exercize such influence thanks to (and constrained by) the specific features of the organization they were members of and the broader political and social context.

Having spelled out some of the limits of the "stories" sketched in the Appendixes, let us focus on some points regarding the explanatory/interpretive capability of the Policy

Communication Model in dealing with response and learning processes.

a. Interpreting response processes.

One threat, many responses.

In the case studies presented in the previous chapters it has been shown that there was no generalized correspondence between the adoption or non adoption of different measures and the detected variations in the extension and seriousness of the radioactive contamination. This remark applies both within and between countries as showed by the German case (where higher precautionary measures were taken in Länder less affected than others by the fallout) and the French case (where no measures were taken also in areas as highly contaminated as in the neighbouring Italy and Germany). It has then been argued that each response (at the national, local and EC level) and the differences between the responses to the Chernobyl fallout cannot be explained by objectively different features of the problem to be faced. Other reasons have been looked for and an interpretation of the processes that developed in each case as well as some comparisons between the different cases were offered.

This was done by focusing on the way scientific and organizational uncertainties (which were both crucial due to the science-based nature of technological risks and to the ill-defined competences in a case of unprecedented crisis) were managed in **defining** the problem and **responding** to it. And this in turn was regarded as due to the relations (in each country and, in a different form, at the international level) between what scientists select as relevant knowledge, what politicians wish to know and to be let known, what information the mass-media have access to, pick out and construct as news, and what pressure social movements and/or interest groups are able to exert concerning the selection, utilization and diffusion of information. These relations also influenced the technical, legislative, organizational and policy adaptations made in the years following the accident.

When analysing the features of the Policy Communication Process in the Chernobyl case, some elements developed within issue framing/cultural approaches and within the Organizational Process Model and the Bureaucratic Politics Model can be useful to analyse the role played by each actor and the interactions between the various actors both at the national and transnational level.

a.1.The role of governmental actors.

As far as **governmental actors** and, in some respects, EC institutions are concerned, the Bureaucratic Politics Model provides important tools to interpret conflicts and coalitions between Ministers as well as between central and local authorities or between officials of different EC institutions. These conflicts and coalitions can be partially explained by pointing to the subjective capabilities, perceptions, stakes, power and position (within the government or political parties or the EC Commission) of leading individuals. On the other hand, the Organizational Process Model reminds us that governmental leaders cannot be taken separately from the constellation of organizations that form the government (or the EC setting); and it explains how the specific features of these organizations influence the definition of the problem as well as the selection and implementation of options. On a more general level, issue framing approaches indicate that politicians' definition of problems as public/political ones or as laying outside their sphere of interest and concern is very much influenced by the broader social context. For example, the presence of strong anti-nuclear movements able to "politicize" nuclear risks (as in the German and Italian cases) or, on the contrary, a diffused acceptance of nuclear power (like in France) have a different impact on politicians' willingness to "see" certain problems as political (beside technical) ones.

Some contributions that point to the relative "weight" of organizational or political features and cultural ones can be found in the contributions on "policy styles" and in the (few) studies concerning policy making and crisis management [3].

The last ones analyse the interaction between the caracteristics of decision-makers, the characteristics of the relevant organizations and the characteristic of the crisis to be faced in shaping governmental responses at the national level. In this respect, Robert Jackson argues that governmental crisis management, "will be determined more by the factors of normal organizational behavior and the normal bargaining process than by between-nation differences per se" (Jackson, 1976: p.230).

This view can be confronted with the concept of "policy style" suggested by Jeremy Richardson and stressing instead cross-cultural/national differences (Richardson, 1982). Richardson defines, "policy style as the interaction between a) the governments'approach to problem-solving and b) the relationship between government and other actors in the policy process" (Richardson, 1982: p.13). He also suggests a typology of national policy styles as characterized by anticipatory or reactive governments' approach to problem solving, and imposing or consensual relationship between the government and other actors.

If one regards both "policy styles" and "normal organizational behavior and bargaining processes" as a sort of "genetic" properties of each (in the case of "policy style") or all (as implicit in the adjective "normal") country/ies and political system/s, a contrapposition between the two approaches will be unavoidable. However this contrapposition is not only unnecessary (and in fact Jackson uses the comparative "more-than" in the quoted sentence); it is also unreasonable. On the one hand

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3 See, for instance, Jackson (1976) and Robinson (1970). From a more sociological perspective, but taking into account also some policy aspects, see Lagadec (1981).

it is in fact impossible to separate the general features (like the reliance on SOPs or governmental positions) of organizational and bureaucratic behavior from their cultural and/or national specific connotations. On the other hand, culture and societies are differentiated and change over time; therefore different "policy styles" can live together (in a more or less conflictual way) in the same country[4] and they can change. Such changes being marginal or radical depending on the strenght of the historical heritage and on the transformations occurring in the political, economic and social basis.

Following this reasoning, both general, "normal", organizational and bureaucratic features and cross-cultural differences must be taken into account in analysing governmental crisis management and responses.

But, as previously mentioned, the responses to Chernobyl were not only governmental responses. In this respect, Richardson's inclusion of the relations between governments and other actors in the analytical framework represents a step forward in order to make sense of the overall picture. And to contextualize governmental actors in the broader policy communication process.

The elements provided by the above mentioned approaches contribute to the understanding of one aspect of the Policy Communication Model, that is **what politicians wish to know and to be let known.**

This depends, on the one hand, on politicians' subjective and "positional" interests, stakes, power and perceptions as well as on the organizational intelligence available at the governmental level in each specific situation. On the other hand, what politicians wish to know and to be let known also depends on the broader social context (and the corresponding "policy style")

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4 Richardson (1982) and especially Hayward (1982) already acknowledged this point.

where issue framing is characterized either by apathy, conflict or consensus.

a.2.The role of experts.

Important actors who are both within and outside the governmental sphere are the **experts**.

The role of governmental experts as advisors and their influence in shaping the governmental and EC definition of the problem and in selecting options has been stressed several times in the present work. Moreover, the role of non-governmental or counter-experts in suggesting alternative definitions of the problem and alternative options, as well as in exercizing a sort of informal peer review of the work of governmental experts, has been also pointed out. Last but not least the relations between experts, the media and (especially through the media) the public have been addressed.

The Organizational Process Model and the Bureaucratic Politics Model provide us with useful tools to interpret the relations between experts and politicians. The first one by pointing to the process of organizational intelligence (that is the way information is selected and processed according to organizational features and procedures), and the second one by implicitly reminding us that the available information and the advices offered by experts are selected by politicans according to their interests and perceptions.

Organization Theory also contributes to the understanding of the functioning of scientific organizations. However, the specific features of such organizations and the behavior of individual scientists cannot be fully grasped without resorting to studies in the field of sociology and philosophy of science [5]. Beside SOPs, programmes and repertories, also the cognitive

5 Some of these science-related issues are discussed in the first chapter, beside being addressed in the cases studies.

dynamics of scientific research, the building and exercise of that specific sort of power which is represented by scientific knowledge must be analysed in order to interpret the disagreements between experts as well as their role as advisers and, using a term introduced by Martin Rein (Rein, 1986), as "sponsors of framing". The role of radiation protection experts and physicists (beside leading Ministers) during the Chernobyl fallout being a case in point. Beside "sponsoring" a certain frame, governmental experts also struggled to keep the "ownership" (Gusfield, 1981) of radiation risk as a problem that public action cannot do anything about. Due to the reasons discussed in teh case studies, such "ownership" was rather successfully kept in France and was instead challenged by counter-experts and the anti-nuclear movement in Italy and the FRG.

These elements, together with organizational features, enable us to interpret another component of the policy communication process, that is how and why scientists select what they regard as policy relevant knowledge.

What scientists select as relevant knowledge depends on specific features of the organizations they are members of, on specific features of scientific research, on experts' capacity and willingness to act or not to act as advisers, and on the public/political or purely scientific dymension of issues.

a.3.The role of mass media.

During the Chernobyl fallout the **mass media** of the various countries were directly involved in crisis management, particularly by diffusing information on countermeasures, and acted as means of communication between different sectors of society. Beside that, they also participated in defining the problem and indirectly (for instance, by giving voice to public concerns) in selecting options. At the transnational level it can be noticed that while no "EC mass media" as such exist, news spread beyond political borders and enlighted the differences and similarities between European countries (as showed in the discussion of the French media coverage of the responses to Chernobyl in the neighbouring Germany and Italy). Furthermore, national media also vehiculated in the Member States the "harmonizing words" issued in Brussels. In this way the media contributed in developing an "EC dymension", beside the various national ones, of the Chernobyl fallout.

Organization Theory provides a good basis to interpret processes such as news gathering, newsmaking and agenda setting. In fact it points to the selective procedures through which news are gathered (by international and national news agencies as well as by each newspaper, TV or radio), to the routines (in terms of timing, standard format, language, etc.) involved in the making of the news, and to the organizational (beside political and economic) constraints which determine the contents and priorities of agenda setting[6].

However, also the interwinement between media and politics must be taken into account. On the one hand, political factors influence the way news are gathered, selected and constructed; in this regard, some authors link organizational and bureaucratic politics aspects by emphasizing the role of officials -and we can include, in the light of the Chernobyl case, also governmental experts- as crucial sources of news and their tactical use of the media (see, Sigal, 1973; Halperin, 1974: cap.10).

On the other hand, the mass media interact with and influence politics thanks to their own power base in society[7] and to their

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6 On the organizational features of mass media, especially concerning the press, see -for instance- Engwall (1978), Fenby (1986), McQuail (1983: cap.4), Sigal (1973), Tuchmann (1978), Wolf (1985, cap.3).

7 According to Michael Gurevitch and Jay Blumler at least three sources of media power can be identified: the *structural* root of media power springs from the media capacity to deliver to politicians an audience which is unavailable by any other means; the *psychological* root steams from the relation of credibility and trust developed by the media with members of their audience; the

ability to produce and diffuse frames. As Gaye Tuchman writes, news is a frame that "..imparts to occurrences their public character as it transforms mere happenings into publicly discussable events" (Tuchman, 1978: p.3). If one adds to these aspects the technological one, that is the quick development and diffusion of information technologies which make the contemporary world a "global village"[8], the increasingly important role of the mass media emerges even more clearly.

All these elements help us to interpret the third component of the policy communication process, that is **what information the mass media have access to, pick out and construct as news.**

This is due to organizational and technological features of the media and to their relationships with the political and social system. Both these elements influence in fact the agenda setting of media and the framing of issues as news.

a.4.The role of public and private interest groups.

During and following the Chernobyl fallout, **public and private interest groups** participated in the problem definition and option selection processes.

As far as private interest groups are concerned, the nuclear industry exercized a crucial influence in framing the issue of the safety of nuclear reactors as a "Soviet" problem not concerning the "West" and in marginalizing that issue as much as possible in the "response agenda". Other private interest groups, such as farmers' organizations, also tried to influence the governmental response by pointing to the economic cost and to the scientific

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normative root that comes from tenets of liberal philosophy such as the freedom of expression (Gurevitch and Blumler, 1977).

8 As pointed out in chapter 3, inequalities in the diffusion of information technologies and constraints on their utilization make the "global village" not homogeneous.

uncertainties involved in restricting the selling of certain foodstuffs. Even when they were not able to impose their definition of the problem, they succeded in making the issue of economic compensation being included in the "response agenda".

With respect to private interest groups it can then be said that their ability to exercize a **pressure concerning the selection, utilization and diffusion of information** depend both on their organizational resources and especially on their economic and, indirectly, political power.

Public interest groups were able (especially in the FRG and Italy) to make their voice listened to in spite of their scarce economic resources. Anti-nuclear and environmental groups participated in the policy communication process through arguments as well as through actions (mainly demonstrations) aimed at making their arguments and concerns visible. They suggested a definition of the problem in terms of the high risks involved by nuclear power technology and suggested both case-specific (i.e.countermeasures) and general (withdrawal from nuclear power) options. In this way they pushed politicians (both government and political parties leaders) to include Chernobyl and nuclear issues in the political agenda.

The organizational features and resources of the mentioned private and public interest groups differ remarkably[9]. As already noticed, there is an enormous difference between the degree of complexity and the economic and technical resources of the nuclear industry and those of the various anti-nuclear groups. However, in the Chernobyl case those anti-nuclear and environmental groups which were better organized and were numerically and politically stronger, were able to use their unformalized and flexible

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9 There is a large Organizational Theory literature dealing with business organizations. Less developed is the literature regarding the organizational features of public interest groups; interesting contribution in this field, especially concerning environmental organizations, can be found in Diani (1988); Nelkin and Pollack (1981); Rovelli (1988); Rucht (1989).

organizational structure to spread and make visible their point of view by promoting local and national initiatives, by organizing counter-expertize to contrast governmental and industry experts and by obtaining access to the media. In other words, those anti-nuclear and environmental groups were able to make the most of the opportunities for communication available in the political system. Opportunities (in terms of the degree of access of the decision making process through courts, participatory procedures like hearings, referenda, etc.) that differ in the various political systems.

As far as the supranational context is concerned, it has to be mentioned that NGOs played a less important, or at least a less direct role at the EC level. This was due not only to the relative weakness of NGOs working at the EC level [10] but to the fact that the EC decision making process (with the multiple bargainings within and between the EC institutions and between them and the member states) mainly reflect internal (within the EC institutions) and inter-governmental bargainings. Which means that the EC response to Chernobyl was influenced by public interests groups in a mainly indirect way, i.e. through the pressure these groups had been able to exert within the member states [11].

On the basis of the mentioned points it can be argued that the organizational features, the relative strenght and the ability of public interest groups to use the available communication opportunities, together with the characteristics of the various political and institutional systems (at the national and

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10 The EC "ombrella organizations" of environmental and consumer groups are rather weak in economic and organizational terms. Besides, the vagueness of the notion of an "European public opinion" and the distance between EC institutions and citizens (usually bigger than in the national context) make also the political influence of these European NGOs quite weak.

11 This was the case also of business EC "ombrella organizations", even if such organizations have much more resources than environmental ones.

supranational level), account for the pressure that these groups are able to exert concerning the selection, utilization and diffusion of knowledge.

a.5. Communicative interaction and uncertainty management.

The analysis offered above tries to shed some light on the specific features of and the interactions between politicians, experts, mass media and interest groups (public and private) as the main actors involved in the policy communication process.

All of them participated, in different ways, in the multi-directional flows of information (including the provision of and contrasts between arguments) that took place during the fallout and in the related processes of problem definition and option selection.

If we start with the initiating event (the Chernobyl accident and fallout) and we try to summarize the main components of the process that lead to the responses to such event, the following chart can be drawn:

```
         c o m m u n i c a t i v e   i n t e r a c t i o n
        ┌-----------------------------------------------------┐
        |                                                     |
        |  u n c e r t a i n t y   m a n a g e m e n t       |
        |  ┌-----------------------------------------------┐  |
        |  |                                               |  |
        |  |                                               |  |
 event--------------->problem definitions--------------->responses

(Chernobyl)          (emergence of a             (decisions and
                     "dominant frame")           non-decisions)
```

When "filling" this chart with some of the findings discussed in the case studies, we see that the same event gave rise to different definitions of the problem (frames).

While in France governmental experts and authorities were able to impose -in a non cohercive way- a definition ("dominant frame") of the fallout as an external problem, both in the FRG and Italy the "dominant frame" that emerged few days after the accident defined the fallout as a nationwide public health problem (with more emphasis on the "emergency" character of such problem in Italy and more emphasis, especially by Länder authorities, on the local variations of such nationwide problem in the FRG).

Moreover, not only different definitions of the problem gave rise to different responses, but also similar definitions of the problem resulted in partially different responses. Till the "dominat frame" defining Chernobyl as an external problem was not challenged (by the media and anti-nuclear groups) in France, no countermeasure was adopted and this no-response contrasted with what was happening in the neighbouring FRG and Italy. Even when such frame was challenged, only few symbolic measures were taken; partially because it was too late to do otherwise and partially because the "challenge" regarded more the secretive attitude of the responsible authorities that the extension and possible health consequences of the fallout. On the other hand, while precautionary measures had been adopted both in the FRG and Italy, differences can be observed in the legal character of such measures (mainly Ministerial decrees in Italy and recommendations by the SSK in Germany) and in their implementation (more differentiated in the FRG due to federal/state cleavages and political party conflicts).

Many case-specific elements contributed to the emerging of one or the other "dominant frame" (and marginalization of other frames), and to the selection of certain responses (including "non-decisions"). Among these elements (analysed in the case studies) one can mention the structure and role of in-house governmental expertise in the three countries, the "weight" of the nuclear programmes in national economy and politics, the activism or weakness of anti-nuclear opposition and counter-expertise, and so on.

On a more general level however, what appear crucial are the relations -or communicative interaction- between the relevant actors and the corresponding management of scientific and organizational uncertainties. These uncertainties had been managed, both in defining the problem and responding to it, in a strategic way (including attempts to deny them) but within the context of certain -eventually changing- constraints such as the evidence provided by monitoring data (evidence that was differently interpreted and used but had to be taken into account) and its diffusion within or outside political borders (international communication flows proved to be an important, while not necessarily binding, "constraint" to secretive attitudes by national authorities). In this respect, elements such as the accessibility of information (from governmental or non governmental sources within and outside political borders) and the degree of pluralism and/or fragmentation (horizontal or vertical) of the policy process proved to be very important in the Chernobyl case.

Summing up, the way each actor contributed to the policy communication process by gathering, selecting, diffusing and/or constructing information was due to the specific features of the (national or transnational) context and on the resources of -and power relations between- the relevant actors.

In turn, the different shape of the communicative interaction between actors in the cases under examination determined the way scientific and organizational uncertainties were managed during the fallout (mainly to take them into account or deny them, to cope with them through emergency or routine procedures, and so on) and, consequently, they determined the different responses to Chernobyl.

b. Interpreting learning processes.

Beside the various short-term responses, many medium- and long-term changes (changes in the framing of issues and technical, legislative, organizational and policy adaptations) followed the Chernobyl accident.

In the case studies some reasons are suggested concerning why these changes occurred and why do they differ in different contexts.

In the following pages a more general framework is offered by asking whether and how the conceptual models discussed above, and especially the Policy Communication Model, can help to interpret learning -beside response- processes.

Before embarking in such enterprise it seems necessary to previously simplify and clarify the "magma" formed by the various changes discussed in the previous chapters. The suggested simplification/clarification will focus on the actors (who are the "learners" ?), the process (how and which kind of learning has taken place ?) and the results (what has been learned ?).

On the basis of this simplification/clarification, the reasons and dynamics of the learning processes will be then explored.

b.1. Clarifying the "magma": the actors, the process, the results.

b.1.1.Actors.

The actors who actually decided about adaptations to be made are the policy makers. But this does not mean that they have been the only learners. In fact, experts collaborated in formulating not only technical but also legislative, organizational and policy adaptations, and in some cases they directly elaborated measures that policy makers had simply to ratify (for example, concerning monitoring and radiation protection norms). Besides, public interest groups and the media pushed into the policy and political agenda some issues that were then addressed by legal, organizational and policy adaptations. What is more, they played a key role in fostering changes in the framing of issue; for instance, "sponsoring" a framing of the Chernobyl fallout as a problem not to be left in the hands of ("owned by") governmental authorities and experts.

As already discussed with respect to the responses to the Chernobyl fallout, if it is true that some individuals took a leading role in promoting (or opposing) certain measures, the main actors involved in the learning (as in the response) process have been collective actors. That is, governmental and trans-governmental (in the case of EC institutions) bodies, international organizations, scientific (both governmental and non-governmental) organizations, public and private interest groups and the media. The focus of analysis must then be on learning by collective rather than individual actors.

b.1.2.Process.

On the basis of the remarks suggested above, an organizational learning process, a policy learning process and a social learning process should be distinguished, the first two being parts of the third one [12].

Organizational learning refers to the way organizational features and dynamics brought about, constrained or prevented learning. Giving the fact that governmental and non-governemntal organizations are actors of the policy process, organizational learning can be regarded -in the present context- as a part of the

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12 Governmental learning is regarded in this context as an aspect of policy learning and it is not specifically addressed because it focuses on specific actors rather than on a process (organizational, policy, social) like the other concepts referred to.

policy learning process. This last process indicates the way policy was marginally or radically changed as a consequence of the new situation caused by the Chernobyl accident, including the new forms and contents of communication among the actors involved. Since policy making is embedded in the broader social environment and results from the interactions between various -not only governmental- actors, policy learning can be regarded as a form and part of social learning. Instead this last term, which indicates all the collective learning processes taking place in a society, is not reducible only to policy changes.

If we ask how these learning processes have been developing, both the framing of issues and the actions taken to deal with them must be taken into consideration. With respect to both these aspects, the role played by each of the mentioned actors and especially the interactions between them must be analysed to understand the mechanisms of and constraints to learning.

The working definition of learning suggested in the first chapter is referred to when analysing whether and how learning had been actually taking place after Chernobyl, and whether such learning explains the changes that had been made or is merely a label for describing them. According to such definition, learning is a collective cognitive process involving the acquisition of new skills and the re-framing of issues, which may then produce changes in behavior. Such process occur through communication and is based on the incorporation of new, or previously neglected, information and (usually) on self-reflection on previous experience. As far as this last point is concerned, it must be noted that learning not always involves self-reflection but may take place on the basis of unintended (quasi-automatic) "matching" between the cumulation of information and skills and the occurring of certain experiences.

While learning always produce cognitive changes, it does not necessarily bring about some practical results. In the Chernobyl case however both practical results and some less visible ones can be observed.

b.1.3.Results.

A way to find out what has been learned after Chernobyl is to look at the technical, legal, organizational adaptations described in the previous chapters. However those adaptations do not exhaust the scope of learning results.

A more comprehensive "list" includes social and governmental awareness that a serious accident can occur and that nuclear risks are transboundary (with the related adjustments in the field of monitoring, radiation protection, emergency management, information exchanges and mutual aid in case of accident). Moreover, other aspects should be added as different actors learned different lessons from Chernobyl. For instance, governmental authorities discovered to be unprepared to cope with transboundary environmental crises; EC institutions and some international organizations realized that there was room for them in the field of transboundary risk management, but they also experienced that national governments were not too willing to transfer to them some of their "sovereign" competences; lay people found out that those responsible for managing nuclear risk were not able to do it properly; the nuclear industry discovered to be vulnerable to a nuclear accident happening also far away and causing an increase in anti-nuclear opposition.

In other words, the results of learning processes had been both actual measures/adaptations and different ways of looking at things.

The following chart summarizes the main aspects of learnig processes:

(see next page)

```
        c o m m u n i c a t i v e   i n t e r a c t i o n
   ┌──────────────────────────────────────────────────────────────┐
   |        u n c e r t a i n t y   m a n a g e m e n t            |
   |  ┌───────────────────────────────────────────────────────┐    |
   |  |                                                       |    |
event----------------->learning---------->medium/long-term changes

(Chernobyl and      (reflection on             (changes in frames,
responses to        experience,                technical, organiz.,
Chernobyl)          acquisition.of             legal, policy adapt.)
                    knowledge and skills,
                    reframing)
```

c.2. Conceptual models and learning processes.

Having (hopefully) clarified the "magma" of post-Chernobyl changes, we can explore the reasons and dynamics of learning processes in the light of the conceptual models previously discussed.

The **Organizational Process Model** and Organization Theory more in general provide us with useful tools to understand why certain adaptations at the organizational level, or organizational learning, have taken place and why did they differ.

Taking the cases, for example, of the reorganization of ENEA in Italy, of CEA in France and some nuclear centres (like Jülich) in the FRG, as well as the marginal organizational changes adopted within the French Ministry of Industry or the designing of the organizational structure of the BMU in the FRG, the Organizational Process Model enable us to identify some organization-specific mechanisms of and constraints to learning.

Regarding the last ones, the difficulties met in adjusting the tasks and the goals of an organization like ENEA or in reducing the size and eventually the responsibilities of a "giant" like CEA (but also of a smaller organization such as the Jülich centre), can be explained by the contributions that point to the entrenched ideologies and values that militate against organizational adaptability (Beyer, 1981) and to the need for, but also to the risks (like the risk of organizational paralysis) implied by unlearning (Hedberg, 1981; Starbuck, 1983). Beside that, also the organization of the BMU, which was formed by putting together "pieces" of other Ministries and by leaving them as almost totally separate units while working under the same roof, can be partly regarded as the result of organizational inertia and resistance to radical changes. This seems to be even more the case concerning marginal adjustments like the establishment of a crisis information unit within the French Ministry of Industry. On the other hand, the resistance of organizations to radical changes can be also interpreted as a way to deal with limited internal flexibility and prevent the risk of paralysis involved by unlearning.

As far as the mechanisms of organizational learning are concerned, it can be noted that in spite of the mentioned difficulties and resistance to change, all the above mentioned organizational adaptations show an ability to learn from and adjust to experience by copying not only with the uncertainties involved in a changing external environment but also with the uncertainties regarding certain features, such as the flexibility, of each organization. This can be viewed as the result of a self-reflective (by organizations themselves) or imposed (for example, by politicians) re-evaluation of certain external events and previous organizational performance, and of a reframing of issues (for instance, nuclear safety in conjunction with -rather than isolated from- environmental policy issues as in the BMU case) through communication within organizations and between them and their environment.

Another point to be made concerns the fact that, once substantial organizational adaptations are made, they can influence the broader policy learning process. And this implies that not only organizational but also political resistance to such adaptations can arise in order to prevent radical policy changes. Or, on the contrary, organizational adaptations can be promoted by politicians as a substitute for policy change.

With respect to the last point, the **Bureaucratic Politics Model** contribute other important elements to explain why certain adaptations were or were not made and why did they differ.

Just to continue with organizations, it was already mentioned (in chapter 5) that the establishment of the BMU was the result of political conflicts between political parties about the nuclear issue together with the willingness and ability of a leading politician to "do something" in order to gain credibility and weaken the opposition.

To give another example concerning the importance of bureaucratic and also party politics in promoting or preventing adaptations, it can be reminded that the results of the anti-nuclear referenda held in Italy after Chernobyl (and which caused a core policy change) were not only the result of the widespread concern about nuclear power and the strenght of the anti-nuclear movement. They also reflected political manouvering by the major political parties that tried to deal with a changed social environment in a way to preserve -or challenge- dominant positions within the governmental coalition.

Beside their general influence in promoting or preventing adaptations, political aspects also help to interpret why different adaptations have been actually made. The presence or absence of strong political conflict (especially, but not exclusively, political party conflicts) over nuclear issues, the importance or irrelevance of central/local and federal/state cleavages, the openess or closure of the political (and legal) system to citizens' participation are all important elements that made and make a difference in deciding about the adaptations to be -or not to be- implemented. However, it is worthwile to mention that these aspects go beyond the "top level" governmental circles analysed by the Bureaucratic Politics Model.

Also with respect to learning processes, as it was the case with response processes, the **Policy Communication Model** can provide a more comprehensive interpretation by including the aspects treated above but emphasizing the patterns of interaction between all the relevant actors in framing issues and taking actions.

If we take the adaptations which were made following Chernobyl, we see that they are the result of organizational and policy learning processes at the national and at the transnational level. And that in turn these learning processes cannot be regarded as a merely governmental "*affair*" but result from the multi-way and asymmetrical communication between policy makers, experts, the media, and public as well as private interest groups. Therefore they can be regarded as parts of a broader social learning process.

Let us clarify this point.

The management of the scientific and organizational uncertainties which emerged during the Chernobyl fallout continued after the short-term responses to the fallout itself and resulted in various kinds of adaptations.

Technical and organizational adaptations aimed at filling the gaps in monitoring networks, improving data gathering methods, harmonizing data and coordinating or centralizing their diffusion have been made in order to reduce at least the uncertainty in the factual basis. Legal adaptations in the field of radiation protection represent important tools for managing both scientific (about limit values) and organizational (about responsibilities) uncertainties. Organizational adaptations concerning the structure, tasks and even goals of certain organizations were also made to cope with the uncertainties about the role of these organizations in a changed political and social environment.

Policy adaptations (both peripheral and, in few cases, core policy adaptations) represent the more comprehensive ways to manage the uncertainties which emerged during the Chernobyl fallout. This was done either by fillings some legal or organizational gaps while preserving the overall policy, or by "dismissing" (as in the Italian case) a too controversial "core" and "save" some parts of nuclear policy like nuclear research.

Concerning the reasons why and processes through which these adaptations were made as a consequence of (even if not necessarily indended to cope with) the scientific and organizational uncertainties experienced during the Chernobyl fallout, some points can be made by focusing on the interactions and communication between the involved actors.

We can start by asking why changes were made after Chernobyl; not only why certain specific changes were made, but also why did change in general occur. A counter-factual question may provide the hints to find an answer; in fact if we ask, "Would any change have occurred if the accident and the fallout would have been kept secret ?" the crucial role of information and communication in fostering change becomes clear. It was by knowing about them and by communicating about their causes, features and consequences that both short-term responses and medium-term adaptations were formulated and implemented.

Regarding this last point, an element to be emphasized is the dynamic of the communication processes; a dynamic which involves both controversy and consensus. It was mainly through controversies and disagreements that changes (in terms of framing of issues and actual adaptations) were originated. Till disagreements did not arise (or were kept well under control), nothing "happened". On the other hand, some forms of consensus (not "universal" but "partial", i.e. between some parts/actors involved in the process) about the seriousness of the event and the risks involved was needed to reach agreement on actions to be taken [13]. In other words, different actors learned from the Chernobyl experience -and eventually took action- by being exposed to each other arguments and arguing and reflecting about them. For example, adaptations regarding monitoring were the result of reflection on the deficiencies (gaps in the monitoring networks, unhomogeneity of data, etc.) experienced during the fallout, reflection that was shaped by the communication and controversy on this matter (controversy which was not confined to scientific circles but was made public by the media) between experts and counter-experts.

Of course this process did not start from zero. Previous frames, together with organizational and political dynamics, influenced the way actors experienced the various aspect of the fallout and the way they made and reacted to arguments.

As Hall argues -for instance- with respect to policy makers, "Policy makers are in a much stronger position to resist pressure from societal interests if they are armed with a coherent policy paradigm [14]...Conversely, in the absence of such a paradigm, policy-makers may be much more vulnerable to outside pressure" (Hall, 1990: p.21). The lack of such a paradigm can help explaining, for instance, the core policy change occurred in Italy following Chernobyl; its availability may instead account for the relative stability of German nuclear policy in spite of a strong anti-nuclear opposition, and for the continuation of the "*tout nucléaire*" option in France. Especially in the last case, the links between civilian and military purposes and the emphasis on

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13 In this respect, I do not share Ernst and Peter Haas' emphasis on "consensual knowledge" as a basic component of learning (Haas, 1990; Haas, 1989). While being a basis to achieve the results of learning (mainly to take action), and being a possible result of learning processes, consensus is not necessarily a basis for learning. A strong consensus can in fact prevent learning, as demonstated -for instance- by the history of the relations between science and the catholic church.

14 A policy paradigm, also according to Hall (1990), is a framework of ideas and standards that specifies not only policy goals and instruments but also the nature of the problems these goals and instruments are meant to be addressing.

nuclear power as a basis of French "*grandeur*" contribute in producing a strong, and hard to influence, policy paradigm where the nature of the problems (energy and defence independence), goals (large and state controlled production of nuclear power), and instruments (laws, economic incentives, etc.) are strictly connected.

From a broader perspective, Thompson and Schwarz (1990) argue that the modes of learning -as far as far as environmental and related scientific/technological issues are concerned- are shaped by the previously mentioned "myths of nature" referred to by the various actors. Following this reasoning, no learning is possible for those -the "fatalists"- who think that nature is "capricious"; what is capricious cannot be predicted and eventually mananged. For others learning is instead possible, though each is disposed to learn different things. For instance, those "egalitarians" who think that nature is "ephemeral" will interpret experiences like Chernobyl as a demonstration that certain technologies should be banned since they represent a too high risk; on the other hand the "hierarchists" who regard nature as "perverse/tolerant" will tend to consider Chernobyl as a demonstration that stronger controls are needed, and the "individualists" who think that nature is "benign" will develop a *laissez-faire* attitude.

This does not mean that each actor remains tied to his/her myth as one could induce from this typology. Post-Chernobyl changes show that even in the nuclear field, where the contrapposition between pro- and anti-nuclear positions usually prevent any possible dialogue, actors did not merely stick to their previous ideas and perceptions. Shifts occurred not only from one to the other cognitive packages and groups of actors (for instance, through cooptation), but also (even more interestingly) within the same ones. For instance, "hierarchist" type of actors had been influenced by "egalitarian" type of arguments -while not becoming themselves "egalitarian"- in the reframing (whether for conviction or opportunity is another matter) of the nuclear controversy in Italy; and this lead previous supporters of nuclear power to argue for the abandonment of the Italian nuclear programme. In the French case one can instead argue that "egalitarian" type of actors had been influenced by "hierachist" type of argument -even when they were not coopted by the establishment- when focusing on management aspects (like monitoring and information) beside -or rather than- asking for the immediate closure of all French nuclear plants. This shows that communication and reflection on experience had been as important as shifts in social context (i.e. from one to the other box of Thompson and Schwarz typology) in fostering reframing. And that, at the same time, the presence or absence of pre-existing strong frames (including policy paradigms) condition the content of reframing.

While there can be disagreements concerning whether the adaptations and the changes in the framing of issues occurred after Chernobyl represent improvements or not, it emerges quite clearly from the remarks suggested above and from the case studies that they represent something new which came out from the interactions between the actors involved in the differently shaped policy communication processes. Processes where the discourse on nuclear power had to be partially or radically reframed in terms of accidents that can (rather than cannot) happen, transboundary risks, credibility of institutions and other aspects previously neglected. And on the basis of this reframing, that occurred through communicative interaction, the mentioned technical, legal, organizational and policy adaptations were formulated, selected and implemented.

In this respect it is worth pointing out that these adaptations were not just the responses to the consequences of previous (nuclear) policies. Certainly the success or failure (in terms of nuclear programmes development, their economic costs and benefits, and their public acceptability) of previous policies had a crucial role in preventing or making relatively easy a core policy change. However, adaptations had to be made in response to a changed social environment (even if changes where not homogeneous in different contexts) where scientific and organizational uncertainties had become a public issue, where the credibility of experts and politicians had been challenged and where also non-governmental actors participated in shaping the policy discourse and in formulating or even selecting (as in the case of the Italian referenda) "learning options".

Beside the adaptations actually made and forming the "physical", visible components of policy learning, also these changes in societal relations and perceptions are lasting and are being "transmitted". For instance, through legislation (that, as pointed out by Gusfield, reinforces meanings) and through media coverage -even if decreasing over years- of the anniversaries of Chernobyl.

Regarding transmission processes it must be added however that when one tries to answer the question "what remains ?", mixed evidence can be referred to.

On the one hand, an increased attention and sensitiveness regarding nuclear risks seems to last; beside being "officially recorded" in national and EC legislation and in international Conventions, such attention seems to inspire the closure of several nuclear plants in the former USSR and GDR and the agreements on technical cooperation in the field of nuclear safety between the EC, former USSR and Eastern European countries. On the other hand, elements such as economic and political instability or the emergence of the debate on the greenhouse effect may "counterbalance" such sensitiveness towards nuclear risks. As far as the first element is concerned, economic and political instability tends to reduce the range of available options and to select from past experience only what is (or seems) useful to face present problems on the basis of certain priorities; industrial safety and environment and health protection usually not appearing among top priorities in these circumstances. With respect to the debate on the greenhouse effect it is worth mentioning that arguments for increasing nuclear power production as an alternative to energy sources producing CO_2 emissions are being put forward by the nuclear industry and by several experts. The suggested trade-offs between more nuclear risks or more CO_2 emissions is being presently discarded as unsound and unnecessary not only by environmentalists but also by many governmental authorities; not only (or mainly) because of the "memory" of Chernobyl but also because of the uncertainties surrounding the greenhouse issue. This "balance" may change or be consolidated in the future depending on changes in the greenhouse debate and/or nuclear accidents or discoveries (for example, regarding nuclear fusion) in the nuclear field.

The mixed evidence regarding "what remains" does not mean that learning did not take place following Chernobyl; it rather indicates that its results are not "given for ever".

Moreover, whether learning involves a capacity of doing better in copying with nuclear risks remains an open question. And the challenge is a very difficult one since what is certainly going to remain for a long time is a burdersome "heritage".

"The pyramids of the Pharaohs have been there for a mere five thousand years. But to contain the radiation your nuclear pyramid must remain for at least one hundred thousand years...
That's some monument to leave our descendants, isn't it ?"

Vladimir Gubaryev, Sarcophagus

REFERENCES

ALLISON, Graham (1971), Essence of Decision. Explaining the Cuban Missile Crisis, Little, Brown and Company, Boston.

BEYER, Janice (1981), Ideologies, values, and decision making in organizations, in NYSTROM, Paul and William STARBUCK eds., Handobook of Organizational Design, vol.2.

CLARK, William (1990), Social learning in the management of global environmental risks, Research Proposal to the MacArthur Foundation.

DIANI, Mario (1988), Isole nell'arcipelago. Il movimento ecologista in Italia, Il Mulino, Bologna.

EDER, Klaus (1985), Geschichte als Lernprozess? Zur Pathogenese politisches Modernität in Deutschland, Surkamp, Frankfurt/Main.

ENGWALL, L. (1978), Newspapers as Organizations, Saxon House, Farnborough, Hants.

FAYERABEND, Paul (1975), Against Method. Outline of an Anarchistic Theory of Knowledge, New Left Books, London.

FENBY, Jonathan (1986), The International News Services, Schoken Books, New York.

GOFFMANN, Erving (1974), Frame Analysis. An Essay on the organization of Experience, Northeastern University Press, Boston.

GUREVITCH, Michael and Jay BLUMLER (1977), Linkages between the Mass Media and Politics: a model fro the analysis of political communication systems, in CURRAN, James et al. eds, Mass Communication and Society, Edward Arnold, London.

GUSFIELD, Joseph (1981), The Culture of Public Problems. Drinking, Driving and the Symbolic Order, The University of Chicago Press, Chicago-London.

HAAS, Ernst (1990), When Knowledge is Power. Three Models of Change in International Organizations, University of California Press, Berkeley/Los Angeles/Oxford.

HAAS, Peter (1989), "Do regimes matter? Epistemic communities and Mediterranean pollution control", in International Organizations, vol.43, n.3.,pp.377-403.

HABERMAS, Jürgen (1984), The Theory of Communicative Action, vol.1, Bacon Press, Boston.

HALL, Peter (1990), Policy Paradigms, Social Learning and the State: the case of economic policy-making in Britain, Estudio/Working Paper, Instituto Juan March, Madrid.

HALPERIN, Morton (1974), Bureaucratic Politics and Foreign Policy, The Brooking Institutions, Washington.

HAYWARD, Jack (1982), Mobilising Private Interests in the Service of Public Ambitions: the salient element in the dual French policy style?, in RICHARDSON, Jeremy ed., Policy Styles in Western Europe, G.Allen & Unwin, London.

HECLO, Hugh (1978), Issue Networks and the Executive Establishment, in KING, A.ed., The New American Executive Establishment, American Entreprise Institute, Washington DC.

HESSE, Mary (1974), The Structure of Scientific Inference, MacMillan, London.

JACKSON, Robert (1976), Crisis management and policy making: an exploration of theory and research, in ROSE, Richard ed., The Dynamics of Public Policy. A Comparative Analysis, Sage Publications, London-Beverly Hills.

LAGADEC, Patrick (1981), La civilisation du risque. Catastrophes technologiques et responsabilité sociale, Seuil, Paris.

LIBERATORE, Angela (1989 b), "Robinson e la foresta. Sui limiti della teoria della scelta razionale", in Meridiana. Rivista di storia e scienze sociali, n.6.

LINDBLOM, Charles (1959), "The Science of Muddling Through", in Public Administration Review, vol.XIX, pp.79-88.

LINDBLOM, Charles (1990), Inquiry and Change. The Troubled Attempt to understand and Shape Society, Yale University Press, New Haven-London.

MAJONE, Giandomenico (1989), Evidence, Argument and Persuasion in the Policy Process, New Haven , Yale University Press.

MARCH, James and Herbert SIMON (1958), Organizations, John Wiley & Sons Inc., New York-London-Sydney.

McQUAIL, Denis (1983), Mass Communication Theory. An Introduction, Sage, London, Beverly Hills.

MENY, Yves (1990), Government and politics in Western Europe. Britain, France, Italy and West Germany, Oxford University Press, Oxford.

MILLER, Max (1986), Kollektive Lernprozesse, Surkamp, Frankfurt/Main.

MORONE, Josep and Edward WOODHOUSE (1986), Averting Catastrophe. Strategies for Regulating Risky Technologies, University of California Press, Berkeley/Los Angeles/London.

NELKIN, Dorothy and Michael POLLAK (1981), The Atom Besieged. Extraparliamentary Dissent in France and Germany, MIT Press, Cambridge Mass.

NEWELL, Alan and Herbert SIMON (1972), Human Problem Solving, Prentice Hall, Englewood Cliffs, New York.

NYSTROM, Paul and William STARBUCK eds. (1981), Handobook of Organizational Design, 2 voll., Oxford University Press, Oxford.

REIN, Martin (1986), Frame-reflective policy discourse, Working Paper, Leyden Institute for Law and Public Policy.

RICHARDSON, Jeremy ed. (1982), Policy Styles in Western Europe, George Allen & Unwin, London.

ROBINSON, J.A. (1970), The concept of Crisis in Decision Making, in ROSENBAUM, N. ed. Readings in the International Political System, Prentice Hall, Englewood Cliffs, New York.

ROVELLI, Carlo (1988), I modelli organizzativi delle organizzazioni ambientaliste, in BIORCIO Roberto and G.LODI eds., La sfida verde, Liviana, Padua.

RUCHT, Dieter (1989), "Environmental movement organizations in West Germany and France: structures and interoganizational relations", in International Social Movement Research, vol.2, pp.61-94.

SCHWARZ, Michiel and Michael THOMPSON (1990), Divided We Stand. Redefining Politics, Technology and Social Choice, Harverst Wheatsheaf, New York/London/Toronto/Sydney/Tokyo.

SIGAL, Leon (1973), Reporters and Officials. The Organization and Politics of Newsmaking, D.C.Heath & Co., Lexington, Mass.

SIMON, Herbert (1957), Administrative Behavior, MacMillan, New York.

TUCHMANN, Gaye (1978), Making News. A Study in the Construction of Reality, The Free Press, New York.

WOLF, Mauro (1985), Teorie delle comunicazioni di massa, Bompiani, Milan.

Opening conclusion

> *"Eines Tages..werden die Kirschbäume aufgeblüht gewesen sein. Ich werde vermieden haben, zu denken: "explodiert"; die Kirschbäume sind explodiert, wie ich es noch ein Jahr zuvor, obwohl nicht mehr ganz unwissend, ohne weiteres nich nur denken, auch sagen konnte."**
>
> *Christa Wolf, Störfall*

Beside and before being a technical, political and legal issue, Chernobyl meant a break in the experience of many persons; a break which has been more or less deep and lasting depending on geographical location and other elements.

Lessons have been drawn from Chernobyl, even if different persons will evaluate them differently on the basis of their positions, interests and perceptions.

Changes occurred in terms of practical adaptations and reframing of issues. In general terms it can be said that an increased awareness of nuclear risks spread together with the Chernobyl fallout and that more "tools" (technical, legal, political) to cope with these risks are now available.

This will not necessarily prevent other major accidents or allow a more effective management of such occurrences and their long-term consequences.

Certainly the mentioned changes can help recognizing and taking into more serious consideration warning signals and

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* "One day the cherry trees will have blossomed. I will have avoided to think: "burst"; the cherry trees are burst into flowers, how still last year I could, while with some awareness, not only think but also say."

eventually to react in a more timely and coordinated way to accidental events. However this will depend very much on economic, social and political conditions since attention to signals is very much influenced by the priorities of those who should be able to recognize them and response capabilities are a matter of political will and economic resources beside technical or legal instruments.

It is also true that maybe major accidents had been prevented since Chernobyl and we do not know about them: non-accidents are non-news, and this is a pity because a lot could be understood not only from disasters but also from successes in avoiding disasters. Hopefully someone else (with more technical knowledge and especially more access to nuclear safety "circles") will find out whether successes had been achieved, how and why.

Finally, many of the points of controversy that characterized the post-Chernobyl responses and medium-term changes are not "solved", therefore disagreements over the interpretation of evidence and the actions to be taken can still arise even if constrained by new national and international laws.

Which means that we cannot abolish uncertainty; we rather have to be aware of it and of our own limits, and live with them.

Appendix 1:

Looking through the Rational Policy Model.

Following the Rational Policy Model's assumptions, the national governments of the three countries analysed in the case studies as well as the EC institutions as a whole (particularly the Council and the Commission) should be taken as unitary actors that made choices in order to reach their goals. These goals should then be identified.

Differently from the case of the emplacement of Soviet missiles in Cuba analysed by Allison, the French, German and Italian governments as well as the EC institutions could not be aimed at making the Soviet authorities "retire the fallout". The goals that may be attributed to our "rational unitary actors" should then regard the management of the fallout, particularly the minimization of its consequences.

Three main goals (eventually conflicting) can be singled out in this respect: to protect public health and the environment, to preserve the national (or the European, in case there would be one) nuclear programmes, to preserve political credibility in the eyes of the public (i.e. electors).

In order to achieve one or more of these goals (according to national and EC priorities and preferences), several different choices could be made: 1) "do nothing", 2) pretend and try to convince others that nothing is happening, 3) take symbolic measures, 4) take substantive measures.

Following this reasoning, the national and EC responses to Chernobyl may be explained as follows.

Italy.

Given the small scale of the Italian nuclear programme, one can assume that the preservation of that programme was not an absolute priority for the national government. Beside that, while health and environment protection can hardly be regarded as a top priority the Italian government(s), public concern on these matters was (is) quite widespread. Preservation of political credibility by showing responsiveness to public concern could then be regarded as the main goal of the Italian government in responding to Chernobyl.

In order achieve this goal, various options could be evaluated.

1) "Do nothing". But news about the fallout were spreading around Europe and had already reached Italian non-governmental bodies, mainly the press agency ANSA. Therefore to "do nothing" could result in somebody accusing the government for its immobilism and in a possible loss of credibility.

2) Pretend and try to convince the public that nothing serious was happening. This was tempted in the first days by (some) governmental authorities, but failed due to contrasting views between governmental advisory bodies as well as to

independent laboratories and anti-nuclear experts releasing data and warning against radiation risk also through newspapers.

3) Take symbolic actions. Generic recommendations (like washing carefully vegetables) were made by some government officials but they proved to be insufficient in face of a concerned public made aware of radiation risk by anti-nuclear groups and experts.

4) In these circumstances, to take substantive measures (i.e. restrictions in the selling and consumption of important foodstuffs) could be regarded as the best option and then the rational choice to be made.

Federal Republic of Germany.

The German nuclear programme is one of the largest in Europe, environment protection is ranked quite high (in comparison with other countries) among the German governmental priorities, and political credibility can be regarded as a quite important element for German like for any other elected officials. Given this situation it is rather difficult to attribute to the German Federal government the intention to pursue one rather than another of the three mentioned goals. An additional goal of the German Federal government (not relevant in the case of non-federal states) could be to preserve or broaden its power versus the *Länder*. It could then be argued that the goal of the German Federal government was to find a "compromise" between the intention/need to preserve the nuclear programme, to protect public health and the environment, to preserve political credibility and to preserve its power versus the Länder.

Alternative options could then be evaluated as follows.

1) "Do nothing". But news were spreading in Europe and both the State and the alternative/green monitoring networks could detect the increase of radioctivity and accuse the Federal government for immobilism or take actions independently from it.

2) Pretend and try to convince the public that nothing was happening. This was tempted also in the FRG but failed due to the fact that independent laboratories as well as the Greens - represented in the Parliament and in some States' governments- raised the issue of radiation risk and that some States started taking measures.

3) Take symbolic measures. Also in the FRG generic recommendations were made by Federal authorities but were insufficient in front of a concerned public, a strong anti-nuclear movement and the authority of the *Länder* to take emergency measures.

4) Given this situation, to take substantive measures (setting threshold limits for several foodstuffs) can be regarded as the best option and then the rational choice to be made by the Federal government.

France.

Beside being the largest one in Europe, the French nuclear programme is important not only for civilian but also for military purposes. It can then be assumed that the main aim of the French government in responding to Chernobyl was to preserve the nuclear programme. One can also attribute to the French government the intention to preserve such programme without losing political credibility.

In order to pursue this goal the selection of the "rational choice" can be reconstructed as follows.

1) "Do nothing". Given the spreading of the news on the fallout around Europe, and especially in the neighbouring countries, this option was not viable.

2) Pretend and try to convince the public that nothing serious was happening. On the basis of the available evidence it seems that this is the option that was chosen by the French government (or at least by SCPRI). And that choice could be regarded as a rational one in order to achieve the above mentioned goal given the legal monopoly of monitoring data of SCPRI, the lack of independent monitoring units that could challenge such Service, the lack of a strong anti-nuclear movement and the lack of local authorities able and willing to contrast the central ones. However, this strategy partially failed due to an information campaign by the media and the emerging of some anti-nuclear dissent.

3) Symbolic measures were then taken (the temporary ban of Alsace spinach) and this could be also regarded as a rational choice in the sense that it tried to pursue the given goal at the minor costs.

European Economic Community.

Nuclear power is indicated as an important source of energy by many official documents produced by the EC Council and Commission, however it has been already mentioned that the creation of an European common nuclear market failed. While it could then be attributed to the EC institutions the intention to preserve nuclear power as a source of energy, there is no EC nuclear programme as such (a part from the research programmes) to be preserved. On the other hand, while environment protection is becoming (especially after the approval of the Single European Act in 1987) a rather important EC policy field, it can be hardly regarded as a top priority of the European Economic Community. It must however be remainded that in the Chernobyl case, environment and health protection measures were strictly linked with such a "core" EC policy as trade. In these circumstances, it can then be attributed to the EC institutions the intention to preserve or even strenghten their political credibility and their power in front of/over the member states.

Accordingly, the selection of the best option can be reconstructed as follows.

1) "Do nothing". The "activism" of some member states made this option not viable: in order not to be left aside, EC institutions had to take action.

2) Pretend that nothing serious was happening. This would contrast with the possibility to justify an EC intervention.

3) Take symbolic measures. EC Recommendations were issued but several members states did not listen to them and this could undermine the authority and credibility of EC institutions.

4) Take substantive measures. The choice to issue a binding EC Regulation can then be regarded as "the" rational one in order to achieve the given goal.

Comparison.

In few words it can be said that, according to the Rational Policy Model, the similarities and differences in the responses to Chernobyl can be explained in terms of different goals to be achieved by rational collective (national and transnational) actors. In particular, the adoption as well as the non adoption of countermeasures are both regarded as rational choices made in order to achieve different -or partially different- national and EC goals taking into account, and using strategically, the available information. Information concerning not only (and not especially) the extension of the fallout but concerning the possible consequences of alternative courses of action.

Appendix 2:

Looking through the Organizational Process Model.

Following the Organizational Process Model Model, the constellation of relevant organizations must be identified (in our case both at the national and at the EC level) and the account of the responses to Chernobyl must focus on three elements: organizational intelligence, organizational options and organizational implementation.

Italy.

As far as the governmental sphere is concerned, the following organizations can be identified as relevant for the management of the Chernobyl fallout: the Health Ministry and the Civil Protection Department, an emergency interministry committee (by the Civil Protection Department) and various advisory bodies (mainly ISS, ENEA and ENEA-DISP, and the technical committee - including these three institutions- established to advise the Civil Protection Minister during the fallout). It is important to notice that these organizations interacted with governmental organizations at the local level (local authorities, provincial and local units of the Health Service) and also with non-governmental organizations like the mass media and the anti-nuclear groups[1].

Concerning **organizational intelligence**, both governmental (the mentioned Ministries, diplomacy, the national meteorological service, ENEA and ENEA-DISP, ISS, provincial and local health units) and non-governmental organizations (university laboratories, mass-media, local action groups) were involved in gathering, processing and diffusing information. Moreover, these organizations interacted with similar organizations within some other countries and with international or transnational organizations such as the IAEA, the WHO and the EC institutions. The difficulties met in obtaining information from direct external sources (i.e. Soviet authorities), in checking the information coming from indirect sources (for example, from US Press Agencies) and in gathering data through the existing (and insufficient) monitoring network have been already discussed. What shall be emphasized here is that this multi-level organizational intelligence shaped the definition (transboundary radiological emergency with possible impacts in Italy) and timing (starting from the day following the accident to the official end of the emergency) of the problem at hand.

On the basis of the information made available through organizational intelligence, **organizational options** were

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1 Figure 2 (see cap.3) summarizes the governmental as well as non-governmental organizations involved in the management of the Chernobyl fallout in Italy.

formulated and selected. The Civil Protection Department, with its emergency-oriented internal organization and tasks, played an important role in framing the problem to be faced and the options for action in terms of national emergency. Therefore, coordination of monitoring activities and centralization of data were decided upon. On the other hand the Health Ministry, advised by the ISS framed the problem and the available options in terms of a public health national emergency. As a consequence, countermeasures such as the prohibition to sell certain vegetables and fresh milk were taken. The reasons why the positions of -and options selected by- the Civil Protection and the Health Ministries prevailed over other Ministries (mainly Agriculture and Industry) were already discussed. What can be noticed here is that organizational features of these governmental bodies such as internal resources (like expertise), SOPs, programmes (for example, interministry as well as advisory bodies coordination) and response to external expectations influenced both their definition of the problem and their selection of options. Concerning this last point it should also be stressed that other important actors, that is the mass media, contributed to the definition of the problem and also indirectly influenced (for example, by making public experts'controversies and citizens'concerns)- to the selection of options. This was done by the mass media on the basis of their own organizational features such as the news making procedures/routines.

Organizational implementation. The implementation of the selected options was also influenced by the interactions between different organizations (governmental -central and local- as well as non-governmental) and by the organizational features of these organizations. On the one hand, organizational features such as gaps in the existing monitoring network required the involvement of organizations previously excluded. On the other hand, contrasts sometimes emerged between centralized and decentralized governmental organizations in implementing measures. Beside that non-governmental organizations exercized forms of informal control (for example, by asking for data and offering their own evaluation of such data) on governmental bodies. Finally the mass media were both directly involved in implementing measures (by diffusing the information needed for obtaining compliance) and in providing an arena for communication between the organizations involved in the management of the fallout as well as between them and the affected public.

Federal Republic of Germany.

The most important governmental organizations involved in the management of the Chernobyl fallout at the Federal level were the Ministry of Interior and its advisory bodies, especially the SSK. State administrations were crucial in dealing with the fallout at the decentralized level. Also non governmental organizations (independent research institutions, the media and the anti-nuclear groups) played an important role[2].

Organizational intelligence. Both Federal and State organizations (monitoring institutions, specialized departments within the Federal Ministry of Interior and within some State Ministries, etc.) as well as non-governmental ones (independent research and monitoring institutes, mass media) were involved in gathering, processing and diffusing information. These German organizations also interacted with other national and international organizations and met various problems (similar to those already mentioned with respect to the Italian case) in obtaining data from direct external sources, checking those coming from indirect ones and coordinating monitoring activities at the Federal and State level. On the basis of the data made available by this complex organizational intelligence, the Chernobyl fallout was defined as a transnational radiological emergency with possible impacts in the FRG.

Organizational options. The Federal Ministry of Interior and the SSK opted for nation-wide measures. Monitoring data were centralized by the Situation Centre of the Interior Ministry and the SSK issued recommendations (in terms of limit values) in the field of radiation protection. At the same time, some State authorities opted for local measures (including different limit values) rather than implementing Federal recommendations. The tension between Federal and State options (i.e. between nation-wide/centralized mesures and decentralized/State specific ones) characterized the management of the Chernobyl fallout in the FRG. Different kinds of organizational resources influenced the selection of and the tension between Federal and State options. The Federal Ministry of Interior concentrated important resources in the nuclear field (money, personnell, authority and -through the SSK- expertise) and was able to set a programme (performed by its specialized unit, the Situation Centre) for centralizing and coordinating information. On the other hand, State administrations could rely on their authority in the field of emergency management and some of them were able to gather the expertise needed for justifying State-specific measures. The mass media also participated in the selection and tension between Federal and State options, the national mass media generally supporting Federal measures while those diffused at the local level (especially local newspapers) emphasized local conditions and decisions.

Organizational implementation. Also in the German case, some organizations previously excluded from the (official) monitoring network were then included as parts of the States' networks. Beside that, independent monitoring was carried on by laboratories and institutes close to or parts of the anti-nuclear movement. The recommendations issued by the SSK had to be implemented (according to the German legislation) by the States administrations, but in some cases such administrations preferred to add or substitute to them some State-specific measures, and this caused a rather differentiated implementation of Federal

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2 The organizations involved in the management of the Chernobyl fallout in the FRG are indicated in figure 4 (see, cap.4).

recommendations. Finally, the mass media were active (as in the Italian case) in the direct implementation of measures as well as in providing an arena of communication between different governmental and non-governmental organizations.

France.

Differently from the Italian and the German case, the French governmental organization that played the most crucial and visible role during the Chernobyl fallout was not a political but a technical body, i.e. SCPRI. Only in a second phase (about two weeks after the accident) the Ministry of Industry emerged as an important actor. Local governmental organizations and non-governmental ones were less active and visible in the French case; also the mass media started questioning the government and playing a more independent role much later than in Italy and the FRG[3].

Organizational intelligence. The collection, evaluation and diffusion of information was the main issue in the French case. In this respect it can be said that the selection of options coincided -rather than being based on- the phase of organizational intelligence. Several governmental bodies (SCPRI, CEA, the Food and Hygiene Laboratories and EDF) were involved in the collection of monitoring data. However such data and their diffusion were strictly centralized by SCPRI on the basis of its legal authority in the field of health protection and according to its routines (including the reduction of activities during the weekends). Independent monitoring centres were lacking, the anti-nuclear groups were not able to challenge official figures and the mass media limited themselves to reporting governmental data. French authorities interacted with international organizations but, while complaining for the insufficient information provided by the Soviet authorities, they released only generic estimates on the impact of the fallout in France. The official definition of the problem that emerged from this situation was that of a serious accident which radiological impacts had been kind enough to stop at the French borders.

The selection of organizational options was implicit in such organization of intelligence and in such definition of the problem. The same organization -SCPRI- had a crucial role in gathering, evaluating and diffusing data as well as in suggesting countermeasures. Given this centralized power of a single organization and given its official definition of the problem (both of them initially unchallenged by other governmental as well as non-governmental organizations), no countermeasures to protect health and environment were taken. However, the French organizations involved in the management of the Chernobyl fallout had to react to inputs coming from organizations outside the French borders such as foreign governmental authorities, mass media and anti-nuclear groups and the EC institutions. Measures taken by German and Italian authorities, EC Recommendations,

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3 Figure 6 of cap. 5 summarizes the action set of organizations involved in the management of the Chernobyl fallout in France.

demontrations organized by anti-nuclear groups in several countries and the coverage of these aspects by foreign mass media diffused also in France (especially the press) roused the reaction of French media, anti-nuclear groups, independent experts and governmental authorities, particularly the Ministry of Industry which concentrate most resources and responsibilities in the nuclear field. Consequently some symbolic measures were decided upon, like the late and short ban of Alsace spinach.

Organizational implementation. While the implementation of the initial option (no countermeasures) was guaranteed by the centralized role of SCPRI, the implementation of the ban of Alsace spinach was rather problematic. Such implementation followed in fact a partially "ad hoc" procedure: the Prefects had in fact to to ratify and guarantee the compliance with an emergency decision (therefore a decision they should have been responsible for according to existing emergency plans) taken by a central authority (the Minister of Industry) who has theoretically no authority to take measures such as restrictions in the selling of foodstuffs. This procedure can be regarded as the result of an organizational dynamic that favoured the central role routinely exercized by the Ministry of Industry on nuclear matters over the adoption of specific emergency programmes which would involve a stronger role of Prefects, i.e. governmental authorities which are very important in general but not in the nuclear field.

European Economic Community.

The EC institutions mainly involved in the management of the Chernobyl fallout at the Community level were the EC Commission - particularly the Directorate General for Environment, Consumer Protection and Nuclear Safety[4], DG XI- and the EC Council; also the European Parliament addressed the issue. Environmental and consumers' NGOs organized at the EC level (like the European Environmental Bureau -EEB- and the Bureau Europeen des Unions de Consummateurs -BEUC) did not play...

Organizational intelligence. Concerning the gathering of monitoring data (i.e. a kind of information which was crucial during the fallout), the EC institutions depended -and still depend- on the Member States. In fact there is no such a thing as an EC environmental monitoring network[5]. Beside that, the EC Commission did not use its right of access to monitoring facilities within the Member States. However, according to the Euratom Treaty, member states should send the results of the monitoring of radioactivity in air, water and soil to the EC

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4 Now Directorate General for Environment, Nuclear Safety and Civil Protection.

5 A Regulation issued in 1989 (COM (89) 303 final) provides for the establishment of an European Environment Monitoring and Information Network to be coordinated by an European Environmental Agency. Both the Network and the Agency are still in the process of being organized.

Commission (DG XI). As already mentioned, the Commission complained that it did not received adequate data to evaluate whether the Basic Safety Standards had been or were likely to be infringed in the Member States. While a Community system for rapid alert in case of food contamination was being established, the first news arrived of countermeasures (restrictions in the selling of certain foodstuffs) taken in some Member States.

Organizational options. On the basis of the mentioned information and lack of information, the EC Commission (particularly DG XI) initiated some actions on the basis of the Community's competence in the field of trade and within the framework of the routine regulatory work in the field of safety done within DG XI. At first the Commission took two measures that did not require the previous approval of the EC Council, i.e. a Recommendation on maximum levels of Iodine 131 in milk and a Decision on imports of meat from Eastern countries. Member States' compliance with these (non binding) measures was unsatisfactory. Therefore the Commission resorted to the advice of its Group of experts on Basic Safety Standards and suggested a Council Regulation on maximum permitted levels of Caesium in foodstuffs. Also the European Parliament called for common limit values. Following some internal bargaining within the Council, a Regulation partially different from the one suggested by the Commission was finally approved.

Organizational implementation. Implementation of EC regulatory actions are responsibility of the Member States. The EC Commission must then rely on reports from national authorities to check whether EC measures are implemented. This was also the case following the Chernobyl fallout.

Comparison.

According to the Organizational Process Model, the responses to Chernobyl and the similarities and differences between them can be explained by referring to the features and behavior of the various organizations involved in the management of the fallout. In this perspective, the adoption or non adoption of certain countermeasures can be regarded as the output of the interactions between different organizations sharing some general features but at the same time having peculiar characteristics and constraints.

Appendix 3:

Looking through the Bureaucratic Politics Model.

Looking through the Bureaucratic Politics Model, the responses to Chernobyl are explained by focusing on three steps: the politics of discovery, the politics of issues and the politics of choice.

Italy.

In the case of the Chernobyl accident and fallout, the **politics of discovery** did not only concern the actual discovery of the accident in the USSR and of the related radioactive contamination in most European countries. It also concerned the "discovery" that an accident regarded as almost impossible took place and that it could involve transboundary and long-term consequences on health and the environment. As far as this second kind of discovery is concerned, in Italy the contrasts emerged between the different perceptions and stakes of the Minister of Industry and the representatives of the nuclear agency (ENEA) and its safety division (ENEA-DISP) on one side, and those of the Minister of Health and the scientists of the ISS on the other side, with the Minister of Civil Protection taking a stand closer to the one of the Health Minister (while initially making reassuring statements) by pointing to emergency aspects. While the Minister of Industry and most experts of ENEA and ENEA-DISP mainly tried to belittle the significance of such "discovery" for the continuation of the Italian nuclear programme, the Minister of Health and the experts of ISS stressed the risk for public health involved by a major nuclear accident like the one just occurred.

The "**politics of issues**" developed accordingly. A mix of technical and political arguments were put forward by the different "players" regarding the causes of the accident, the possibility or impossibility for such an accident to occur in Italian -and, more in general- in Western nuclear plants, and the possible health and environmental impacts of the Chernobyl accident in Italy and in other European countries. On the one hand the Minister of Industry and the experts of ENEA and ENEA-DISP emphasized that a major nuclear accident was an extremely rare occurrence and that the Chernobyl accident was mainly due to peculiarities of the Soviet nuclear technology and -implicitly- of the Soviet political system. On the other hand, the Minister of Health and especially the experts of ISS repeated the warning already issued after TMI concerning the possibility of major nuclear accidents to occur and the need to improve Italian emergency procedures; beside that they stressed the necessity to deal with the Chernobyl fallout as a public health issue. The Minister of Civil Protection took the opportunity to strenghten his role by emphasizing some emergency aspects such as the need to quickly collect and evaluate monitoring data in case of technological accidents occurring both within and outside the borders.

The politics of choice can be sketched in the following terms. Starting from the first "moves" by the Minister of Civil Protection (i.e. the consultation with ISS and ENEA-DISP, the calling of a meeting of the emergency committee and the establishment of an ad-hoc technical-scientific commission) the selection among various possible actions was "channelled" towards emergency measures. But while the Minister of Civil Protection could have been satisfied with the mere centralization of data, the experts of ISS pushed for, and the Minister of Health issued, precautionary measures aimed at protecting public health against ionizing radiation. The Minister of Industry was not able to contrast this relatively quick development and he could not prevail over the Minister of Health once the problem had been defined in terms of health protection (and therefore within the competence of that Minister) and the ad-hoc coalition between the Minister of Health and the Minister of Civil Protection had been formed. These inter-Ministers bargaining were also influenced by the pressure coming from sectors of public opinion (particularly the anti-nuclear movement) which concerns were reported by the media.

Federal Republic of Germany.

Also in the FRG the politics of discovery developed beyond the actual discovery of the Chernobyl accident and fallout. However, differently from the Italian case, in the FRG no major inter-Ministers contrasts emerged concerning the significance and consequences of such occurrence. The Federal Minister of Interior, who concentrated all responsibilities in the nuclear field (including, through his advisory body -SSK-, radiation protection), was able to act as the central actor at the Federal level and to impose his perception of the accident as something that had to be dealt with (because of the fallout) but that could never occur "here". At the same time the political (beside scientific) "discovery" of local variations of the fallout was characterized by contrasts between Federal authorities and some State governments.

The distinction of responsibilities between Federal and State authorities was a main theme of the politics of issue. While the Federal Minister of Interior and the representatives of SSK argued for the need of centralized responsibility in the management of the fallout, some State Ministers (starting from the Green Minister of Environment of Hesse) pointed to the authority of the Länder to decide and implement emergency measures at the local level. Beside that, the procedural issue of Federal-State relations interwove with substantive issues (debated both in the Federal and the State Parliaments and within political parties) such as energy policy, nuclear safety and right to information.

The politics of choice was framed according to the mentioned tensions between the Federal (especially the Minister of Interior) and some State authorities. In some Länder precautionary measures were taken before the issuing of recommendations at the Federal level, also due to the need for local authorities to respond to initiatives by local action groups. In the attempt to keep the situation under Federal control, the Minister of Interior prescribed the centralization of data collection and issued the recommendations on limit values prepared by the SSK. While many States authorities decided to comply with these measures, many others decided to adopt different (lower) limit values and to add behavioral recommendations such as keeping children indoor. Also in the FRG the pressure exercized by the anti-nuclear movement, which initiatives and slogans were reported by the media, influenced the bargaining between the various governmental (Federal and State) "players"; for instance, by making them feel that something had to be done to cope with both the radioactive and the political fallout.

France.

In France the **politics of discovery** was mainly characterized as a politics of hiding. While the accident at Chernobyl was discovered in spite of the Soviet initial attempts to secrecy widely criticized by French authorities and media, the impacts of the Chernobyl fallout in France were hidden. The Director of SCPRI, well-known for being adverse to "excessive" safety measures in the nuclear sector, acted as the leading figure in this respect. For about two weeks he only released reassuring evaluations about the "low" levels of radioactivity and did not make public the monitoring data centralized by SCPRI. Governmental leaders, including the Minister of Health (responsible for radiation protection) and the Minister of Industry (responsible for nuclear power promotion and regulation), kept silent on this specific point while joining the Director of SCPRI in diffusing reassuring statements.

Also the **politics of issues** was mainly left to technicians, maily the Directors of SCPRI, CEA, IPSN and the representatives of EDF. The safety of French plants and the impossibility for an accident like the one of Chernobyl to occur in Western reactors was asserted together with the need to preserve the French nuclear programme. As far as the issue of countermeasures to cope with the fallout was concerned, it was mainly treated as an external problem. Governmental experts (especially the Director of SCPRI) and politicians (for example, the Minister of Agriculture) repeated in several occasions that no measures was needed in France; they also explicitly or implicitly blamed the authorities of the neighbouring FRG and Italy for taking measures regarded as unnecessary or even wrong. The attempt to prevent the the issue of health risk (and related countermeasures) for the French population to reach the decision-making agenda can be regarded -in the words of Bachrach and Baratz- as a case of "nondecision-making", i.e. the manifestation of the second face of power (Bachrach and Baratz, 1962; 1963).

The **politics of choice** can be considered as an extension of such nondecision-making strategy. The choice not to adopt countermeasures was in fact implicit in the attempt to prevent the issue of health risk to emerge. However, when the governmental nondecision-making strategy partially failed due to external factors (such as some changes in the attitude of the media and a more visible role of anti-nuclear groups), many politicians started criticizing the Director of SCPRI. Once the nondecision-making coalition was (at least on the surface) broken, the Minister of Industry tried to restore his power and credibility by taking some symbolic action.

European Economic Community.

As far as the politics of discovery was concerned, the representatives of the EC Commission "discovered" that they were dependent on the willingness of the Soviet authorities to release information about the accident and on the willingness of the Member States' authorities to communicate the results of monitoring.

The politics of issues focused on the issue of EC competence in the given circumstances. Officials of the EC Commission resorted both to the EEC and to the Euratom Treaty in order to assert their competence; in this respect they selected the issue of trade (within the Communisty as well as between the EC and non-EC countries) and the issue of health protection (particularly the compliance with Basic Safety Standards) as fields of uncontroversial EC competence.

The politics of choice proved to be quite controversial due to the multi-level negotiations that characterize the EC decision-making process. This was especially the case concerning the adoption of the Council Regulation on limit values for Caesium. The Member States' representatives negotiated within the EC Council the limit values to be adopted and finally agreed on values which were higher than the ones suggested by the EC Commission but lower than the ones suggested by some Member States' representatives.

Comparison.

Following the Bureaucratic Politics Model, the responses to Chernobyl can be interpreted as unintended outcomes of bargainings between leading governmental and EC actors having different interests, perceptions, skill and power. Different responses are regarded as the result of different configurations of the "game", depending on the mentioned attributes of the players involved, in the cases under considerations.