

## Chapter 1 : Seveso disaster | Revolvly

*The Seveso disaster was an industrial accident that occurred around pm on July 10, , in a small chemical manufacturing plant approximately 20 kilometres (12 mi) north of Milan in the Lombardy region of Italy.*

Seveso disaster The Seveso disaster was an industrial accident that occurred around It resulted in the highest known exposure to 2,3,7,8-tetrachlorodibenzo-p-dioxin TCDD in residential populations, [1] which gave rise to numerous scientific studies and standardized industrial safety regulations. Location of disaster The Seveso disaster was named because Seveso , with a population of 17, in , was the community most affected. Other affected neighbouring communities were Meda 19, , Desio 33, , Cesano Maderno 34, and to a lesser extent Barlassina 6, and Bovisio-Masciago 11, The factory building had been built many years earlier and the local population did not perceive it as a potential source of danger. Moreover, although several exposures of populations to dioxins had occurred before, mostly in industrial accidents, they were of a more limited scale. The chemical 2,4,5- trichlorophenol 2 was being produced there from 1,2,4,5-tetrachlorobenzene 1 by the nucleophilic aromatic substitution reaction with sodium hydroxide. The 2,4,5-trichlorophenol was intended as an intermediate for hexachlorophene. Crucially, no steam temperature reading was made available to plant operators responsible for the reactor. This much hotter steam then proceeded to heat the portion of the metal wall of the accident reactor above the level of the liquid within it to the same temperature. The abnormally-hot upper region of the reactor jacket then heated the adjacent reaction mixture. At the nominal reaction temperature, TCDD is normally seen only in trace amounts of less than 1 ppm parts per million. Zone A was further split into 7 sub-zones. The local population was advised not to touch or eat locally grown fruits or vegetables. Within days a total of 3, animals, mostly poultry and rabbits, were found dead. Emergency slaughtering commenced to prevent TCDD from entering the food chain , and by over 80, animals had been slaughtered. By the end of August, Zone A had been completely evacuated and fenced, 1, people of all ages had been examined and were found to suffer from skin lesions or chloracne. An advice center was set up for pregnant women of which only 26 opted for an abortion , which was legal in special cases, after consultation. Another women brought on their pregnancies without problems, their children not showing any sign of malformation or pathologies. This amount would be tripled two years later. Studies on immediate and long-term health effects A study [9] 14 years after the accident sought to assess the effects to the thousands of persons that had been exposed to dioxin. The most evident adverse health effect ascertained was chloracne cases. Other early effects noted were peripheral neuropathy and liver enzyme induction. The ascertainment of other, possibly severe sequelae of dioxin exposure e. A study published in concluded that chloracne nearly cases with a definite exposure dependence was the only effect established with certainty. Early health investigations including liver function, immune function, neurologic impairment, and reproductive effects yielded inconclusive results. An excess mortality from cardiovascular and respiratory diseases was uncovered, and excess of diabetes cases was also found. Results of cancer incidence and mortality follow-up showed an increased occurrence of cancer of the gastrointestinal sites and of the lymphatic and hematopoietic tissue. Results cannot be viewed as final or comprehensive, however, because of various limitations: A study [10] confirmed in victims of the disaster, that dioxin is carcinogenic to humans and corroborate its association with cardiovascular - and endocrine -related effects. In , an update including 5 more years up to found an increase in "lymphatic and hematopoietic tissue neoplasms" and increased breast cancer. Later that spring decontamination operations were initiated and in June a system epidemiological health monitoring for , people was launched. They then used trichlorophenol to make a drug to fight the skin infections, which they tested in dogs. In June , the Italian government raised its special loan from 40 to billion lire. By the end of the year most individual compensation claims had been settled out of court. The total amount would reach 20 billion lire. Waste from the cleanup The waste from the clean up of the plant was a mixture of protective clothing and chemical residues from the plant. This waste was packed into waste drums which had been designed for the storage of nuclear waste. It was agreed that the waste would be disposed of in a legal manner. To this end, in spring , the firm Mannesmann Italiana was contracted to dispose of the contaminated chemicals from Zone A.

Mannesmann Italiana made it a condition that Givaudan would not be notified of the disposal site which prompted Givaudan to insist that a notary public certify the disposal. On December 13, the notary gave a sworn statement that the barrels had been disposed of in an approved way. A public debate ensued in which numerous theories were put forward when it was found that Mannesmann Italiana had hired two subcontractors to get rid of the toxic waste. On May 19 the 41 barrels were found in an unused abattoir slaughterhouse in Anguilcourt-le-Sart, a village in northern France. From there they were transferred to a French military base near Sissonne. The Roche Group parent firm of Givaudan took it upon itself to properly dispose of the waste. On November 25, over nine years after the disaster, the Roche Group issued a public statement that the toxic waste consisting of 42 barrels 1 was added earlier that year had all been incinerated in Switzerland. According to New Scientist it was thought that the high chlorine content of the waste might cause damage to the high temperature incinerator used by Roche, but Roche stated that they would burn the waste in the incinerator and repair it afterward if it were damaged. They stated that they wanted to take responsibility for the safe destruction of the waste. In May, the Court of Appeal in Milan found three of the five accused not guilty; the two still facing prosecution appealed to the Supreme Court in Rome. On May 23, the Supreme Court in Rome confirmed the judgment against the two remaining defendants, even though the prosecuting attorney had called for their acquittal. At least a week passed before it was publicly stated that dioxin had been emitted and another week passed before evacuation began the government had to control which area was mostly polluted and, after that, to organise everything for the evacuated people. As a result, the local population was caught unaware when the accident happened and unprepared to cope with the danger of an invisible poison. In the context of such heightened tensions, Seveso became a microcosm where all the existing conflicts within society political, institutional, religious, industrial were reflected. However, within a relatively short time such conflicts abated and the recovery of the community proceeded. For, in Seveso, the responsible party was known from the outset and soon offered reparation. Moreover, the eventual disappearance of the offending factory itself and the physical exportation of the toxic substances and polluted soil enabled the community to feel cleansed. The resolution of the emotional after-effects of the trauma, so necessary for the recovery of a community, was facilitated by these favourable circumstances. Treatment of the soil in the affected areas was almost perfect; the area now has a dioxin level below the normal level. The whole site has been turned into a public park, Seveso Oak Forest park. There are two artificial hills in the park; today, under these hills there is all what remains of the toxic area destroyed houses, tons of poisoned dirt, animal corpses Some inspections under them declared the sarcophagus has to resist for almost years before the toxic substances will vanish. Several studies have been completed on the health of the population of surrounding communities. While it has been established that people from Seveso exposed to TCDD are more susceptible to certain rare cancers, when all types of cancers are grouped into one category, no statistically significant excess has yet been observed. This indicates that more research is needed to determine the true long-term health effects on the affected population. Epidemiological monitoring programmes established as follows with termination dates: The Seveso disaster gives valuable comparative insight into the effects of Agent Orange on flora and fauna in Vietnam, not to mention the Vietnamese people, as TCDD was a significant contaminant in Agent Orange.

## Chapter 2 : A moral paradox

*The Seveso disaster was an industrial accident that occurred around pm July 10, , in a small chemical manufacturing plant approximately 15 km north of Milan in the Lombardy region in Italy.*

The factory building had been built many years earlier and the local population did not perceive it as a potential source of danger. Moreover, although several exposures of populations to dioxins had occurred before; mostly in industrial accidents, they were of a more limited scale. This reaction must be carried out at a temperature above what was achievable using the normal process utilities available at the plant, so it was decided to use the exhaust steam from the onsite electricity generation turbine, and pass that around an external heating coil installed on the chemical reactor vessel. Crucially, no steam temperature reading was made available to plant operators responsible for the reactor. This much hotter steam then proceeded to heat the portion of the metal wall of the accident reactor above the level of the liquid within it to the same temperature. The abnormally-hot upper region of the reactor jacket then heated the adjacent reaction mixture. Zone A was further split into 7 sub-zones. Within days a total of 3, animals were found dead, mostly poultry and rabbits. Another women brought on their pregnancies without problems, their children not showing any sign of malformation or pathologies. This amount would be tripled two years later. Early health investigations including liver function, immune function, neurologic impairment, and reproductive effects yielded inconclusive results. Results cannot be viewed as conclusive, however, because of various limitations: In , an update including 5 more years up to found the expected increase in "lymphatic and hematopoietic tissue neoplasms" and increased breast cancer. Later that spring decontamination operations were initiated and in June a system epidemiological health monitoring for , people was launched. In February The International Steering Committee released its final report stating that "with the exception of chloracne, no ill effects can be attributed to TCDD". In June , the Italian government raised its special loan from 40 to billion lire. It was agreed that the waste would be disposed of in a legal manner. To this end, in spring , the firm Mannesmann Italiana was contracted to dispose of the contaminated chemicals from Zone A. Mannesmann Italiana made it a condition that Givaudan would not be notified of the disposal site which prompted Givaudan to insist that a notary public certify the disposal. A public debate ensued in which numerous theories were put forward when it was found that Mannesmann Italiana had hired two subcontractors to get rid of the toxic waste. The Roche Group parent firm of Givaudan took it upon itself to properly dispose of the waste. They stated that they wanted to take responsibility for the safe destruction of the waste. In May , the Court of Appeal in Milan found three of the five accused not guilty; the two still facing prosecution appealed to the Supreme Court in Rome. On May 23, , the Supreme Court in Rome confirmed the judgment against the two remaining defendants, even though the prosecuting attorney had called for their acquittal. At least a week passed before it was publicly stated that dioxin had been emitted and another week passed before evacuation began. Few scientific studies had confirmed the level of danger TCDD posed and there were scant industrial regulations to be followed. As a result the local population was caught unaware when the accident happened and in such an insecure situation became very frightened. Confrontation with an invisible poison possibly extremely hazardous to human health was a very traumatic experience for small rural communities. In the context of such heightened tensions, Seveso became a microcosm where all the existing conflicts within society political, institutional, religious, industrial were reflected. However, within a relatively short time such conflicts abated and the recovery of the community proceeded. For, in Seveso, the responsible party was known from the outset and soon offered reparation. Moreover, the eventual disappearance of the offending factory itself and the physical exportation of the toxic substances and polluted soil enabled the community to feel cleansed. The resolution of the emotional after-effects of the trauma, so necessary for the recovery of a community, was facilitated by these favourable circumstances. Treatment of the soil in the affected areas was so complete that it now has a dioxin level below what would normally be found. The whole site has been turned into a public park, Seveso Oak Forest park. Some say that Seveso is now the least polluted place in Italy. Several studies have been completed on the health of the population of surrounding communities. It has been established that

people from Seveso exposed to TCDD are more susceptible to rare cancers but when all types of cancers are grouped into one category, no statistically significant excess has yet been observed. Epidemiological monitoring programmes established as follows with termination dates:

**Chapter 3 : Long-lasting effects of the Seveso disaster on thyroid function in babies**

*The Seveso disaster was an industrial accident that occurred around pm on July 10, , in a small chemical manufacturing plant approximately 15 kilometres (9 mi) north of Milan in the Lombardy region of Italy.*

Defense industry[ edit ] December 6, A ship loaded with about 9, tons of high explosives destined for France caught fire as a result of a collision in Halifax harbour, and exploded. The explosion killed about 2, and injured about 9, Gillespie Company Shell Loading Plant explosion. A plant for processing ammonium nitrate in Edison, New Jersey exploded, killing 24 people, injuring and destroying several buildings. Explosion of between and tonnes of ordnance in an underground munitions store that killed 70 people. The cause of the fire was determined to be a welding rod damaging a hydraulic hose. This allowed hydraulic vapors to leak and spread throughout the silo, which were then ignited by an open flame. Lapua Cartridge Factory explosion. An explosion in a munitions factory in Lapua , Finland kills 40 workers. A military storage center in Rawalpindi, Pakistan exploded, killing more than 90 people. Evangelos Florakis Naval Base explosion , Cyprus. The disaster occurred when 98 containers of gunpowder exploded; 13 people were killed, among them the captain of the base, three commanders, twin brothers who were serving there as marines, and six firefighters. The Centralia, Pennsylvania coal mine fire began, forcing the gradual evacuation of the Centralia borough. The fire continues to burn in the abandoned borough. March 4, The Natchitoches explosion: A inch gas transmission pipeline, north of Natchitoches, Louisiana , belonging to the Tennessee Gas Pipeline exploded and burned from stress corrosion cracking on March 4, killing 17 people. At least 9 others were injured, and 7 homes feet from the rupture were destroyed. The same pipeline had also had an explosion on May 9, , just feet m from the failure. The Torrey Canyon supertanker was shipwrecked off the west coast of Cornwall, England, causing an environmental disaster. This was the first major oil spill at sea. The Banqiao Dam failed in the Henan Province of China due to extraordinarily heavy precipitation from the remnants of Typhoon Nina and poor construction quality of the dam, which was built during the Great Leap Forward. The flood immediately killed over , people, and another , died of subsequent epidemic diseases and famine, bringing the total death toll to around , and making it the worst technical disaster ever. This is the largest oil spill from an oil tanker in history. Three Mile Island accident. Mechanical failures in the non-nuclear secondary system, followed by a stuck-open pilot-operated relief valve in the primary system, allowed large amounts of reactor coolant to escape. Plant operators initially failed to recognize the loss of coolant, resulting in a partial meltdown. The reactor was brought under control but not before up to P Bq 13 million curies of radioactive gases were released into the atmosphere. Ixtoc I oil spill. The Ixtoc I exploratory oil well suffered a blowout resulting in the third-largest oil spill and the second-largest accidental spill in history. A Texaco oil rig drilled into a salt mine transforming Lake Peigneur , a freshwater lake before the accident, into a saltwater lake. An explosion in Newark, New Jersey was felt for about 2 miles from the epicenter, but only claimed 1 life, and injured 224 people. The mobile offshore oil rig Ocean Ranger was struck by a rogue wave off the coast of Newfoundland, Canada and sank with the loss of all 84 crew. Romeoville, Illinois , Union Oil refinery explosion killed 19 people. An explosion at a liquid petroleum gas tank farm killed hundreds and injured thousands in San Juanico, Mexico. At the Chernobyl nuclear power plant in Prypiat, Ukraine a test on reactor number four went out of control, resulting in a nuclear meltdown. The ensuing steam explosion and fire killed up to 50 people with estimates that there may be between 4, and several hundred thousand additional cancer deaths over time. Fallout could be detected as far away as Canada. The Chernobyl Exclusion Zone , covering portions of Belarus and Ukraine surrounding Prypiat, remains contaminated and mostly uninhabited. Prypiat itself was totally evacuated and remains as a ghost town. Norco, Louisiana , Shell Oil refinery explosion. Hydrocarbon gas escaped from a corroded pipe in a catalytic cracker and was ignited. Louisiana state police evacuated 2, residents from nearby neighborhoods. Seven workers were killed and 42 injured. An explosion and resulting fire on a North Sea oil production platform killed men. Exxon Valdez oil spill. It is considered to be one of the most devastating human-caused environmental disasters ever to occur. Texas City Refinery explosion. Over were injured, and 15 were confirmed dead, including employees of Jacobs, Fluor and BP. BP has since accepted that its

employees contributed to the accident. Several level indicators failed, leading to overfilling of a knockout drum, and light hydrocarbons concentrated at ground level throughout the area. A nearby running diesel truck set off the explosion. Hertfordshire Oil Storage Terminal fire. A series of explosions at the Buncefield oil storage depot, described as the largest peacetime explosion in Europe, devastated the terminal and many surrounding properties. There were no fatalities. Sayano-Shushenskaya power station accident. Seventy-five people were killed at a hydroelectric power station when a turbine failed. The failed turbine had been vibrating for a considerable time. Emergency doors to stop the incoming water took a long time to close, while a self-closing lock would have stopped the water in minutes. A large explosion occurred at a Kleen Energy Systems megawatt, Siemens combined cycle gas- and oil- fired power plant in Middletown, Connecticut, United States. Deepwater Horizon oil spill in the Gulf of Mexico. Eleven oil platform workers died in an explosion and fire that resulted in a massive oil spill in the Gulf of Mexico, considered the largest offshore spill in US history. Fukushima I nuclear accidents in Japan. Hurricane Sandy caused a ConEdison power plant to explode, causing a blackout in most of midtown Manhattan. The blue light emitted from the arc made places as far as Brooklyn glow. No person was killed or injured. Forty-seven people were killed when there was a derailment of an oil shipment train. The oil shipment caught fire and exploded, destroying more than thirty buildings. It was the fourth-deadliest rail accident in Canadian history. Food industry[ edit ] May 2, The Washburn "A" Mill in Minneapolis was destroyed by a flour dust explosion, killing The mill was rebuilt with updated technology. The explosion led to new safety standards in the milling industry. The event has entered local folklore, and residents claim that on a hot summer day, the area still smells of molasses. The Roland Mill, located in Bremen, Germany, was destroyed by a flour dust explosion, killing 14 and injuring Grain elevator explosion in Haysville, Kansas. A series of dust explosions in a large grain storage facility resulted in the deaths of seven people. Thirteen people were killed and 42 injured when a dust explosion occurred at a sugar refinery owned by Imperial Sugar. Morin-Heights, Quebec, Canada. A roof collapse in the Gourmet du Village bakery warehouse killed three workers. Pemberton Mill was a large factory in Lawrence, Massachusetts that collapsed without warning. An estimated workers were killed and injured. Grover Shoe Factory disaster. A boiler explosion, building collapse and fire killed 58 people and injured in Brockton, Massachusetts. This was a major industrial disaster in the US, causing the death of more than garment workers who either died in the fire or jumped to their deaths. An explosion at an illegal fireworks operation on a farm near Benton, Tennessee killed eleven, injured one, and inflicted damage within a radius of several miles. The accident was kept secret by the communist regime, however, the news broke the iron curtain and made it to the western media. A massive fire and explosions at a chemical plant killed two people and injured over Kader Toy Factory fire. A fire started in a poorly built factory in Thailand. Exit doors were locked and the stairwell collapsed. A fire and explosion at a fireworks depot in Enschede, Netherlands resulted in 24 deaths and another were injured. About 1, homes were damaged or destroyed. One firefighter died; seven from the rescue team as well as 17 locals were injured. A gas leak triggered a large explosion and ensuing fire at a gear manufacturing facility in Milwaukee, Wisconsin. Three were killed and 47 injured, with several of the building at the facility being leveled. Qinghe Special Steel Corporation disaster. A ladle holding molten steel separated from the overhead iron rail, fell, tipped, and killed 32 workers, injuring another 6. An unlicensed fireworks factory exploded accidentally, leaving by some reports at least 22 people dead and at least injured.

**Chapter 4 : Seveso disaster - Worst environmental disasters - Pictures - CBS News**

*Seveso, Italy, was the scene of one of the worst industrial disasters in European history, when several tons of poisonous gas -- including TCDD, a type of dioxin -- were released into a residential area.*

Moreover, better health and safety have become prominent public goals, precisely because there seem to be real possibilities for achieving them. Unfortunately, none of these ideals is unambiguous: In the debates on risks in the s, it gradually emerged that "safe" does not mean zero-risk. Just as an empirical proposition may be accepted as true and later proven false e. But the reverse does not hold: These and similar contradictions associated with the concept of safety are managed pragmatically by a variety of devices. One of these is linguistic interpretation. The pragmatic interpretation that is invoked will depend on circumstances. In spite of the fact that many experts and critics are aware of the dialectical character of safety, most public discussions reflect the belief that an objective condition of safety is obtainable with just a little more application and honest effort. When such expectations are disappointed, critics seek explanations in simplistic theories that usually involve misguided or malevolent parties. Academics are just as prone to this behaviour as others. An important recent example was the use of "cultural theory" by certain social scientists to explain why Americans apparently considered that environmental safety had declined during the s despite considerable progress in pollution control. This explanation was based on a fourfold model of social psychological ideal types of people, in relation to their social groups. For example, environmentalists of all sorts were labelled "sectarians" and were said to possess a romantic cosmology that derived from the psychological contradictions of supposedly closed and egalitarian millenarian groups Douglas and Wildavsky In our terms, Douglas and Wildavsky had become partially aware of the contradictions in the ideal of safety, and realized that it is not reducible to numbers. Yet they could not move on to accommodate the contradictions by means of practical measures for realizing safety in the face of real hazards Funtowicz and Ravetz The Seveso Directive provides an important and relevant example of the contradictory character of safety. Article 8 of the Directive is based on the assumption that openness on the part of firms and authorities is good for safety. Clearly, policies of concealment can be very bad for safety. But it is questionable that perfect openness leads to perfect safety. Let us consider what might have happened if the Seveso Directive had been in place in ; this is an imaginary, counterfactual case, which cannot be used for the logical proof of a thesis but which can be a useful heuristic device. The Directive as a whole demands certain sorts of institutional behaviour, in return for which it provides a certification of quality of performance. Then the ICMESA factory would have previously submitted its safety report and we suppose, further, that there would have been no objections to it. The local population and the authorities would have been provided with some information about the chemical processes and their hazards. Presumably, knowledge of the earlier accidents involving TCP would have been in the public domain. Also, there would have been some emergency procedures in place. Now, supposing that, in spite of all the available information, the explosion had still happened, what would have ensued? First, it is likely that there would not have been a delay of 10 days before dioxin was publicly identified, nor another 10 days lost before there was any clarity about what to do. Would it have helped the community response, for this information to have been known instantly? There would doubtless have been a more speedy evacuation and, therefore, probably less exposure of the affected human population. But would there have been less trauma Conti ; Edelstein resulting from the sight of dead and dying animals and from the evacuation, or less dread from the unknown consequences of the invisible poison, or less of a stigma associated with Seveso and its population and products see Chronology, July ? However, as we have remarked, it was the relatively successful recovery from the accident that enabled Seveso to become an uncomplicated symbol of successful response to industrial disasters. The contrast with Bhopal and Chernobyl is striking. Of course, there was an early period characterized by the recriminations and accusations of incompetence and cover-up that commonly afflict such victim communities. This aggravation reached its height about six months after the Seveso gas release, when little remedial work was under way and the regional government proposed to install an incinerator in the district. Since then there have been periods of lesser and greater tension, mainly associated

with the use by others of Seveso as a symbol; but suspicions about the behaviour of the company and the authorities seem never to go away. In the context of such heightened tensions, Seveso became a microcosm where all the existing conflicts within society political, institutional, religious, industrial were reflected. However, within a relatively short time such conflicts abated and the recovery of the community proceeded. For, in Seveso, blame was never at issue: Moreover, the eventual disappearance of the offending factory itself and the physical exportation of the toxic substances and polluted soil enabled the community to feel cleansed. The resolution of the emotional after-effects of the trauma, so necessary for the recovery of a community, was facilitated by these favourable circumstances. All these achievements, which made Seveso a symbolic example of recovery from industrial disaster, depended on the construction of a working relationship between the community, the government agencies, and the firm. This was accomplished through open and sometimes bitter struggle among the various parties, but the common interest in a reasonable outcome was never in question. The victims knew that they would receive assistance. Had there been uncertainty and strife about the source, amount, and timing of compensation, the communities would not have been able to pull themselves together as they did within a year and a half, once the threat of malformed babies receded and evacuees were returned to their homes. Instead, we can imagine a permanent state of mistrust between the different governmental agencies and companies and, indeed, within the communities themselves, where the processes of recovery would have been seriously inhibited. Histories of recovery from other disasters, both natural and man-made, show how important are these factors in the political and moral spheres Barton ; Erikson ; Couch and Kroll-Smith Now we must ask, if a firm had already been in compliance with safety regulations of the kind later required by the Seveso Directive, would its response have been different? It is a commonplace of the theory of regulation that the submission of firms to the financial costs of external regulation is compensated by the legal protection they receive for compliance. That would have been enough to slow down the reparations. But it was the unprecedented speed of compensation offers, along with acceptance of blame and contribution to rehabilitation, that made all the difference to the recovery of Seveso. Otherwise, there could have been the protracted litigation that occurs in so many such cases and which causes psychological and moral harm, ultimately inhibiting the healing processes of recovery. Thus, we encounter a moral paradox illuminated by Seveso: Once an accident has occurred, the cleansing of resentment and guilt, which are experienced by agents and victims each in their own way, could be inhibited by a denial of moral liability. The paradox can be expressed as an ill effect of a good principle: Such paradoxes are familiar to those managing hazards of various sorts in the insurance field; thus "moral hazard" refers to the tendency of people to take chances once they know that the insurers will pay; and the "no fault" principle for common accidents, while seeming to exculpate the responsible persons, is promoted as being useful in preventing the expenses and injustices of litigation. A scientific paradox Seveso also produced a paradox about the use of scientific knowledge in the policy process. Although there was undoubted physical and psychological illness among people, together with the deaths of many animals, dread consequences for human health have been elusive Mastroiacovo et al. In this respect it could be said that Seveso is a disaster that has not yet produced identifiable disastrous consequences. Even the most recent epidemiological results, while showing an increase in some sorts of rare cancers, do not provide firm evidence for a generally increased cancer risk to the monitored population Bertazzi et al. Once it was realized that the population had been subjected to dioxin contamination, the accident became, by definition, a disaster with severe psychological, social, and economic effects. However, in this case, scientific certainty about the extreme toxicity of dioxin gradually dissipated. A visitor to Seveso now finds a park where the factory once stood; some say that Seveso is now the least polluted place in Italy. Of course, the history of illness, dread, and disruption cannot be undone. So Seveso has become, simultaneously, a symbol of an industrial disaster and a monument to relevant ignorance in science Keynes. But such ignorance is not absolute and it need not be paralyzing for decision-making. At Seveso, monitoring continues, and the lessons of this relevant ignorance are being assimilated into our understanding of the place of science in the modern world. Seveso now functions partly as an experiment, along with other monitored disaster sites such as Hiroshima. Data from the affected Seveso population are used as evidence in other, less straightforward, pollution cases and also for the ongoing review of regulations. Every experiment exists in a

particular context, and inferences from its data depend on an assumption of similarity between the experimental setup and that of the other case in question Funtowicz, MacGill, and Ravetz a, b, c. The extent to which Seveso, with its single event of atmospheric contamination and later contact with contaminated objects, is an appropriate model for situations of long and continuous contamination will be debated among scientists and policy makers. Toxicology necessarily makes inferential leaps - from animals to humans, from large doses to small, and from acute to chronic doses. In turn, these inferences underlie the dose-response models that are used to define "safe limits. As we have seen, Seveso was an immediately perceived disaster, but one where the long-term health consequences have up to now been accepted as far from disastrous. We may be tempted to make a simple inference: Seveso was a harmless dioxin disaster; therefore, other dioxin releases need not be harmful. Such an argument was recently made in Arkansas, where the evidence of Seveso has been used in arguments supporting the safety of a proposed toxic waste incinerator that would emit dioxin in a similar quantity to that estimated for Seveso Schneider Thus, we have the scientific paradox of Seveso: The symbol of Seveso may now be becoming increasingly complex: Paradoxically, the excellence of the recovery of Seveso could be used for the assertion of limited liability, with possible consequences for litigation and impeded recovery elsewhere. However, as scientists know, it needs only a single long-delayed pathological condition to appear in the monitoring process for the original negative resonance of Seveso to be restored. And then the recovery of Seveso, apparently so complete at this time, could suddenly be thrown into question. Even the complete absence of conclusive evidence of cancer among chloracne victims and others in the most exposed zone A might be explained in terms of "the small population size, youth of the subjects, and short follow-up period" Bertazzi et al. First, it was realized that even apparently unique industrial disasters have regular causes; in one sense they are all "man-made" Turner because of the way they occur through failure of systems for prevention. A more radical interpretation, derived from a study of Three Mile Island, is that they are actually "normal accidents" Perrow The affected industries, while not planning such accidents, accept them as a normal aspect of operations. We can even consider industrial systems as "accident generating systems" Haastrup and Funtowicz, routinely producing unwanted outputs along with their intended products; these include continuous pollution and wastes, along with occasional incidents of different intensities. When an incident goes beyond a certain threshold defined conventionally by the terms of relevant regulations it is deemed to be an "accident," and some accidents eventually become disasters. Thus, our comprehension of industrial risks has moved completely away from the acausal or "acts of God" approach; they are creations of the industrial system as much as its intended products. This new awareness about industrial risks has coincided with an increasing concern for the perceived loss of environmental quality due to the synergistic effects of technological development and environmental processes, as in the cases of acid rain and global warming. We now appreciate that the technological system is global, complex, and rather tightly coupled. The dividing line between the "goods" and the "bads" produced by the system is sinuous and indistinct. Implementation of this ecological awareness in industrial and regulatory practice is now under way. The new ecological awareness includes an appreciation not only of the interconnectedness of the effects of the "bads" of the industrial system but also of the conventional character of the traditional distinction between "manmade" and "natural. Contradictions within that subsystem, and between it and other components of the total system, are the key to its comprehension. Thus, famine and floods for example may now be no different in kind from the sudden events called industrial accidents and disasters. To understand the processes of recovery from such unwanted events we must conceive of them as occurring within that total system. In the case of industrial disasters, the recovery of a community takes place not only in the societal sphere but also in its moral dimensions and, equally importantly, in its ecological aspects as well. Thus, community recovery exists as part of a wider process, involving all the elements of the total ecosystem.

Chapter 5 : Seveso disaster - Wikipedia

*On July 10, , an explosion at a northern Italian chemical plant released a thick, white cloud of dioxin that quickly settled on the town of Seveso, north of Milan.*

Starting from the denunciation of hidden costs of industrial development in terms of workers illness caused by the way industrial production was organised, the struggle for occupational health extended to encompass a more broad idea of environmental health. Health issues inside factories were thus directly linked with those emerging outside, i. In this struggle -that saw mobilizing together a wide array of different social actors, like workers, unionists, physicians, intellectuals, students- the way in which health was traditionally conceptualized underwent a change. Health was no more defined as a state of absence of illness definition in negative terms but as good quality of life definition in positive terms. The shift from a negative to a positive definition of health entailed two important changes in the way health issues were usually approached Tonelli, Second, health was no more considered a question of healing individuals affected by diseases but mostly of prevention, through modifying environmental conditions recognized as sources of harms. This implied a shift from a logic of compensation of damages through their monetization towards enforce structural transformations. The Law , approved in and reforming the Italian health system, represents the higher accomplishment of this mobilization, with the creation of a universalistic National Health Service based on local public health services units USL in charge of health quality, both inside and outside factories. At the same time, the obstacles encountered in implementing the Law , with the following adjustments required, showed the difficulties in translating into actual practice the most innovative principles incorporated into the reform design Berlinguer, ; 1 Luzzi, As pointed out by Barca , p. Besides these macro-economic and institutional factors, other, more endogenous reasons contributed to the weakening of the Italian movement for environmental health. On the one hand, the link established between environmental health and class struggle made clearly visible how social inequalities produced by the capitalistic system were relevant in explaining the occurrence of diseases that was usually presented as accident, fatality or individual destiny. An interpretation of health as individual experience, yet social fact originating in the human and environmental exploitation induced by capitalistic organisation of production, has been then propitious to address structural causes accounting for health and illness. On the other hand, being this frame strongly ideological, it was confronted to unexpected resistances when trying to extend the mobilisation to other social actors beside workers and leftist intellectual elites. In the concluding part, we are going to highlight an issue whose importance for the mobilisation of Seveso victims went unnoticed by activists of environmental health, that is, the importance of the environment as a territory to which a community is attached. This mix of social and political activism with scientific research was not unusual at that time in Italian social movements, quite the contrary. As pointed out by Luisa Passerini , p. In the field of work-related health issues, researchers, technicians and workers started to join forces in auto-organised groups engaged inside factories in defining innovative tools for investigating health impacts of production processes. This new way to produce scientific knowledge was based on two main principles: The direct participation of workers in the production of knowledge concerning their work conditions went with the refusal of the usual way to internalize work-related health damages, i. Underlying was a critique of the neutrality of scientific and technical arguments, that brought to challenge as well the way production processes were organised: Health damages linked to work activities were no more seen as inevitable side-effects, but as products of technical choices that could have been different Cavagna The group of Castellanza had two distinctive traits, accounting for its role of promoter of a larger coalition. This implied to promote the auto-organisation of citizens and to have them involved in the production of knowledge concerning environmental health. A link was clearly established between the factory and its territory, addressing the problem of environmental externalities of industrial production. On the other hand, the group was supported in developing new methodologies of investigation, inside and outside factories, by professor Giulio A. Maccacaro, director of the Institute of Biometry and Medical Statistics of the University of Milan, who first introduced in Italy epidemiological studies. Maccacaro1 was not only a

renowned scientist but as well one of the prominent leftist intellectual figures politically engaged in a radical critique of the role of science, in particular medical science, in producing and re-producing forms of social exclusion, oppression, marginalization and control. Together with Franco Basaglia<sup>2</sup>, Maccacaro was a key-figure in promoting a new understanding of medical science and expert knowledge as embodying power relations. Quoting Maccacaro , p. A certain form of science has always been an expression of the political and economic power. At present, science is the cornerstone of power, and of power men live and die. After specialization in UK and USA, in he became professor of medical statistics and biometry in the faculty of medicine of the university of Milan. For an analysis of the Italian mental health system reform see de Leonardi

The journal was meant as an open forum for scientists, activists and ordinary people to discuss critically, in their link with social and political issues, existing scientific methodologies, new methodologies, case studies, and new theoretical approaches to science. Objective rationality was unmasked as a capitalistic rationality of profit and power maximisation. These various and spontaneous initiatives were showing in their practice how a different rationality could be supported by a different kind of scientific knowledge and a new way of experts involvement in society. This new way of experts involvement implied for them to be aware of social assumptions and social impacts of the methodologies they were applying. These premises were specified by Maccacaro in a programme of action detailed in ten points Maccacaro, , that can be summarized in two main guidelines. First, the reform of the existing health system and practices in order to take into account and address the social nature of health, through improving prevention and promoting the territorialisation of health services. The second point stressed by Maccacaro was the need for direct participation of citizens in the organisation of health services, included the legitimacy of forms of auto-organisation of health and social services. Initiatives led by workers inside factories and by feminists in the territory with the creation of women health centres were presented as examples of innovative practice of participation and auto-organisation. As pointed out by Bignami , pp. Maccacaro clearly foresaw the unifying potential of environmental health issues and the political need to work at connecting mobilisations on health issues inside factories and in the territory Castellina, At the same time, Maccacaro was aware of the obstacles this project had to overcome in order to succeed. Maccacaro seemed instead to overlook the difficulties implied in transposing from factories to the outside an approach to environmental health that was embedded in a specific political culture largely shared by workers inside factories. The possibility to extend to the generality of environmental health issues the approaches both in scientific and political terms developed for occupational health was assumed as non problematic. Besides, the frame of class struggle stayed as a central reference in shaping justifications for political engagement in health issues: This editorial was his last written text, since Maccacaro died of a heart attack the 15th of January

The test of the Seveso disaster Seveso is a town of After World War Two, chemical industries began to install their plants in this area, given the rich water resources and good infrastructures. On Saturday July 10th, , at around Various poisons were dispersed by wind to settle on buildings and backyards in the towns of Meda, Cesano Maderno, Desio, and the most heavily afflicted, Seveso. This negligence is made more serious when one realizes that the health risks of trichlorophenol were well known from previous industrial accidents. These risks revolve around the chemical produced in the process of synthesizing trichlorophenol: In , the extremely harmful effects of dioxin on human health were predicted largely on the basis of toxicological evidence. Epidemiological studies on dioxin were still scarce and limited to tracking cohorts of industrial workers all adult males accidentally exposed to high concentrations of dioxin Zedda, A large-scale dioxin contamination affecting an entire population was without precedent: There were no instruments yet available for measuring dioxin levels in human blood Mocarelli

The toxic cloud passed by largely unnoticed, considered by inhabitants of Seveso and Meda as a typical nuisance in a long series , though one that was perhaps a bit more annoying because of its nasty smell. Givaudan engineers reassured local authorities that everything was under control Rocca In fact, the Italian movement for decriminalizing abortion was at its peak. The Lombardy regional authorities management of the dioxin crisis was marked by bureaucracy and technical dependency Conti The affected population was considered by public authorities unable to deal with the exceptional nature of the event: Committees of experts were created on the initiatives of public authorities and asked to supply solutions with respect to health risk,

decontamination, and socio-economic problems. Each committee was required to give its advice unanimously so that the only thing the Regional Council had to do was to approve them. No discussion involving the affected citizens on alternative technical choices was allowed, not inside the Regional Council, not outside. Decisions of a true political nature were therefore taken inside the technical-expert committees, meaning that these were not just advisory committees but non-democratic decision-making bodies. Likewise, an ad-hoc technical body was created The Seveso Special Bureau in order to implement the measures decided by expert committees. The crisis management was far from democratic transparency, offering no opportunities for inputs from citizens, even if the decisions taken strongly affected not only their everyday life but as well the future of their territory and of them as a community Centemeri a, pp. Trade unions, whose presence was quite fragile in the factories of the contaminated area, were thus silenced. Out-of-court settlements were reached with the Italian State, the Lombardy Region, the municipalities touched by the contamination and with citizens having suffered certified material losses or proven health damages. Therefore, the issue of compensation was dealt with in terms of individualization and monetization of the damage, with no public discussion concerning the criteria adopted to compensate. Equally absent from the scene was the problem represented by the uncertain long-term health effects to be expected as consequence of the contamination. To summarize, in the management of the dioxin crisis, public authorities " in the same way as the multinational Roche- seemed mainly concerned with limiting the damage dioxin contamination could caused them, in terms of loss of legitimacy, than with fully understanding the gravity of the contamination effects. Both actors actively worked in order to individualize the damage and to put it under the category of the exceptional. The link Medicina Democratica was engaged in denouncing between a certain kind of science and a certain kind of power was well exemplified in the management of the dioxin crisis. In fact, given the scientific uncertainty surrounding dioxin, it was clear to Seveso citizens that most decisions taken could not rely on much objectivity. Scientific controversies about dioxin hazards were widely discussed in the media. Nevertheless, public authorities insisted that decision criteria were purely scientific and technical. This convinced the public that the dioxin contamination was the case for political manipulation. Abortion became gradually the central issue in the public debate on the Seveso disaster, so that more general environmental health concerns, in particular the history of chronic pollution that the ICMESA accident was bringing to light, slipped into the background. In the next paragraph we are going to analyze how this shift occurred. Anatomy of a failure Following the ICMESA accident and the dioxin emergency, Medicina Democratica along with left-wing political parties, tried to organize a mobilisation of the disaster victims. According to this interpretation, the Seveso tragedy called for enlarging and radicalizing the critique addressed to capitalistic system, since it was now clear that not just workers but the environment and, through the environment, ordinary citizens were paying hidden costs for the benefit of a profit that was largely privatized and unequally redistributed. One of its distinguishing traits is the development of "opere," or social services made available through voluntary organizations. Relations between CL and the State have always been rather conflictual. The very same idea of Welfare State is then the object of critique. They are prevented from deciding about their destiny and the destiny of their territory. This analysis of the Seveso disaster was translated by Medicina Democratica into specific actions organised in the territory. The STPC addressed the Seveso disaster consequences as a problem of public health, larger than the dioxin contamination and touching the entire region of Lombardy, heavily industrialized and polluted. The Committee was meant to control and to critical examine the measures taken by regional authorities in response to the crisis. The main guidelines of the STPC were stated in an official document produced by the group as follows: Victims participation was crucial in order to guarantee the success of the struggle led by the STPC. This struggle was first of all oriented to a full disclosure of the damages caused by the ICMESA accident, of their gravity and irreversibility. Given the radical uncertainty of dioxin effects, and their long-term nature, STPC supported in name of prevention and precaution the plausibility of the worst scenario case, so to avoid that uncertainty could be turned into a justification for minimizing the damage. Equally important for STPC activists was the denunciation of a state of chronic contamination in the region, and not just in Seveso. However, victims participation appeared since the beginning to be quite small. The fact was that the way Medicina Democratica was using the crisis, as an

opportunity to denounce human and environmental costs of capitalistic exploitation, forced Seveso people to exist in the public space as victims of an irreparable damage, touching them as persons as well as the territory they 11 were living in.

### Chapter 6 : Seveso disaster, 10 July [EcoMole Blog]

*The best-known consequence of the Seveso disaster was the impulse that it gave to the creation of the European Community's Seveso Directive, a new system of industrial regulation. Within the EC, each country previously followed its own rules for managing industrial safety.*

It resulted in the highest known exposure to 2,3,7,8-tetrachlorodibenzo-p-dioxin TCDD in residential populations [1] which gave rise to numerous scientific studies and standardized industrial safety regulations. Location The Seveso disaster was so named because Seveso, with a population of 17,000, was the community most affected. Other affected neighbouring communities were Meda 19,000, Desio 33,000, Cesano Maderno 34,000, and to a lesser extent Barlassina 6,000, and Bovisio-Masciago 11,000. The factory building had been built many years earlier and the local population did not perceive it as a potential source of danger. Moreover, although several exposures of populations to dioxins had occurred before, mostly in industrial accidents, they were of a more limited scale. Chemical events The accident occurred in building B. The chemical 2,4,5-trichlorophenol 2 was being produced there from 1,2,4,5-tetrachlorobenzene 1 by the nucleophilic aromatic substitution reaction with sodium hydroxide. The 2,4,5-trichlorophenol was intended as an intermediate for hexachlorophene, [3] although it can also be used as an intermediate for the herbicide 2,4,5-T 2,4,5-trichlorophenoxyacetic acid. This reaction must be carried at a temperature above that of the normal process utilities that were available, so it was decided to utilize the exhaust steam from the electricity turbine on site, and pass that around an external heating coil on the reactor. On this occasion the batch process was interrupted prior to finishing the final step of removal of ethylene glycol by distillation, due to an Italian law requiring shutdown of plant operations over the weekend. Other parts of the site started to close down as batches finished, and no more were started. No steam temperature reading was available to the plant operators. This batch was then stopped by isolating the steam, and turning off the stirrer. Zone A was further split into 7 sub-zones. The local population was advised not to touch or eat locally grown fruits or vegetables. Within days a total of 3,000 animals were found dead, mostly poultry and rabbits. Emergency slaughtering commenced to prevent TCDD from entering the food chain, and by over 80,000 animals had been slaughtered. By the end of August, Zone A had been completely evacuated and fenced, 1,000 people of all ages had been examined and were found to suffer from skin lesions or chloracne. An advice center was set up for pregnant women of which only 26 opted for an abortion, which was legal in special cases, after consultation. Another women brought on their pregnancies without problems, their children not showing any sign of malformation or pathologies. This amount would be tripled two years later. Studies on immediate and long-term health effects A study [9] 14 years after the accident sought to assess the effects to the thousands of persons that had been exposed to dioxin. The most evident adverse health effect ascertained was chloracne cases. Other reversible early effects noted were peripheral neuropathy and liver enzyme induction. The ascertainment of other, possibly severe sequelae of dioxin exposure e. A study published in [10] concluded that chloracne nearly cases with a definite exposure dependence was the only effect established with certainty. Early health investigations including liver function, immune function, neurologic impairment, and reproductive effects yielded inconclusive results. An excess mortality from cardiovascular and respiratory diseases was uncovered, possibly related to the psychosocial consequences of the accident in addition to the chemical contamination. An excess of diabetes cases was also found. Results of cancer incidence and mortality follow-up showed an increased occurrence of cancer of the gastrointestinal sites and of the lymphatic and hematopoietic tissue. Results cannot be viewed as conclusive, however, because of various limitations: A study [11] observed no increase in all-cause and all-cancer mortality. However, results support that dioxin is carcinogenic to humans and corroborate the hypotheses of its association with cardiovascular - and endocrine -related effects. In 1997, an update including 5 more years up to found the expected increase in "lymphatic and hematopoietic tissue neoplasms" and increased breast cancer. Later that spring decontamination operations were initiated and in June a system epidemiological health monitoring for 100,000 people was launched. In September The International Steering Committee was created, staffed with "renowned experts from all over the world", in order to assess the scientific data generated. In February, The International

Steering Committee released its final report stating that "with the exception of chloracne, no ill effects can be attributed to TCDD". In June , the Italian government raised its special loan from 40 to billion lire. By the end of the year most individual compensation claims had been settled out of court. The total amount would reach 20 billion lire. Waste from the cleanup The waste from the clean up of the plant was a mixture of protective clothing and chemical residues from the plant. This waste was packed into waste drums which had been designed for the storage of nuclear waste. It was agreed that the waste would be disposed of in a legal manner. To this end, in spring , the firm Mannesmann Italiana was contracted to dispose of the contaminated chemicals from Zone A. Mannesmann Italiana made it a condition that Givaudan would not be notified of the disposal site which prompted Givaudan to insist that a notary public certify the disposal. On December 13, the notary gave a sworn statement that the barrels had been disposed of in an approved way. A public debate ensued in which numerous theories were put forward when it was found that Mannesmann Italiana had hired two subcontractors to get rid of the toxic waste. On May 19 the 41 barrels were found in an unused abattoir slaughterhouse in Anguillcourt-le-Sart , a village in northern France. From there they were transferred to a French military base near Sissonne. The Roche Group parent firm of Givaudan took it upon itself to properly dispose of the waste. On November 25, over nine years after the disaster, the Roche Group issued a public statement that the toxic waste consisting of 42 barrels 1 was added earlier that year had all been incinerated in Switzerland. According to New Scientist it was thought that the high chlorine content of the waste might cause damage to the high temperature incinerator used by Roche, but Roche stated that they would burn the waste in the incinerator and repair it afterward if it were damaged. They stated that they wanted to take responsibility for the safe destruction of the waste. In May , the Court of Appeal in Milan found three of the five accused not guilty; the two still facing prosecution appealed to the Supreme Court in Rome. On May 23, , the Supreme Court in Rome confirmed the judgment against the two remaining defendants, even though the prosecuting attorney had called for their acquittal. At least a week passed before it was publicly stated that dioxin had been emitted and another week passed before evacuation began. Few scientific studies had confirmed the level of danger TCDD posed and there were scant industrial regulations to be followed. As a result the local population was caught unaware when the accident happened and in such an insecure situation became very frightened. Confrontation with an invisible poison possibly extremely hazardous to human health was a very traumatic experience for small rural communities. However, within a relatively short time such conflicts abated and the recovery of the community proceeded. For, in Seveso, the responsible party was known from the outset and soon offered reparation. Moreover, the eventual disappearance of the offending factory itself and the physical exportation of the toxic substances and polluted soil enabled the community to feel cleansed. The resolution of the emotional after-effects of the trauma, so necessary for the recovery of a community, was facilitated by these favourable circumstances. Treatment of the soil in the affected areas was so complete that it now has a dioxin level below what would normally be found. The whole site has been turned into a public park, Seveso Oak Forest park. Some say that Seveso is now the least polluted place in Italy. Several studies have been completed on the health of the population of surrounding communities. It has been established that people from Seveso exposed to TCDD are more susceptible to rare cancers but when all types of cancers are grouped into one category, no statistically significant excess has yet been observed. Epidemiological monitoring programmes established as follows with termination dates: The Seveso disaster gives valuable comparative insight into the effects of Agent Orange on flora and fauna in Vietnam, not to mention the Vietnamese people, as TCDD was a significant contaminant in Agent Orange.

**Chapter 7 : Seveso disaster : Wikis (The Full Wiki)**

*Icmesa chemical company, Seveso, Italy. 10th July Accident summary. At approximately on Saturday 10th July a bursting disc on a chemical reactor ruptured.*

Advertisements Location The Seveso disaster was so named because Seveso was the community most affected. Seveso is a small town with a population of 17, in Other affected neighbouring communities were Meda 19, , Desio 33, , Cesano Maderno 34, and to a lesser extent Barlassina 6, and Bovisio-Masciago 11, The factory building had been built many years earlier and the local population did not perceive it as a potential source of danger. Moreover, although several exposures of populations to dioxins had occurred before, mostly in industrial accidents, they were of a more limited scale. Chemical events The accident occurred in building B. The chemical 2,4,5- trichlorophenol 2 was being produced there from 1,2,4,5-tetrachlorobenzene 1 by the nucleophilic aromatic substitution reaction with sodium hydroxide. The 2,4,5-trichlorophenol was intended as an intermediate for hexachlorophene , [3] although it can also be used as an intermediate for the herbicide 2,4,5-T 2,4,5-trichlorophenoxyacetic acid. This reaction must be carried at a temperature above that of the normal process utilities that were available, so it was decided to utilize the exhaust steam from the electricity turbine on site, and pass that around an external heating coil on the reactor. On this occasion the batch process was interrupted prior to finishing the final step of removal of ethylene glycol by distillation , due to an Italian law requiring shutdown of plant operations over the weekend. Other parts of the site started to close down as batches finished, and no more were started. No steam temperature reading was available to the plant operators. This batch was then stopped by isolating the steam, and turning off the stirrer. Zone A was further split into 7 sub-zones. The local population was advised not to touch or eat locally grown fruits or vegetables. Within days a total of animals were found dead, mostly poultry and rabbits. Emergency slaughtering commenced to prevent TCDD from entering the food chain , by over 80, animals had been slaughtered. By the end of August Zone A had been completely evacuated and fenced, people of all ages had been examined and were found to suffer from skin lesions or chloracne. An advice center was set up for pregnant women of which several opted for an abortion , which was legal in special cases, after consultation. Then two government commissions were established to thrash out a plan for quarantining and decontaminating the area and finally the Italian government diverted 40 billion liras from its coffers; this amount would be tripled two years later. Studies on immediate and long-term health effects A study [9] 14 years after the accident sought to assess the effects to the thousands of persons that had been exposed to dioxin. The most evident adverse health effect ascertained was chloracne cases. Other reversible early effects noted were peripheral neuropathy and liver enzyme induction. The ascertainment of other, possibly severe sequelae of dioxin exposure e. A study published in [10] concluded that chloracne nearly cases with a definite exposure dependence was the only effect established with certainty. Early health investigations including liver function, immune function, neurologic impairment, and reproductive effects yielded inconclusive results. An excess mortality from cardiovascular and respiratory diseases was uncovered, possibly related to the psychosocial consequences of the accident in addition to the chemical contamination. An excess of diabetes cases was also found. Results of cancer incidence and mortality follow-up showed an increased occurrence of cancer of the gastrointestinal sites and of the lymphatic and hematopoietic tissue. Results cannot be viewed as conclusive, however, because of various limitations: A study [11] observed no increase in all-cause and all-cancer mortality. However, results support that dioxin is carcinogenic to humans and corroborate the hypotheses of its association with cardiovascular - and endocrine -related effects. Later that spring decontamination operations were initiated and in June a system epidemiological health monitoring for , people was launched. In September The International Steering Committee was created, staffed with "renowned experts from all over the world", in order to assess the scientific data generated. In February, The International Steering Committee released its final report stating that "with the exception of chloracne, no ill effects can be attributed to TCDD". In June , the Italian government raised its special loan from 40 to billion liras. By the end of the year most individual compensation claims had been settled out of court. The total amount would reach 20 billion liras. Waste from

the cleanup The waste from the clean up of the plant was a mixture of protective clothing and chemical residues from the plant. This waste was packed into waste drums which had been designed for the storage of nuclear waste. It was agreed that the waste would be disposed of in a legal manner. To this end, in spring , the firm Mannesmann Italiana was contracted to dispose of the contaminated chemicals from Zone A. Mannesmann Italiana made it a condition that Givaudan would not be notified of the disposal site which prompted Givaudan to insist that a notary public certify the disposal. On December 13, the notary gave a sworn statement that the barrels had been disposed of in an approved way. A public debate ensued in which numerous theories were put forward when it was found that Mannesmann Italiana had hired two subcontractors to get rid of the toxic waste. On May 19 the 41 barrels were found in an unused abattoir in Anguilcourt-le-Sart , a village in northern France. From there they were transferred to a French military base near Sissonne. The Roche Group parent firm of Givaudan took it upon itself to properly dispose of the waste. On November 25, over nine years after the disaster, the Roche Group issued a public statement that the toxic waste consisting of 42 barrels 1 was added earlier that year had all been incinerated in Switzerland. According to New Scientist it was thought that the high chlorine content of the waste might cause damage to the high temperature incinerator used by Roche, but Roche stated that they would burn the waste in the incinerator and repair it afterward if it were damaged. They stated that they wanted to take responsibility for the safe destruction of the waste. In May , the Court of Appeal in Milan found three of the five accused not guilty; the two still facing prosecution appealed to the Supreme Court in Rome. On May 23, , the Supreme Court in Rome confirmed the judgment against the two remaining even though the prosecuting attorney had called for their acquittal. At least a week passed before it was publicly stated that dioxin had been emitted and another week passed before evacuation began. Few scientific studies had confirmed the level of danger TCDD posed and there were scant industrial regulations to be followed. As a result the local population was caught unaware when the accident happened and in such an insecure situation became very frightened. Confrontation with an invisible poison possibly extremely hazardous to human health was a very traumatic experience for small rural communities. However, within a relatively short time such conflicts abated and the recovery of the community proceeded. In Seveso accident the responsible party was known from the outset and soon offered reparation. Moreover, the eventual disappearance of the offending factory itself and the physical exportation of the toxic substances and polluted soil enabled the community to feel cleansed. The resolution of the emotional after-effects of the trauma, so necessary for the recovery of a community, was facilitated by these favourable circumstances. Treatment of the soil in the affected areas was so complete that it now has a dioxin level below what would normally be found. The whole site has been turned into a public park, Seveso Oak Forest park. Some say that Seveso is now the least polluted place in Italy. It could be argued that Seveso is a disaster that has not yet produced identifiable disastrous consequences. Several studies have been completed on the health of the population of surrounding communities. It has been established that people from Seveso exposed to TCDD are more susceptible to rare cancers but when all types of cancers are grouped into one category, no statistically significant excess has yet been observed. Epidemiological monitoring programmes established as follows with termination dates: The Seveso disaster gives valuable comparative insight into the effects of Agent Orange on flora and fauna in Vietnam, not to mention Vietnamese people as TCDD was an active chemical element in Agent Orange.

**Chapter 8 : Seveso disaster : definition of Seveso disaster and synonyms of Seveso disaster (English)**

*Failure Knowledge Database - Selected Cases 1 Explosion of Chemical Plant in Seveso, Italy – July 10, Seveso, Italy – Mitsuo Kobayashi (Graduate School of New Frontier Sciences, University of Tokyo).*

Amplification Sharing Situational uncertainty involves a poor match between the decisions that must be taken and the information at hand. It is normally the most salient type of uncertainty because information is central to decision-making. It is also a very common type of uncertainty because complete high-quality information about major hazards is usually lacking. Moreover, interagency collaboration in decision-making is usually required and knowledge about the capabilities of such agencies is often incomplete. But few public decisions about industrial hazards meet these exacting criteria, so decision makers cannot ignore the possibility that they will be subject to legal action or moral censure. Societal uncertainty occurs when institutions and the publics that they are intended to serve are not well integrated. Such uncertainty is most marked where every action is scrutinized by lawyers who represent other stakeholders. But societal uncertainty can be manifested in other ways. For example, respect for government agencies may be low, or individualism may be carried to extremes, either among the public or among leaders in major institutions. Institutional uncertainty is brought about when agencies withhold information for bureaucratic reasons. It is most likely to be high in circumstances where there are difficulties about informal communication, acquaintance, and trust among personnel of agencies with different traditions and missions. This ensures that the necessary channels of understanding and confidence are absent during a crisis. Institutional uncertainty can be high even in relatively consensual societies, if there happens to be a tradition of bureaucratic secrecy. When the parameters of confidentiality are strained, proprietary uncertainty becomes salient. Thus, in the midst of an emergency there may be a debate about the rights of persons to know, to warn, or to conceal. Scientific uncertainty is the last but by no means the least important type of uncertainty. It is mobilized at various phases of hazard including before, during, and after emergencies. For example, scientific risk assessments that are undertaken well in advance of a crisis may employ long-established techniques to evaluate industrial plants and equipment but may have to depend on less-seasoned methodologies to analyse the transport of environmental pollutants Funtowicz and Ravetz. When a hazard is in the acute emergency phase, the possibility of effective forecasting may be either good or poor, depending on the circumstances which themselves cannot always be predicted. Thus, scientific uncertainty can vary from low to very high. Two sets of strategies table 4. Some people may decide to suppress information about uncertainty entirely, even from themselves. This may translate into a refusal to admit that uncertainty exists or a failure to notice it. It is an extreme form of discounting. Ordinary discounting will recognize a possibility but as with many events in the distant future will assign such a low value to its salience that it can be neglected for policy purposes. Recognition of an uncertain contingency is a balanced appreciation. By contrast, amplification is an emphasis - perhaps even an overemphasis - of the significance of uncertainty. Corresponding to the interpretations are the policies concerning communication of uncertainties. At one extreme lies secrecy, the extreme case of confidentiality; then comes publicity, with its own extreme form - sharing. There are many variations and nuances in any practical policy of communication. The utility of these classification schema can be illustrated with reference to the Seveso disaster, the Seveso Directive, and the Karin B incident. Modelling the Seveso disaster At the time of the Seveso disaster, the complexity of communication problems under conditions of severe uncertainty was recognized, if not fully managed. Before the gas release, no one outside the plant neither residents nor political or health authorities - had any idea that there was a hazard of such magnitude. The explosion and release were greeted by incredulity, followed by alarm and dismay. Ten days passed before the firm confirmed that dioxin had been released Pocchiari, Silano, and Zapponi Only then did the governmental authorities and the public learn that there was a grave risk. Even so, it was impossible to assess the danger with any precision. There was an onset of genuine dread, about illness in general and about malformed babies in particular. The widespread illness and deaths of animals of many species was an ominous sign. The authorities had their own severe problems of decision-making under uncertainty, including the definition of different polluted zones, programmes of evacuation of endangered

residents, and disposal of contaminated material. Scientific uncertainty was salient, as shown by the fact that local investigating magistrates closed off the site within eight days of the accident. Societal uncertainty was severe because there had been no previous institutional preparation or consultation for the accident. For example, the Swiss Technical Director of ICMESA found himself under arrest when he attended a works meeting 12 days after the accident the Director of Production was also placed under arrest at that time, and was assassinated by terrorists four years later. One of the few relatively straightforward aspects of the accident was the low level of proprietary uncertainty. Although the provision of relevant information did not proceed as quickly or smoothly as desired by all, at least there was no need for the government authorities to use legal means to force the firm to divulge information. The fact that the ICMESA factory was already sequestered would have made it highly imprudent for its owners to withhold information about the contaminants, and it was noted at the time that the dioxin threat had already been publicized by the media before it was officially confirmed. Later, and off the Seveso site, proprietary uncertainty was not as low, particularly in connection with the disposal of barrels containing toxic materials. From onwards, stories of concealment and blunders began to circulate and these have not yet ended see Chronology. Modelling the Seveso Directive Our model of uncertainty management is also reflected in the regulations of the Seveso Directive. The main concern here is with communication: Member States shall ensure that information on safety measures and on the correct behaviour to adopt in the case of an accident is supplied in an appropriate manner, and without their having to request it, to persons liable to be affected by the major accident originating in a notified industrial activity within the meaning of Article 5. The information should be repeated and updated at appropriate intervals. It shall also be made publicly available. Such information shall contain that laid down in Annex VII. First, there is an attempt to institute progressive reduction of scientific uncertainty via updating requirements. When we consider the implementation of the hazard communication requirements of Article 8, we find that the model illuminates practice. First, actual EC regulations seem to assume that societal and institutional uncertainties are not salient or severe. Nor do they deal with the possibility of situational uncertainty i. The contrast between European and American practice is noteworthy. Some 12 years after the Seveso gas release, a shipload of Italian industrial toxic wastes was first dumped in Nigeria and then reloaded after protests. In the full glare of publicity and widespread public dread, the regions of Emilia-Romagna and Tuscany undertook the final task of disposal, in the process showing how a large quantity of mixed toxic wastes could be managed, with full satisfaction of technical requirements and local concerns. Between the time that the Karin B was discovered to be carrying a toxic cargo and the eventual agreement on destruction of the wastes, all uncertainties were effectively out of control. Whoever knew about such shipments had previously kept them secret; when they were discovered, therefore, all the issues of knowledge, uncertainty, and responsibility came into play simultaneously. However, when the regional authorities of EmiliaRomagna and Tuscany together with several local authorities - finally took physical possession of the wastes, the change was dramatic. Acting in cooperation with each other and with the media, and creating opportunities for the participation of interested communities, they were able to reduce salient uncertainties, starting with the scientific ones and then proceeding to others, such as institutional uncertainties. The societal uncertainties became less severe and less salient, and the clean-up operation proceeded peacefully to a successful conclusion in all respects Centro Informativo Karin B ; Egidi

**Chapter 9 : Seveso Dioxin Cloud - Top 10 Environmental Disasters - TIME**

*A dioxin leak from the Icmesa factory near Seveso, a town about 13 miles north of Milan in July, , caused the death of 3, animals upon contact with the gas and another 80, animals.*

The Seveso Disaster Five Givaudan workers were sentenced to spend a few years in prison by the Criminal Court in Monza but appealed to the court in Milan: The other two appealed to the Supreme Court in Rome and their attorney called for their acquittal; however, the court confirmed the judgment against the two employees. In the face of this claim, later reports revealed that the company delayed action and took its time warning the public about the issue at hand Whipple, Several events have happened prior to the Seveso dioxin disaster that involved TCP, the chemical compound contained in the reactor at the incident that released dioxin as a result of the explosion. TCP production came to a cease following a dioxin accident at a site in Germany in Following a dioxin accident at a similar plant in the Netherlands in , the site was closed down and taken apart. The pieces were then covered in concrete where they then got dumped into the ocean De Marchi. Knowing that these events had previously occurred, the plant at the Seveso disaster remained in operation regardless. The issue of negligence comes into play because of the prior incidents involving dioxin. After an accident at a Dow Chemical plant in similar to the Seveso disaster, safety measures were taken to prevent future mishaps. Installed over the TCP reactor at the Dow Chemical plant was a supplemental safety vessel that in the case of the reactor valves rupturing, the safety vessel would contain the leak and cool down any toxic substances that may escape De Marchi. The plant at the Seveso disaster could have taken this important safety measure to possibly prevent the accident from occurring. Money was most likely not an issue due to the fact that the location was at Lombardy, one of the most industrialized and wealthiest areas in all of Italy De Marchi. The Mossville Disaster All of the companies believed to be involved in the polluting of Mossville deny any responsibility and continue working as normal. The ATSDR issued another report in stating that all of the levels were in line with EPA standards and that there is nothing to indicate that the dioxin levels are connected to any of the manufacturing plants nearby Anonymous. The residents however, continue their struggle to receive health care, legislation to limit the plant emissions and additional independent dioxin testing. The Times Beach Disaster Relocation: The Centers for Disease Control recommended that the residents of Times Beach be permanently relocated. In the EPA decided that the proper course of action was to thermally treat contaminated soil exceeding 20 ppb dioxin, and to place a one-foot soil cover over portions of the site exceeding 1 ppb. The EPA also decided to carry out demolition and onsite disposal of treatment residues and the structures and debris remaining at Times Beach EPA In , the EPA, Missouri, and signed a Consent Decree stating which parties would be responsible for specific parts of the clean up effort. This cleanup effort was completed in , and the site was reopened in as a State Park EPA Russell Bliss was never charged with a crime, but he has been overwhelmed by civil lawsuits since the incident Flock All that sounds bad, but what can we do? These are not isolated incidences, accidental and purposeful releases of toxic chemicals occur all around the world, every day. Quiet unassuming rural towns are often the unknowing victims in the manufacturing race to produce more and make it cost less. Understandably, most people are unaware of the hazards of manufacturing and what emissions companies are responsible for controlling. As an occupant of this planet, we must all try to understand more about the current and potential dangers to our health and our community. No communities should ever again be considered expendable in the manufacturing process.