From Chernobyl to Fukushima : Do the pedagogics of disaster exist?

A paraître dans :

Late Lessons volume 2: Draft structure & contents, 2012 (European Environment Agency)

What does the panic caused by the increasing occurrences of incidents involving several Japanese reactors at the Fukushima nuclear plant after the earthquake show us? Citizens, media and some analysts consistently drew a parallel with Chernobyl, as both memory and signifier, and this comparison has become an issue for the authorities and politicians of nuclearized states. Where does this fear of comparison come from, and is this comparison reasonable? After 15 years of research in sociology and anthropology, years dedicated to make sense of and relay the experience of Chernobyl, not as regards the merely technical aspects of the event, but as regards the changes it caused in the lives of the Chernobyl inhabitants, I can't resist having a closer look at the incident in Japan, using my personal experience of Chernobyl.

The never-found lessons of Chernobyl.

he most superstitious among us have not failed to establish a link between the 25th anniversary of the Chernobyl accident, and the highly unexpected –yet predictable- incident in the Fukushima Daichi Plant. But there are certainly better reasons to put these two accidents and their consequences into perspective, which are now the most serious ones in the history of modern technique. In the last few months a strange comparison of these two phenomena permeates the debates –technical as well as societal ones- and yet we cannot say with certainty that we are facing a new Chernobyl. Even if the Japanese crisis's severity rating has been raised to Level 7, the highest level on the scale of nuclear events, Chernobyl being so far the only occurrence of such an event- it seems to complete the commensurability of both disasters. But to acknowledge and make sense of an event like this one, historical and cultural references are still needed. And so, many experiences spent in the contaminated areas of Ukraine and Byelorussia have allowed me to understand how much "Chernobylians" lacked and still lack references, images, words… to make sense of their misfortune. Chernobyl has initiated an entirely new type of catastrophe, so novel in fact that it left the State, technicians and inhabitants totally clueless as what to do to confront that kind of adversity. Apparently, it is no longer the case for Fukushima, since the "battle of Chernobyl" has been led, even if 8 million people will keep on living in areas which will be contaminated for several hundred years still. But we still need to learn from the first disaster to apprehend the second one, to think the incredible complexity of the societal and even symbolical stakes of such an incident in the long term, beyond the practical and sanitary aspects on which most protagonists are focusing right now. The exercise we need to engage into means to delve deep into the world of Chernobyl to learn from it the elements which will guide us, here and now in Fukushima of course, but also in all the places where there is still a nuclear danger, in the long term of the generations to come.

Is it reasonable to consider that we are facing a new Chernobyl? The Chernobyl disaster –whose long-term effects will last for centuries- immediately comes to mind as the only cultural and historical reference to address the accident in a social way, as a representation, as a construction of a nuclear

disaster. But can we compare them in a technical way? Experts in nuclear technology are striving to try and explain to us that the conception of Japanese nuclear plants is different from the Soviet ones, especially those equipped with a containment structure, etc. But isn't it too late? The contamination has been proven, several criticality accidents have occurred, as well as several explosions and so far uncontrolled radioactive releases. Isn't it more reasonable to think, therefore, that tens of thousands of people, maybe hundreds of thousands, will have to make the painful experience of Chernobyl inhabitants? We might have to remember more urgently than ever the improbable lessons of Chernobyl because we need to prepare for the worst: living sustainably in sustainably contaminated areas.

The lessons of Chernobyl.

It would be pointless to try and sum up in few sentences the conclusions drawn from a disaster which I have spent 15 years researching from an anthropological perspective, and this research is far from being over; all the lessons have not been drawn either, as it raises so many questions. Let us remember that Chernobyl is not an accident which happened by chance, but the result of an experiment which had been scheduled with no consideration for the most basic safety requirements, with no caution either. Let us remember that one million people were called in to "liquidate" the aftermath of the disaster, and they were unsuccessful, let us remember that it quickened the collapse of the Soviet Union and that it has proven impossible, as of today, to measure its health outcomes realistically, not even approximately, for we never had the opportunity to produce epidemiological data. This is why only the heuristics of the Chernobyl legacy will be outlined; although like many others it was not preceded by any testament, but in its turn, opened "a breach between the past and the future", according to Hannah Arendt's words.

For those of us who already have memories from Chernobyl, the sequence of the events which happened in Fukushima , and the way people reacted to them is déjà vu. The explosion, even a smaller one in Japan, of a containment shell whose initial function was, like a sarcophagus, to prohibit all interaction between what is inside and the world of the living, this explosion has been seen before, just like the liquidators who were busy trying to tame the wounded technical monster, and while doing so were exposed to doses of radiation nobody had ever imagined before the accident (some Japanese workers received third-degree burns within the space of a few minutes). The ballet of helicopters desperately trying to douse water on the reactor(s) to cool them off has been seen before too. Let us not be mistaken: this is not the beginning of a new story, but the story of Chernobyl which is continuing. So these are the lessons that can be drawn from the memory of the future. What the Chernobyl survivors have taught me in the first place is that there is no way life can go back to normal after a major nuclear pollution. Contamination draws a new imaginary geography, outlining radioactive "zones" determined by the winds and rains, incompatible with human life, the nature of which had been defined by the visionary Russian film-maker Andreï Tarkowski in the movie Stalker: a contaminated techno-nature, in every way identical to the one which existed before, has found new rules, which, if not respected, will inevitably lead us, sooner or later, to a certain death. What else can be done, when there is no way to escape, when there is no place to find shelter? This is the second lesson from Chernobyl, the one which has been learned by the inhabitants of the future Japanese contaminated areas, very much at their expense: when there is no means –either technical

or psychological ones – to escape the human condition which is to live for many years in territories which will be contaminated for many years too, there is only one way: a denial of reality to be able to face the future in a quiet way. Belarus physicist V.Nestenko had observed that within the decade that followed the accident, the individual doses measured on the inhabitants of the contaminated zones had gone up, while it should have been more natural for them to decrease. It means that after the stress of the so-called accidental phase has been dealt with, the stressful situation which is still happening in Fukushima, the idea to going back to life as usual is much stronger than accepting the reality of things, and people have gone back to their daily routine, just like it was before the accident.

The prospect of living for a long time in a contaminated area leads us to make a clear and fundamental distinction between irradiation and contamination. All discourses today are rightfully focusing on the radiations released by the fission products. The problem is that we have to consider –as the Ukranian experience has taught us- the devastating effects on health of dust particles –either breathed in or swallowed in food- which will attach themselves to human organisms and will continue to have consequences over many years. The words "small doses" has, according to many scientists, become something of a misnomer: even a tiny dose has an effect, as the new toxicology teaches us, sometimes even a stronger effect than bigger doses (for example in the case of lead). When we talk about the radiotoxic products released from nuclear plants (such as Cesium 137, Strontium 90, etc.), it can be said that their toxicity is phenomenal. As a consequence of this, none of the 3 million children out of the 8 million people living in the territories officially contaminated by Chernobyl is considered by the WHO as healthy: as we have seen before, all of them suffer from various pathologies linked to the weakening of their immune system. The problem is that, in order to evaluate the Japanese situation, no true expertise of the health consequences of Chernobyl has ever been carried out: it has even been impeached, at all costs, by the IAEA and the WHO, which shows subservience to it: both are sworn to secrecy on all nuclear issues. The nuclearized states were in no hurry to know the truth, and we have had to make do with the "theory of the 32 dead" for many years. Even today there is no comprehensive study to give conclusions on the massive consequences of the accident on the populations within the last 25 years, these consequences being caused by many factors and delayed. There is only one single independent expertise to lay the foundations of the reasonable health outcomes of Chernobyl: it resulted from empirical observations in hospitals, in the field and with the help of associations of liquidators (125 000 died): we have to remember Dr.Yuri Bandazhevsky's fate (a specialist of anatomic pathology): he was the first to try and establish a correlation between the contamination by small doses and the emergence of diseases in Belarus. He was successful. But he was arrested in 2001 under fallacious accusations in a way which was strongly reminiscent of the Soviet Union era. He remained in jail until 2005, his Institute was searched and all documents relevant to his work (hard drives, theses, reports…) have since then disappeared. He was never able to resume his work.

But the main lesson which can be taught to us by the Chernobylians might be the following one: there is no way to "decontaminate" a territory, only small objects. Because of that, there is no way life can go back to normal, there is no way back. The nuclear disaster is –as opposed to natural disasters or even modern wars which allow a possibility to reconstruct, to lick wounds and to erase the scars of traumatic memories- a disaster with no after-life – like Chernobyl. It is a non-event, rather a never-ending event, an ongoing, daily process which devours biological life, like a "growing tree", as the inhabitants of what has become the "zone" used to say. Since the effects of lasting contamination extend on the living, and with the living (mutagenesis, carcinogenesis, inter-

generational transmission), we can say that they colonize the future and offer no way to escape from a tragic future: no culture, not even a Buddhist one, is ready to face that challenge.

We are then led to question our actions because of the third lesson of Chernobyl. 23 years ago, the explosion of Reactor N°4 in the Lenin plant –which was destined to become the largest electricity-generating plant in the world – occurred in circumstances we seem to often ignore. This accident, by far, didn't happen by chance, the Chernobyl disaster was the result of a true system test on the reactor: to see how, in the case of an emergency shutdown, the residual heat release could be used to produce more energy. When the test started, there was a rupture of the reactor vessel, causing a brutal and huge drop of power in the reactor, leading to a series of operations which were hard to control, and a series of blasts. It exposed the graphite moderator of the reactor to the air, causing it to ignite tens of thousands of tons of ultra-radioactive graphite sending a plume of radioactive smoke fallout in the entire Northern Hemisphere.

But more serious things happened, and most European populations are mostly oblivious of them, even the ones directly involved. Professor V.Nesterenko, from the National Academy of Sciences of Belarus, who was directly involved himself in the liquidation of the disaster's consequences once said: "it is my belief that we came very close to a nuclear explosion in Chernobyl. Had it happened, Europe world have become uninhabitable." Indeed, according to his estimations, along with his collaborators from the Department of Physics of Reactors from the Nuclear Energy Institute at the National Academy of Sciences of Belarus, 1,300 to 1,400 kilograms of the mixture uranium + graphite + water constituted a critical mass which could have triggered an explosion, an atomic one this time, with a power of 3 to 5 megatons, 50 to 80 times more powerful than the explosion in Hiroshima. All it would have taken was the mass of the melting reactor to go through the concrete slab on which it stood, and reach the cement chambers filled with water, and all the conditions for an atomic explosion would have been created. Such a powerful explosion would have created irreversible radiation injuries on the inhabitants living a 300-km radius – including the cities of Minsk and Kiev, both capitals-, the whole of Europe would have been the victim of a radioactive contamination which would have prevented all normal life. As an example, the consequences of a 1-megaton explosion can lead to a 90%-mortality within a 100-km radius. Hence it could be said that the decision to make this experiment which occurred between the 25th and the 26th of April was an experiment of total risk.

Limited evacuation, confinement within a 30-km radius: true crime

The choice of the nuclear energy is or was originally made by powerful states to settle their own domination, and not a choice by societies for the sake of their energy comfort. It tells the story of a dual confinement: the confinement of the atom and of information. When the first one is leaking, the second one is never far. So disastrous accidents like the one we are experiencing are crises – "moments of 'judgment'" in Greek- that is to say they reveal and analyze the nature of technological and political issues in a powerful way. But are the citizens of rich societies ready to accept its counterpart, not the hypothetical "risk" of an accident, but its inexorable occurrence one day or another. The Fukushima disaster was, in that sense, predictable, meaning that it belongs to the project, and is included in it. This is what Sociologist Paul Virilio calls the integral accident.

“The innovation of the ship was also the invention of the shipwreck. Inventing the steam engine, the locomotive, also meant the derailment, the train crash. Planes also invent the air disaster. The same goes with the automobile and the high-speed crash, with electricity and electrocution, with, of course with major technological risks resulting from the development of chemical industries, or nuclear ones… any era with a technological evolution brings, along with its various instruments, machines, specific accidents, which reveal in a “negative” way, the development of scientific thought.

So, to make the choice of the nuclear, a choice which no informed society can make after Chernobyl, means that there is a possibility of an accident happening and having long-term consequences. This idea has been summed up by Hannah Arendt’s definition: ‘Progress and catastrophe are the obverse and reverse sides of the same coin’. Needless to say, the increasing lifespan of nuclear plants, the precarious working conditions of staff are the objective components leading to an extreme vulnerability of nuclearized states… and even of the entire mankind. Fukushima is now the utterance of a general mistrust for technical progress, an utterance anthropologist A.Gras had already outlined in his eponymous book: fragility of power. The concept of disaster seems to be working better when we have to reflect on what is happening than the concept of calculable risk. A brief genealogy of modern catastrophes can lay the foundation of a reasoning about finding alternative ways to make sense of the event.

From Lisbon to Chernobyl.

Any catastrophe, coming from words Greek words “renversement, or “retournement”, leads us to the question of what it means, that is to say meaning and direction in French. A disaster similar to last month’s disaster in Japan had once transformed the destruction of the city of Lisbon after an earthquake , also followed by a tsunami and a great fire into a real rattling of ideas, introducing Europe to modern philosophy. Giving up the “best of all possible worlds wanted by God” which Leibniz held so dear, made us face our responsibilities, according to Rousseau.

“Let us admit, for example, that nature had not assembled 20,000 seven or eight-story houses, and if the inhabitants had been more evenly scattered, in lighter-built houses, the damage would not have been so great, maybe even non-existent.”

had Rousseau replied to Voltaire, who believed in the Providence, thus bringing some rationality in the reading of danger. Don’t the Chernobyl, and now the Fukushima disasters lead us today to give up the “best of all possible worlds” which Man, for He can not leave His destiny in the hands of God, now relies entirely on technique? After all, the world which has collapsed after Fukushima is different from the Soviet model too often associated with Chernobyl, and which contributed to confine the event to a mythical past, to a different place and prevented us from understanding all the consequences. Fukushima belongs to the western and liberal model, the model of the nuclear plants with containment structures benefiting from building and operating techniques we deemed the safest. It might be the reason why – even if we wanted to link both events- there was such a resistance to do so. To associate – in the sense of comprehending both- Chernobyl and Fukushima means to accept the recognition of today’s failure of our technical project, whose Promethean foundation the nuclear embodies today with biotechnologies. It had been possible to stiffle the Chernobyl disaster –disposing of it far too quickly as if the story was over- and to gag the people

living in contaminated areas because of the pressures of pro-nuclear lobbies, but it is no longer possible with the Japanese disaster, tempted as we are to identify ourselves to it, something we can see in the model we have chosen in the last thirty years.

A contaminated future.

Chernobyl, and now Fukushima have brought to the fore catastrophes of a new kind, never before experienced by Man because of the fact that they last in time, and above all because they get bigger with the biological life they're destroying. They determine the biological lives, but also the social and psychological lives of generations of still unborn individuals, whose existence is already colonized by the atom. Unlike a tsunami, which in our minds, still represents the model of a catastrophe, to the point that this word, Shoah in Hebrew, was chosen to name the biggest moral catastrophe of the history of mankind, there will not be an after-Fukushima, or there will only be an after-Fukushima, which is the same thing. In that sense, the Fukushima disaster, whose beginnings we are witnessing (the plutonium which seeped into the ocean can live thousands of years), cannot be compared with the other nuclear disasters of Hiroshima and Nagasaki, because they belonged to a state of exception reminiscent of modern wars: the way ordinary rights are suspended would allow for killing without committing a crime. With Chernobyl and Fukushima, we have to deal with "ordinary" industrial installations destined to increased the well-being of global society, which is the discourse which justified their promotion. This is why these events make us question the choices our societies make worldwide, the technological and energy choices, in a word, our model of society.

Let us keep in mind that every time a catastrophe happens (an earthquake, an oil spill, etc.), the GNP PNB, hence growth, increases in proportion, which is already a problem in itself: such an economic boon does not happen with a nuclear disaster. A contaminated territory, whether it be a soil, a fish-producing area, or even worse, and urban zone, will result in a dead loss which can only be evaluated by the period of time during which its use will be strictly forbidden. It is impossible to bear economically speaking such a constraint, neither for a collectivist economy nor for a liberal one. This is why the nuclear cannot be insured, or by only by society itself. This is why the rehabilitation of exclusion zones around Chernobyl were merely a strategy to move the limits of the forbidden zone to allow the meadows and fields to be used again. This is finally why there will be no lasting evacuation from the contaminated areas of Fukushima.

Risk as an externalization of danger and vulnerability.

It seems urgent to reconsider our model of risk management, and to abandon the accounting and statistic logic to which it is closely linked. Unlike the previous model of industrial accidents relying on the insurantial logic of repair, the new technological risks are collective risks (which can have an impact of the entire world population), completely impossible to control and irreversible, like radiological or biotechnological pollution. They are also characteristically odorless and tasteless, produced continuously, within the "normal" functioning frame of industrial plants, without any foreboding of a spectacular pre-existing event. It seems urgent then to invent new imaginaries of vulnerability, to find our capacity to imagine again, to imagine the worst. Risk, being in its technical

meaning, defined as statistics, avoids the issue of danger as substance, and before that of vulnerability, and goes back to its core, what can only guide an assessing way of thinking: the probabilistic expression. The question then is not to know whether the heart of a nuclear reactor and the plutonium it contains represents a threat in itself, nor to assess what would be affected if it came to be "externalized" in its turn, but rather to protect ourselves with the belief that the probability of such an event to occur is null. In the end, doesn't assessable risk appear like the impoverished manner with which Man living in technoscientific societies, and unable to account for the events happening to him, makes sense of his misfortune? In this way, he accounts for what he has produced, but cannot be aware of this because the quantified expression he gave of it deprives him of all critical thinking.

To go beyond the concept of risk, what change of paradigm?

The emergence of "new risks", collective and of technological origins, whose conditions of appearance had long been prepared, has been consistently challenging for the people who should predict and/or control them once they have appeared: people's representatives, engineers, forecasters, public or private insurers who can no longer fulfill their missions properly. Uncertainty has paradoxically seeped deep inside societies, which precisely, had made the choice of technical progress hoping this could reduce hazards and uncertainties and master nature. The huge investments made regarding prevention, often technical prevention, doesn't seem to be able to prevent new accidents or diffuse and continuous processes affecting human life via the environment any more. If the "institutions of risk" inherited from the Welfare State are no longer adapted to the nature of the new threats originating from our actions and impacting our societies (the « living-together concept ») and the inhabitable earth (Ecumene), it raises the issue of knowing if a new paradigmatic frame could help us to analyze and characterize those new risks and, above all, to give them answers that would be socially acceptable. This problematic is now the place for a set of new questions -about the relation between technological innovation (industrial activity), fundamental science (the knowledge production), the logics of expertise and decision-making (political power) and society, especially with the issue of knowing if "social" knowledge is relevant when confronted with the former hegemony of "scholarly knowledge", that is to scientific-technical.

Ulrich Beck's book, Risk society was published 25 years ago, right when Reactor N°4 exploded in the Lenin Nuclear Plant in Chernobyl, which opened new horizons for industrial and technicized societies: we would no longer have to think in terms of production and distribution of wealth, but in terms of social organization and of our future from the standpoint of production and distribution of risks, as Beck had foretold. Indeed, the notion of assessable risk -and its corollary, uncertainty- seems to have expanded to now include the domain of assessment and insurance where it was confined to the scope of all human activities. Beck's thesis relied on the existence of a dual paradox which should be affecting us all in our post-modern, post-industrial, etc. times. On the one hand, scientific and technical innovations meant at first to control hazards have today given rise to new threats; and on the other hand our technician societies supposedly capable of confronting any danger in terms of "treatable risk", have given birth to a never-ending social demand for safety and security which cannot be satisfied. The irruption of these "risks" of course refers to an unfortunately very tangible and quantifiable reality (the sky-rocketing increase of "environmental illnesses", the acceleration of

global climate change and its consequences on biodiversity and on food world-wide), the reality of the technological threat, (the proliferation of health crises, the documented consequences of agricultural biotechnologies using pesticides, electromagnetic pollutions, etc.) and they lead experts and policiticans to take the possibility of the disappearance of the human species seriously. But the proliferation of risks also belongs to the different imaginaries structuring our times: this proliferation, is, in other words, a social fact. Risks are omnipresent –whether we perceive them in other human beings, in nature, on our plates, in young people as in any other part of the population considered "at risk", in private (i.e protected) as well as in public (CCTV-monitored places), so omnipresent in fact that they could be considered as a new category of perception, an aesthetic perception.

Men from the Renaissance have built their relation to the sensible world using the notion of landscape, as observers of nature confronted to the observed nature-object, it could be said that risk is the relation which has from now on been established between men – plagued with worries at the beginning of the 21st century- and a techno-world or techno-nature which is hard to grasp. This is why it is our mission to keep a critical mind regarding a polysemic notion, complex and contradictory, and to question whether or not it is relevant in human sciences, between object of study for sociology and sociological concept.

Reflecting on what we are doing: risk, vulnerability, catastrophe

There are at least two paradigms used to reflect on "what we are doing", or at least to reflect on the negative or problematic consequences of our technological actions: risk on one side, and catastrophe, on the other.

We are used to defining the first one as the product of a hazard (potential or real expression of a threat) and vulnerability (what will be affected). Catastrophe - which has been the foundation of many currents of thoughts since WW2, including the discovery of extermination camps, the nuclear bombs on Hiroshima and Nagasaki – for its part expresses the idea of a promise being reversed or turned into a threat. It is the role of Human Sciences, with an on-going dialogue with other fields of research, to question the uses, the stakes and the limits of the notion of risk through pluridisciplanory interrogations and experiences, and to question the possibility to reflect on the consequences of human actions beyond a simple approach by assessment. If it is easy to see that a purely quantitative and abstract indicator of "wealth" such as the GDP –which keeps increasing every time there is a catatrophe-, the quantitativist reduction of measuring "what we are doing", and which we name risk is no longer such a big problem. Nevertheless, while necessary, it makes our capacity to imagine the future, the images of disasters while confronted to a future increasingly marked by catastrophes poorer. Is assessable risk in opposition with other concepts, more qualitative ones, and above all, more significant as regards the nature of the threat? How relevant is, for example, an "enlightened catastrophism" (Jean-Pierre Dupuy's words), for a sociological and anthropological analysis of Men and the Environment's vulnerability and of new environmental risks?

In Human Sciences, the paradigm of risk has resulted into four different types of approaches in France. The first one relies on scientific expertise as the principal means of solving the social crises

born from situations of environmental and health vulnerabilities. The second one, which can be defined as the political way, relies entirely on the study of the process of decision-making and on the analysis of recent crises, so as to make an attempt at clarifying the action principles of decision-makers in both the public and the private fields, leading us to research a type of "governance" of new risks which would combine prevention, precaution and insurance. The third one, at last, is the "economistic" approach, which tries to find a solution when relying on the market and on the liberal economy. Those three ideal-types can have a hybrid or combined form, but all respectively share a reliance on the three institutional components of Modernity, without even challenging them: Science, State and Market. Undeniably, the redistribution of scientific, political and economical stakes linked to environmental risks can no longer ignore the necessity to take civil society under consideration when dealing with risk, as can be seen not only in the emergence of a "scientific third sector" or a "citizen science" but also in the new forms of organized opposition (such as the GMO voluntary reapers or militant citizen association), fighting against the unfettered release of new technological and environmental threats: it is the fourth approach. In a more fundamental way, the different approaches to risks, either presumed or real ones, do not question in a radical way –that is to say at the very root of the matter- the political and economical logics at work in the creation and production of the threats looming over men, the environment, and democratic regimes. The legitimacy of the three "stalwarts" constituent of the modern project at work in the dynamics of industrial and technological development in the last fifty years has been seriously put into great doubt, particularly after the numerous crises which have occurred in the last two decades: the Chernobyl "lie", the contaminated blood "case", the Mad Cow incident, the asbestos "scandal"… In the end, it seems that in all those situations, the State, through its representatives, has failed its most fundamental missions to protect citizens, and it also seems that Science is no longer a rational and disinterested activity trying to achieve a higher goal: the happiness of the greatest majority, but is now an operative technoscience devoid of morals, intricately linked to the interests of industrial lobbies, and that the Market is no longer the self-regulating place for exchanges and passions between men, but an organized and globalized system of destruction devoid of any humanity.

Without pretending to consign the crucial nature of those stalwarts of modernity (the rule of Law, the market as a place for exchanges, and Science as a project for the autonomy of knowledge) to the dustbin of history, we still have to question their limits and their potentially corrupted nature, in the context of a society of risk. Producing pluridisciplinary reasonings on a group of actions (and of their consequences), produced by individual and collective choices brought down to the analysis of this one and only common factor: the notion of risk. In the end; doesn't risk seem to be the impoverished and simplistic manner in which Man in our technoscientific societies, no longer able to grasp the reality of what is happening to Him, to give meaning to His misfortunes? It also gives an account of what Man has produced, but he can not be completely aware of it because the quantified expression Man has given to this product deprives him of any critical thinking. In the way it is expressed, in a quantified and abstract way, devoid of any substance, risk, defined as a statistical hazard, pushes us further away from our responsibilities, and robs us of any way of thinking other than calculating thoughts, so much so, that, in the end, the consequences of technological acts appear natural and ahistorical because of it, while in truth, we are confronted to development choices.

If, along with Claude Lefort, we can consider modern democratic societies on the very basis of their indetermination, (societies which can freely choose their history), we cannot help but witness with

disbelief the fact that these societies are no longer able to protect their citizens from the rising health and environmental perils closely linked to the nature of their development itself –something the Fukushima catastrophe has brought into the limelight. This reality can no longer be brought down to the sole angle of "risk management", a notion which has been developed in the field of calculability and predictability, both characteristics of so-called "exact" sciences, and this field has progressively invaded social sciences which are now increasingly involved in the operation of insurance systems, either as precaution or a repairment. An attitude of cautiousness toward our increasing vulnerability is the only way to get more information about the different faces of a threat, and above all, the form it can take in one society, at any given time.

Risk as an externalization of danger and vulnerability.

Risk, in its technical acception has been defined as the product of hazard by vulnerability, and eludes the question of danger as substance upstream and the question of vulnerability downstream, to get back to its core, on which calculating thought can get a hold: the probabilistic expression. The question then is not to know whether the heart of a nuclear reactor and the plutonium it contains are a threat in themselves, nor to evaluate what would be affected if it came to "externalize", but to find a shield behind the idea that the occurence that such an event can happen one day is null. A probability is deemed null when it is inferior to one chance in a million and that is the reason why the Basic Nuclear Installations scattering the national territory have not been elaborated to resist to a commercial plane crashing into them, since they have not been built beneath air corridors. It makes sense. So it could be said that a risk that has been calculated from a technical standpoint cannot think, or have a concrete vision of real situations imagined by science-fiction authors when they are staging a catastrophe. When the people who manage risks try to do so, staging large-scale simulations", it is a ridiculous show that equals their shrinkening moral conscience and the ability to perceive.

When" risk" is experienced from the standpoint of real people, which is shown through socio-anthropological investigations, it represents a radically different reality, yet bearing the same name; for example, when a mother wonders if she can feed her children with home-grown vegetables, or with shellfish harvested near the nuclear fuel reprocessing plant in La Hague. Even if the producer explains to her, on expensive glossy information leaflets, that there are indeed traces of radioactive tritium in the stream next to her house, but that it doesn't cause " any harm to her health"; or if the health authorities send her a colorful brochure full of charts showing the rates of contamination in the environment measured in Sievert becquerels… a "becquerelle" will remain, in the minds of the people native of the Nord-Cotentin, a young goat. It doesn't mean that the citizens –even if they are "non-specialists" of technical risks, are unable to understand the calculated expression of the estimated rates of contaminations in the environment; it is within anybody's reach to be able to read, understand and interpret a data sheet, in the same way we can try to know if in the results of our medical check-up, the numbers are good or not permissible values. But an ordinary citizen can find it very difficult –like all the other specialists of radiologic and industrial risks! –to put the quantified data into perspective in the lifeworld: no single man is able to predict the health consequences –just to mention those- of a "small" contamination linked to such and such substance,

insofar as the effects of contamination are, as will be shown, associated, potentiated, and postponed in time.

Risk, which has been defined as the operating concept of the "risk society", has a double meaning: a simple occurrence for experts, it also shows a social acceptation which belongs to a different way of thinking, the meditating thought, raising the issue of the meaning of the word "sens", in French (both meaning and direction). Risk as a social construction, far from trying to establish the significant risk of the occurrence of an event, beyond all considerations about the nature and consequences of such an event, tries to answer both questions: where are we going? Which way are we choosing? The social construction of risk deals with the missing dimensions of the concept of risk: danger on one side (what is threatening us?) and vulnerability on the other (what could be affected? What might we be in danger of losing for good?).

Externalization of danger: the example of Fukushima.

Raising questions about what we are doing should be the main origin of our interrogations after, or rather while Japanese employees and technicians are in all likelihood sacrificing their lives to regain control of the technical monsters they have created themselves. Is it possible to imagine that the most rationalized systems –like our advanced technician societies, Japan being a Paragon of the kind- have ignored to that extent the systemic dimension of technical risk (associated here with seismic hazard)? Such a situation had already happened in France, when the Blayé Nuclear Plant in the Bordeaux region, came to be in critical position after the combined effects of the storm of 2000 (the dams broke), and strong tides. It is also well-known that the French nuclear plants are vulnerable during heat-waves.

The sad lesson learned in Fukushima will be, once again to show the limits of the notion of risk as the computational approach of what is threatening us. Catastrophe, as both occurrence and experience is hard to pinpoint in models of theories and numbers. Opening new imaginaries of vulnerability, regaining our ability to imagine, and to imagine the worst is an emergency. The answer will probably come from civil society, from citizens (and scientists behaving like citizens) being careful and having some common sense when facing the excessiveness shown by technical systems and liberal economies. It raises a question, a political one, its true nature: i.e. the technological choices and the disastrous effects they contain. Let us remember that the choice of the nuclear power was originally made by powerful states to secure their political domination, and not by societies to be comfortable when producing energy. Since then, it has always been the story of a double confinement, both of the atom and of the information. When the first one is leaking, the second is never far from doing the same. So the catastrophic situations of crises we are going through, "moment of judgment" in Greek, of revelation- both reveal and analyze the nature of technological and political stakes. But are people living in rich societies ready to accept its counterpart, that is to say, not the risk of hypothetical accident, but its inevitable occurrence, one day or another. The accident in Fukushima, was, in that sense, predictable because it belonged to the initial project itself, it belongs to it. This is what Sociologist Paul Virilio calls the integral accident "The innovation of the ship already meant the invention of the shipwreck. Inventing the steam engine, the locomotive, also meant the derailment, the train crash. Planes also invent the air disaster. The same goes with the automobile and the high-

speed crash, with electricity and electrocution, with, of course with major technological risks resulting from the development of chemical industries, or nuclear ones… any era with a technological evolution brings, along with its various instruments, machines, specific accidents, which reveal in a "negative" way, the development of scientific thought.

So, to make the choice of the nuclear, a choice which no informed society can make after Chernobyl, means that there is a possibility of an accident happening and having long-term consequences. This idea has been summed up by Hannah Arendt's definition: 'Progress and catastrophe are the obverse and reverse sides of the same coin'. Needless to say, the increasing lifespan of nuclear plants, the precarious working conditions of staff (cf. the writings of Annie Thébaud-Mony on the temporary workers on nuclear plants are the objective components leading to an extreme vulnerability of nuclearized states… and even of the entire mankind.

Risk as the externalization of vulnerability: the lessons of Chernobyl.

The prospect of a long-term survival in a contaminated area, which came after 1986, leads us to make an essential difference between irradiation and contamination, that is to say between the present time and a long time. Yet, what is being said about the accident in Japan today is focusing -with due cause- on the irradiation caused by the radiation leaks of fission products. The problem is that we also have to take into account – just like the Ukrainian experience has taught us- the deleterious effects of small doses of particles of dust inhaled, present in food products, which later attach themselves into our bodies and have consequences many years later. The words "small doses" have, according to many scientists, become something of a misnomer: even a tiny dose has an effect, as the new toxicology teaches us, sometimes even an effect stronger than bigger doses (for example in the case of lead). When we talk about the radiotoxic products coming from nuclear plants (such as Cesium 137, Strontium 90, etc.), it can be said that their toxicity is phenomenal. As a consequence of this, none of the 3 million children out of the 8 million people living in the territories officially contaminated by Chernobyl is considered by the WHO as healthy: as we have seen before, all of them suffer from various pathologies linked to the weakening of their immune system. The problem is that, in order to evaluate the Japanese situation, no true expertise of the health consequences of Chernobyl has ever been carried out: it has even been impeded, at all costs, by the IAEA and the WHO, which its subservient: both are sworn to secrecy on all nuclear issues. The nuclearized states were in no hurry to know the truth, and we have had to make do with the "theory of the 32 dead" for many years. Even today there is no comprehensive study to give conclusions on the massive consequences of the accident on the populations within the last 25 years, these consequences being caused by many factors and delayed.

Beyond the political dimension underlying the organization of this silence, that is to say the veil of secrecy over the true vulnerability of the states and populations suffering from long-term –even eternal effects of a nuclear disaster, trying to understand the meaning of such a disaster with tools taken from the analysis of risks seems to be an illusion. After Chernobyl the question is not to know if such or such an event could happen anymore, but rather to accept a process that has started in 1986 which will determine the nature of the (new) world in which Chernobylians are condemned to live

with no possibility of escape. The difference between risk and disaster, is, from this point of view, that the first one still allows an open future with the introduction of the possibility of a deadly event happening, and the second one represents the temporality of the future in question. If, according to the expression of Isabelle Stengers, we live in the time of catastrophes, as if confronted to a new negative determinism, the notion risk as the assessable expression of something that cannot be determined does not make sense any more. What Chernobyilians can teach us, in that perspective, is that there is no way to "decontaminate" an entire territory, either urban or rural. Soviet authorities, even with huge human and equipment forces, have failed to achieve that. So there is no way life can go back to normal, there is no way back to what life before the accident was. Even if outlining a before and after also belongs to the very definition of the word catastrophe, the nuclear catastrophe is, contrary to natural disasters or even modern wars which for a possible reconstruction, a catastrophe with no After. It is an non-event, rather a never-ending event, an ongoing, daily process which devours biological life, like a "growing tree", as the inhabitants of what has become the "zone" used to say. Since the effects of lasting contamination extend on the living, and with the living (mutagenesis, carcinogenesis, inter-generational transmission), we can say that they colonize the future and offer no way to escape from a tragic future: no culture, not even a Buddhist one, is ready to face that challenge. Chernobyl has taught us that the only way to survive in a contaminated zone is to deny the risk, but at such a high cost, because no other choice is possible, there is no alternative, including no way to escape.

Logically, the last lesson of Chernobyl forces us to question our actions, according to what G.Anders and H.Arendt liked to say, something the concept of assessable prevents us from doing, avoiding the issue of responsibility. So, 23 years ago, the explosion of Reactor N°4 in the Lenin plant –which was destined to become the largest electricity-generating plant in the world – occurred in circumstances we seem to often ignore. This accident, by far, didn't happen by chance, the Chernobyl disaster was the result of a true system test on the reactor: to see how, in the case of an emergency shutdown, the residual heat release could be used to produce more energy. When the test started, there was a rupture of the reactor vessel, causing a brutal and huge drop of power in the reactor, leading to a series of operations which were hard to control, and a series of blasts. It exposed the graphite moderator of the reactor to the air, causing it to ignite tens of thousands of tons of ultra-radioactive graphite sending a plume of radioactive smoke fallout in the entire Northern Hemisphere.

But more serious things happened, and most European populations are mostly oblivious of them, even the ones directly involved. Professor V.Nesterenko, from the National Academy of Sciences of Belarus, who was directly involved himself in the liquidation of the disaster's consequences once said: "it is my belief that we came very close to a nuclear explosion in Chernobyl. Had it happened, Europe wold have become uninhabitable." Indeed, according to his estimations, along with his collaborators from the Department of Physics of Reactors from the Nuclear Energy Institute at the National Academy of Sciences of Belarus, 1,300 to 1,400 kilograms of the mixture uranium + graphite + water constituted a critical mass which could have triggered an explosion, an atomic one this time, with a power of 3 to 5 megatons, 50 to 80 times more powerful than the explosion in Hiroshima. All it would have taken was the mass of the melting reactor to go through the concrete slab on which it stood, and reach the cement chambers filled with water, and all the conditions for an atomic explosion would have been created. Such a powerful explosion would have created irreversible radiation injuries on the inhabitants living a 300-km radius – including the cities of Minsk and Kiev,

both capitals-, the whole of Europe would have been the victim of a radioactive contamination which would have prevented all normal life. As an example, the consequences of a 1-megaton explosion can lead to a 90%-mortality rate within a 100-km radius. Why would it be forbidden to think that the situation in Japan could lead to the same thing possibly happening, especially since massive doses of water were injected inside the reactors to cool them off. “It is such a huge disaster”, G.Anders once wrote, “that it sets us free from our fears, like the huge enterprises we take part in liberate us from our responsibilities.” (Anders, 2007)

All things considered, there are two dimensions of the process of making decisions about major risks: the first is a political one, the second, systemic and technical. The first can be regulated by democratic groups, and can question the foundations of our political regimes. Is “technical democracy” appearing on the ruins of the former ways of regulating former risks, as Ulrich Beck thinks? Or, on the contrary, are we the witnesses of the continuing, even increasing process of the technique becoming autonomous, impossible to control, another sign of which could be the recent global financial crisis? If the political dimension of technical risks (that is to say industrial, financial, health hazards…) relies on the visible ability of civil societies in the North and the South to answer these questions; the second one relies on our ability to resist the temptation to leave our destinies in the hands of technique by replacing Man by a machine, a watchman by a computer, and risk by danger and vulnerability. Both are closely linked, and cannot be separated in our thoughts when we try to construct new ethics for technoscientific societies. Decisions taken by collective groups that have never been so huge (World government, G20, Europe), or by individuals through the interaction and addition of billions of local actions, have effects world-wide, and now involve the very survival of the human species. If since 1945 we have become, a species on borrowed time, as Anders thought, the question is to know how to postpone indefinitely our end. The catastrophist approach, qualitative and complex, developed by philosophers and socio-anthropologists reacting against the concept of abstract, ahistorical, and purely statistical risk , tends to lead us away from our responsibilities, and should be repossessed by people in charge of the management or production of new risks or… catastrophes might happen. To do so, a new approach and a close reading of Günther Anders’s works seems to be a good start to broaden our atrophied faculties and our moral conscience.