

INCIDENT, ACCIDENT, CATASTROPHE
AND CATACLYSM
Practice and Policy.

by Patrick LAGADEC

D201 0479
April 1979

INTRODUCTION

Major industrial hazard constitutes a new challenge. From my research on risk analysis I believe that in addition to the phenomena already well known — incident, accident, catastrophe — a fourth category should be taken into account : the cataclysm. Potential industrial disasters equal natural calamities in severity. There is already a language and a preoccupation with this reality. I have presented them in a simple table divided into three parts :

I : in face of disasters, the immediate reactions ;

II : prevention ;

III : risk and development.

The aim of the article is to clarify the present debate. This is necessary if we want to meet the real challenge of how to set up overall policy which takes major risks into account in development choices.

I - IMMEDIATE REACTION TO EVENT	INCIDENT	ACCIDENT
1. Consequences	<ul style="list-style-type: none"> - Slight injuries - Small damage 	<ul style="list-style-type: none"> - Serious injuries ; deaths - Important damage
2. Reactions	<ul style="list-style-type: none"> - First aid - Repairs 	<ul style="list-style-type: none"> - Hospital - Insurance - Claim for damage
3. Level of responsibility	<ul style="list-style-type: none"> - Foreman 	<ul style="list-style-type: none"> - Management
4. Examples	<ul style="list-style-type: none"> - Countless 	<ul style="list-style-type: none"> - Many - More than 2 000 fatal accidents per year in U.K. or France
5. Industrial sectors concerned	<ul style="list-style-type: none"> - All 	<ul style="list-style-type: none"> - All
6. Contribution of scientific knowledge towards solution	<ul style="list-style-type: none"> - Immediate - Automatic - Routine application of scientific knowledge 	<ul style="list-style-type: none"> - Well organized - Specific diagnostic necessary for rehabilitation and followup

CATASTROPHE	CATACLYSM
<ul style="list-style-type: none"> - Many casualties (up to 1 000 as in the case of the crash of two Jumbo-Jets) - Massive destructions 	<ul style="list-style-type: none"> - Over 1 000 casualties - Large communities affected - Mutagenetic damage - Geo-ecological upheavals
<ul style="list-style-type: none"> - Regional and National Emergency Plans - State intervention and responsibility - Insurance - State (tax payers) covers a large part of the damage 	<ul style="list-style-type: none"> - National Emergency Plans powerless - Insurance covers : minimal - State covers : a part of the damage - Uncovered : a large part of the damage
<ul style="list-style-type: none"> - State ; government ; local authorities - Generally a coordinator is appointed 	<ul style="list-style-type: none"> - No one - State does everything it can but is no more competent faced with a cataclysm than a foreman faced with a catastrophe.
<ul style="list-style-type: none"> - Aberfan ; Summerland ; Feyzin ; Teneriffe 	<ul style="list-style-type: none"> - Seveso type ; potential consequences : evacuation of a big city for ten years or more. - Flixborough type : potential consequences : more than 10 000 casualties. - Amoco Cadiz type ; potential consequences : disruption of a vast eco-system and ruin of large coastal regions (such as the Riviera).
<ul style="list-style-type: none"> - Many 	<ul style="list-style-type: none"> - especially : Energy, Chemistry, Genetics...
<ul style="list-style-type: none"> - Difficult - Science cannot give on the spot answers to problems often not having been studied in terms of safety. 	<ul style="list-style-type: none"> - Minimal - Science is largely powerless ; except for a description, afterwards, of the reasons for its powerlessness.

I - IMMEDIATE REACTION TO EVENT (continued)	INCIDENT	ACCIDENT
7. Particular contribution of economic knowledge	<ul style="list-style-type: none"> - Immediate ; automatic - Business accounting - Social welfare 	<ul style="list-style-type: none"> - Important in making estimation - Social welfare
8. Contribution of the judicial process	<ul style="list-style-type: none"> - Rules well established 	<ul style="list-style-type: none"> - Procedures established to obtain compensation
9. Mass-media	<ul style="list-style-type: none"> - Does not mention 	<ul style="list-style-type: none"> - Brief articles
10. Reactions of the victims	<ul style="list-style-type: none"> - Annoyed 	<ul style="list-style-type: none"> - Angry
11. Victims' statements ; victims representatives' statements.	<ul style="list-style-type: none"> - Should be prevented 	<ul style="list-style-type: none"> - Serious study should be given to problems - Workers should be fully trained by management in all safety aspects of their work (9)

CATASTROPHE

CATAclysm

- Interesting in estimating quantitative aspects (a part of the damage).

- Reduced
- Useful in estimating a few aspects of the disaster.

- A large portion of the problem must be dealt outside of established legal process
- State intervention

- Justice only intervenes in a few aspects of the problem and with great delay (up to 10 years)

- Headlines
- Mass media may be influenced by authorities.

- Front pages
- Authorities have no control of the information.

- Demonstrations

- Possibility of riots

"No preventive measures were taken" (10)
 "We gave many unheeded warnings"
 "We demand fair compensation"
 "The people I represent can now sleep soundly. The plant is destroyed ; the damage has been done" (2)
 "I have heard it said that such a disaster could not happen, but it did" (3)
 "Although that was a major disaster it would be as nothing compared with the same type of event" in such and such place, circumstance... (4)

- Reactions not expressed by words :
 - . Violence
 - . Inhibition, obliviousness
 - . Lashback, unmanageable outburst of repressed anger
 - . Serious social unrest

I - IMMEDIATE REACTION TO EVENT (continued)	INCIDENT	ACCIDENT
12. Official statements	-	<p>"The most important single reason for accidents at work is apathy" (14)</p> <p>"Accidents do not happen, they are caused ; horse-play and tomfoolery, carelessness and thoughtlessness, lack of concentration, lack of respect for oneself and others, familiarity, drinking, fatigue, haste, working conditions, frustration, irritability and boredom" (15)</p>
13. Industrial statements	-	- Personal factors must be taken into account.
14. Banal reactions of general public (or so-called reactions of public).	<i>"That's life"</i>	<i>"Bad luck"</i>

CATASTROPHE

"All the (safety) measures were taken" (11)
 "There will be a fair compensation" (12)
 "Don't involve politics" (12)
 "There will be intervention and national solidarity" (12)
 "I must say nothing which will in anyway prejudge or prejudice the outcome of inquiries that are being established" (5)
 "I have no doubt that if the firm departed from the original planning permission this would have serious repercussions in terms of its public liability" (6)
 "Much has already been done to ensure the fullest cooperation between local authorities and the health and safety inspectorates on potentially hazardous plants" (7)
 "This must be the last accident"
 "Our overriding concern must be for the relatives of those who died and those who were grievously injured by this tragedy" (8)
 "At no point in the inquiry was there any evidence that the industry (or the firm) in particular was not conscious of its responsibilities relative to safety" (16)

"We will pay everything" (13)
 "Insurance will pay"
 "There were no deviations from normal practice in force or in other plants" (17)

"Fatality"
 "Someone is guilty"
 "We are all consumers"
 "Life is risky"

CATAclysm

"Let Nature take its course" (12)
 "This country has always proved it was able to face adversity"
 "Solidarity will enable us to continue our Progress, the development of our Civilization".

"Insurance will pay within the limits of the maximum ceiling"
 "This is an international problem"
 "We are unfairly attacked"
 "Consumers want this product"
 "We participate in the development of the nation "
 "There are major hazards. State must help industry".

- No standard reaction
 - Only resurgence of reactions to ancestral experience of natural disaster, calamity, scourge of God...
 - "Man must meet the challenge and take the responsibility for salvation of the human race".

II - PREVENTIVE ACTION	INCIDENT	ACCIDENT
1. Contribution of science in general	- Establishing laws	- Establishing regularities
2. Contribution of statistics and probability calculations in particular.	- Establishing laws	- Establishing regularities - Figure of reference : 10^{-4}
3. Objects of intellectual analysis	- Elementary factors	- Elementary factors ; simple systems.
4. Safety measures that would be necessary	- Routine precautions	- Specific safety measures

CATASTROPHE

CATACLYSM

- Gives indications of possible risks based on study of functioning systems.

- Indicate general directions of thinking about the functioning of systems interacting.

- Can establish general tendencies
- Figure of reference (so called 'acceptable risk'): 10^{-6}

- May contribute to thinking about the problem
- There is no "acceptable" probability. Other factors must intervene in evaluating the situation.
- An official view : *"This (10^{-4}) might perhaps be regarded as just on the borderline of acceptability". (18)*

- Complex systems

- The underlying logic of highly complex systems interacting.

- Safety measures of exceptional quality in normal routine
- Study of abnormal functioning
- Detection of poor strategies implemented.

- PERFECT safety measures in routine functioning (absolutely necessary ; not just a luxury ; not to be proud of them).
- Constant research for potential failures and for poor policies implemented.
- Total REFUSAL of the common *"we can't turn back now"* policy.

III - RISK AND DEVELOPMENT	INCIDENT	ACCIDENT
1. Hazard and planning	- The planner will verify the efficiency of routine safety measures.	- The planner will verify that safety is taken into account in the development of systems implemented.
2. Risk and public administration ; basic approaches	- Codes of practice	- Regulations and standards. - Large bodies responsible for the question
3. Common references to so called "public opinion"	<i>"Caution is necessary"</i>	<i>"Things can always go wrong"</i>

CATASTROPHE

- The planner will study specific means of preventing and eventually remedying catastrophes.
- He will make sure that policies implemented and risk taken can be socially justified.

- Statutory regulations and laws ; licences.
- Specific bodies responsible for the question.
- Current problem : the present economic crisis makes it more difficult to enforce strict industrial control (environmental standards, industrial major hazards and health and safety at work, taken together).
- This crisis could in some contries transform the most competent agencies of hazard control into mere agencies of industrial expansion. What will be the longterm effect of this situation ?

- *"Life is dangerous"*
- *"There are economic imperatives".*

CATAclysm

- The planner will carefully study the basic strategies, the policies implemented or in practice and which may brutally or by degrees disrupt the industrial, ecological and socio-economic environment in the future.

- Statutory requirements
- Highly specialized bodies
- Potential conflict between necessary competence and independence of these bodies
- Constant conflict between safety and the other economic and social objectives, often called "imperatives".
- *"Planning is alternative thinking" (20) but it appears that decision makers generally do all they can to narrow the choices. A large margin of choice is frightening. Necessity which has been dominant untill now is often preferred because the challenge of assessing risk is thus eliminated. It is easier to say "we must" than to ask : "what ? why ? when ; where ? for whom ?", etc...*

- *"You can't fight Progress"*
- *"It would be a crime against mankind to abandon these techniques, these policies..."*
- *"Man always conquers adversity"*
- *"Necessity is the mother of invention"*
- *"Were there is a will there is a way"*
- *"The population has always accepted the cost of Progress".*

III - RISK AND DEVELOPMENT (continued)	INCIDENT	ACCIDENT
4. Decision making and social justification	- Decentralized	- Joint consultation on safety measures.

CATASTROPHE

- Sometimes, discussion with established political and social representatives
- . on the means of avoiding catastrophes
- . on the necessity of already implemented projects.

CATACLYSM

TWO PERSPECTIVES

- 1) A social choice must be made and the option must be justifiable because the outcome is crucial.
 - . "Some of the questions which consideration of major hazards poses should not be answered by committees of experts alone" (19)
 - . "The organizations of employers and workpeople, the professional bodies, the local authorities and so on must be fully involved(...) this calls for a greater degree of real participation in the process of decision making at all levels" (21)
 - . "What is needed is participation in the actual making of decisions both at technical level (...) and also in the overall management of the system, at the level where policy is determined" (22)
 - . "The community may therefore have to decide what level of risk it is prepared to accept in order to obtain benefits of any particular activity" (23)
 - . "The regulation of risk would then become a question of those people involved with it and not an abstraction and often interminable discussion on sterile committees" (24)

This implies serious efforts toward information, education, debate...

Since debate by elected representatives is not sufficient how can a larger audience participate in debates which will call into play passions, vested interests and generally restricted analysis and incompetence ?

- . "The process of risk regulation does not guarantee "right" decisions, only decisions made openly in a credible manner that assure all interested parties an opportunity to present their views and all issues fair consideration" (26)

- 2) The difficulties involved in "democratic process" and especially in thus arriving at adequate technical choices, in addition to arousing public anxiety, make necessary the setting up of committee of experts to reach the best decisions.

In order to be in accordance with the need of democratic process these experts should be sworn to impartiality. They will be not only experts but also judges.

CONCLUSION : three views and a question.

1) "What risk should we run"

"If I say that the risk from lightning, the transport of chemicals, or rock climbing is small and should be ignored, while you say it is high and demands immediate attention, discussion between us is difficult. If, however, there is an agreed scale for measuring risk, a dialogue become possible. We thus have a basis for assessing risks to the public at large from industrial activity" (27)

2) "Acceptability versus democracy"

"The concept of "acceptable" risk has become so dominant in recent safety thinking that is no longer questioned. If as Kletz (who expresses current thinking) contends, it is possible to determine what level of risk is accepted by society in general, is there any reason why this level should not be the criterion by which any risk can be scientifically declared "acceptable" ? We believe that, in practice, it is extremely difficult to quantify risks in the way this approach demands, and, more crucially, that it is impossible to compare risks of different types, undertaken for different reasons in different social circumstances (...) comparing risks in broad areas of hazard as a guide to policy is like comparing apples and oranges. Such a process may reveal that, statistically, apples weigh more than oranges but it is no help in finding out which fruit people prefer. In fact, there is no quantitative, scientific methodology that will substitute for political acumen in reaching decisions about the allocation of resources for the regulation of risks" (25)

3) "Virtue in compromise"

"...there are three classes of risk : "injustifiable" when the risk is too high to be accepted whatever the benefit ; "justifiable but not justified" when the benefits are too small to tip the scales ; and "justified" when the risk is worth accepting because of its associated

benefits (...) Absolute safety is not an available option. Society does not and should not value safety above all else. "Safety First" is a good slogan but a poor policy. Perhaps the greatest contribution we can all make to the continuing debate is to agree that, in the details if not on principles, there is "virtue in compromise" (28)

A QUESTION : The basic challenge

Thus, the questions debated now are : What is an "acceptable risk" ? How is this decided ? By what process shall decisions be made and implemented ? We are given recipes, admonishments, well intend advice ; but is this sufficient ? The most important challenge is elsewhere : we don't have a well defined policy on this matter of risk taking — i.e. a clear view on the ends and the means of our industrial societies and of the risks which they are prepared to take in order to assure their reproduction. In advanced industrial societies this issue of defining global policy arises in every economic sector. However most often the underlying issue is glossed over because of its difficulty. And this difficulty is increased when considering risk because the eventuality is frightening and this makes it easier to ignore the problem.

We must seriously tackle the difficulty of thinking clearly about industrial risk rather than simply rely on all traditional recipe and "common sense". We hope this paper has pointed out the work to be done in dealing with this necessity of going, at last!, to this policy problem. We are in the infancy of risk policy. It is high time to tackle seriously the problem : the basic challenge of defining a policy.

REFERENCES

- 1) Patrick LAGADEC : La prise en compte des grands risques dans les sociétés industrielles considérées comme avancées. Ecole Polytechnique, Paris, décembre 1978.
- 2) John ELLIS (Brigg and Sunthorpe) : Parliamentary debates. Vol. 875, n° 56. Tuesday 18th June 1974, p. 255. HMSO.
- 3) John ELLIS : idem, p. 267
- 4) Lewis CARTER-JONES (Ecdes.) : idem, p. 268
- 5) Harold WALKER (The Under-Secretary of State for Employment) : idem, p. 269.
- 6) William BAXTER (West Stirlingshire) : idem, p. 267.
- 7) Harold WALKER : idem, p. 270.
- 8) Harold WALKER : idem, p. 273.
- 9) John GRAYSON and Charlie GODDARD : Industrial safety and trade union movement. Studies for trade unionists. Vol. 1, n° 4. 19th Edition, december 1975, p. 13.
- 10) A local representative to the French Prime Minister at Landeda (Brittany). 18 mars 1978 (Amoco-Cadiz Catastrophe).
- 11) Raymond BARRE's answer (Landeda - Brittany - 18 mars 1978).
- 12) Amoco-Cadiz and Seveso cases.
- 13) HOFFMAN LA ROCHE : Seveso case.
- 14) Lord ROBENS : Safety and Health at Work. Report of the Committee. London. HMSO. Cmnd 5034, 1972 (§ 13).
- 15) Royal Society for Prevention of Accident quoted by Patrick KINNERSLY : The Hazards of Work. How to fight them. Pluto Press. London 1973 (p.197).
- 16) The Flixborough Disaster. Report of the Court of Inquiry. Department of Employment. London. HMSO. 1975 (§ 201)
- 17) The Flixborough Disaster : idem (§ 204)

- 18) Health and Safety Commission. Advisory Committee on Major Hazards. First Report. HMSO. 1976, p. 12 (§ 19).
- 19) Advisory Committee on Major Hazards. First Report, idem, p. 9-10.
- 20) after KALECKI.
- 21) Lord ROBENS, op.cit., p. 36 (§ 114).
- 22) Lord ROBENS, idem, p. 37 (§ 117).
- 23) Department of Employment, Safety and Health at Work, Selected Evidence Report of the Robens Committee. Vol. 2, London. HMSO. 1972, p.315, §13b.
- 24) Lawrence GINTY and Gordon ATHERLEY : Acceptability versus democracy. New Scientist : The Risk Equations, p. 8.
- 25) Acceptability versus democracy : idem, p. 6, 7, 8.
- 26) William D. ROWE. Governmental regulation of societal risks. The George Washington Law Review. Vol. 45, n° 5. August 1977, p. 968.
- 27) Trevor KLETZ : What risks should we run ? New Scientist, 12 May 1977, p. 320, 321 or The Risk Equations, p. 3, 4.
- 28) John DUNSTER : Virtue in compromise. New Scientist publication : The Risk Equations, p. 14.