Science of language to improve risk communication

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1. *SAFETY* / *RISK* : semantic proximity and philosophical background
2. Risk corpus : authentity, diversity, multilinguality as model validation
3. Risk language : from complexity to interaction by terminological collocations

Starting with the assumption of risk management as a complex interaction of human and technical elements, the following demonstration will focus on risk communication, the quality of which increases thanks to theories, methods and applications of science of language and information science. « Risk science » (Covello/Manpower 1985) must combine the objective quantifying and solution-bringing hard science with the subjective qualifying and problem-anticipating human science, this subjective, emotional survalue, « human factors » transforming the objective rational *risk evaluation* into the generic *risk assessment*. This unifying interdisciplinarity is not only the main subject of the present symposium « Systems and Human science », but also constitutes the guideline for MULTH, a multilingual risk glossary in hypertext conceived as a contribution to knowledge, awareness and services of risk, supported by the EU-Commission within its 6th Research Framework for WIN since September 2004, in preparation since 2003.

1. *SAFETY* / *RISK* : semantic proximity and philosophical background

In addition to the general issues just mentioned that MULTH shares with SSR 2006, there is the specific topic itself. Far from opposition and polarity *safety* alias *risk* are in a complementary antonymic relation closer to *father* and *mother* than to *war* and *peace*. So, in technical definitions, SAFETY becomes the distinctive feature for the *acceptability of risk*, *risque acceptable*:

- « willingness to live with a risk in order to secure certain benefits (TESEC-EUR-OPA) »

- « un risque est acceptable en référence à un objectif de securité donné (ASR) ».

At the University of Zürich (ETH), an important research project was devoted to *safety* and *risk* in the middle eighties, subject also of a symposium held at the University of St. Gallen in 1986 and published under the same title and at the same time by the Swiss Fire Insurance. In 2001, the unit Major Hazard Agreements at the Council of Europe devoted an expert meeting to *environmental safety / sécurité environnementale*. These works analyse both phenomena in the fields of natural and social sciences (economy and politics) referring to concepts and categories such as « responsability, authority, freedom ».

Risk and *safety* themselves are abstract nouns implementing not only the assertion of existence, the « *disaster event* », but modalities of existence, so the « uncertainty and probability of disaster » for *risk*, the « avoidance of disaster » for *precaution, prevention* and *safety*. The constant reference to an entity the existence of which is not wanted, reminds one of Platonist problematics, but Enlightenment changed Greek and scholastic views, and *risk management* became the technical and pragmatic conversion of the « probability of the existence of a disaster » into its « non-existence ».

So risk science benefits from being efficiently supported by the theories of the abstract and non-existent object that developed within philosophy of language and which generated ontology in the 19th century Central Europe (Circle of Vienna, Slovenia, Poland) and in North America (Kampits 1980). Ontology has developed from opposition to, to integration into metaphysics. Sistology (Sylvan 1987), the theory of the non-existing and the impossible explores the multiple qualities of ontologically neutral objects, develops an ontologically neutral logic and enables semantics to study all possible and pure objects (Greciano 1989). Multiple referential, i.e. existential relations cover actual objects (risk events and responses) by « denotation », the fictive ones (risk simulations, trainings) by « exemplification ». Goodman (1981) shows that fiction and non fiction have the same force to create real worlds ; fiction meaning moves into « factual fiction ».

Risk is also characterized by « uncertainty », another standard feature and major issue of SSR 2006, that mobilises probabilistic thinking and modelling. that give the chance to *avoid disaster* and to *assure prevention.* *Risk* is directly concerned by ontology as the existent (the disaster event) and the non existent (the prevented disaster) and by the conceptual classifications, a main topic of MULTH, that prevail nowadays in the informatical acceptation of ontology :

- « En informatique, le terme ontologie, dénomme un "système de classification". On doit comprendre par là que l'ontologie s'apparente à la famille des outils qui structurent les concepts, parmi eux : taxinomie/taxonomie, thésaurus. Une ontologie décrit de manière générique les connaissances propres à un domaine donné et offre de celui-ci une compréhension consensuelle. » (www.teledetection.fr/index.php?option=com_glossary&Itemid=214&lang=fr)

The linguistic turn of this same philosophical current in the second half of the 19th century is very important to catch the language of *risk* and *safety*. At that time, ontologists paid special attention to natural language, focussing on reference, semantics and semiotics : Frege (reference vs sens), Meinong (perception), Quine (ontological assumption), Peirce (typology of signs as index, icon and symbol) and Carnap (analyticity). They all have greatly contributed to this new conception considering language as a generator of existence and modalities of existence, particularily necessary to the formation and specification of concepts; therefore their interest in linguistic markers of nomination (words), identification (determiners), concept categories (word classes), relations and family ressemblance (hypero- and hyponymes, syno- and antonymes), in the specification of concepts (definitions) and in the conceptual identification of the participating entities of states, processes and actions (semantic roles as actors, victims, sources, finalities …). Peirce is particularily convincing : as co-editor of the American Century Dictionary, he wrote more than 16.000 definitions. Objects are considered as release of empirical knowledge a posteriori, of rational knowledge a priori, tending towards systems, empirical knowledge and human factors as well.

Following these movements, language becomes more important than reality, and ontological categories are transferred to conceptual structures defined by linguistic and cognitive constraints ; experience, theories and language are necessary for the conceptual reconstruction of knowledge representation ; conceptualization becomes the final and common dimension for categories and relations of grammar, syntax, semantics and pragmatics ; ontology has become the semantics of possible worlds (Hintikka) ; nowadays, ontology has moved from philosophy to science of language, to information science and data science ; « modalities of existence », more than « existence » are particularily welcome for RISK : *disaster* as object, *safety* as objective, *chance, catastrophy* as evaluations, *protection* as obligation and desire, to conclude with Meinong's higher order objects in conceptual relation with each other that the onomasiologic macrostructure of MULTH glossary respects.

2. Risk corpus: authenticity, diversity, multilinguality as model validation

The theories of pragmatics convinced linguists of the efficiency of authentic corpus. Empirical methods moved away from artificially fabricated sentences and focussed on genuin idiosyncratic language in order to improve communication and to validate linguistic analysis based on lexical semantics, case grammar and speach acts by the speakers'use. Linguists are far from being surprised that specialists of law (National transportation safety board) and physics (Rubise, Gautier 1995, 39 and 81) attribute accidents and major hazards to communication problems, f.e.,

- The great fire of the ferry *Scandinavian Star* in 1990 : language difference between mechanics, board officiers and passengers was made responsible for the tragic event;
- The Boeing crash in Teneriffa where the confusion, if not mistranslation, of instructions « *vous pouvez vous aligner* » misunderstood as « *vous pouvez décoller* » caused the passengers' death.

For reasons of pertinence and univocity, MULTH extracts multilingual terms semi-automatically out of texts of special risk purpose and offers corresponding multilingual

referenced definitions out of technical glossaries and dictionaries. As far as risk texts are concerned, balance could be kept within the three languages concerned, thanks to bi-text method (Hartmann 1994) :

- parallel texts : same subject, same function, same tendencies allowed to find text equivalences in several languages . Scientific risk literature is present in the three linguistic communities concerned ;
- paired texts : in absence of parallel texts, couple of texts created by translation reveal the concordancies. From this point of view, legal risk texts, especially of the EU are an interesting source to detect correspondences above all between English and French.

Multilinguality being of great topicality, difficulties arise from the predominance of publications in English that lead to a differenciated terminology that French integrates by borrowing (*précaution, prévention, dégradation environnementale*) and German expresses by genuine word formations (*Vorsorge, Vorbeugung, Umweltschutz*). Existing dictionaries illustrate the following situation : most international institutional risk glossaries (OECD-ISDR, Geneva 2001) are monolingually English ; national institutions, universities and research centers create them in their own national language (SKKK, Köln 2003) and sometimes join the English equivalent (CEDIM, Karlsruhe 2005). Mono-lingual dictionaries combine terms with their definitions (TESEC-EUROPA Strasbourg/Tchernobyl, 2001) ; bi-lingual dictionaries offer only terminological correspondences without definitions (BfG, Hydrologie).

Risk management is of extreme topicality, especially in France, where the Conseil d'État devoted its public report 2005 to « The responsability and socialisation of risk » and where risk is in 2006 one of the subjects at the highest selective examination for admission to teaching posts (concours CAPES, agrégation) in geography. Risk management requires a harmonized communication between experts, decision-makers and citizens for the greatest possible number of linguistic communities. This means natural discourse diversity from science to institutions and administration, to press dissemination ; several text-types are concerned : articles, laws, institutional statements

and recommendations, practical instructions. This also means natural language diversity , which is nowadays required as well by France (Paris conference in October 2005) not only as a distinctive feature of European identity, but also to encourage international professional life. Since November 22th, 2005 the Commission of the European Union has been officially supporting this multilingual challenge by new strategies and actions for learning and training, reminding us that the responsibility for initial language formation rests on the member states themselves. So far as language of special purpose and terminology are concerned, national commissions are responsible for their development and dissemination. MULTH moves exactly in this direction, working on risk terminology and risk expressions for English, French and German and proposing the enlargement for all possible languages of the European continent, because risk implies transbondary and risk language phenomena imply risk culture. Coming back to the two trends : the objective quantifying and the subjective qualifying, French risk research reminds one of the first, German of the second. This observation is in accordance with the results of intercultural comparisons in language, literature and mentalities between these two countries.

3. Risk language : from linguistic complexity to practical interaction by terminological collocations.

Risk thematics confirms complexity, one of our common main topics of SSR 2006, coming from the interdisciplinarity between natural and human sciences, from the interaction of high technology and every day life, so that risk language becomes the meeting point where technical terms, objects and methods and ordinary words combine. With reference to Habermas (1985), combinatorics / connectivity / connexionisme reveal themselves as the key categories for risk language and risk metalanguage ; they proceed by contiguity of terms forming compounds, word groups and expressions, by disciplines interacting in risk assessment ; this fusion promotes cognition more efficiently than antitheses and digression and becomes the guarantee for the progress of knowledge.

Phraseological terms (Arntz/Picht 1991)/terminological collocations (Mel'cuk 1996) are more word terms, idiomatic combi-terms, already examined in economics, medecin and law ; they result from lexical contiguity and combinatorics. First comparisons show a higher frequency of this phenomenon in risk language than in scientific languages in general, estimated by Goffin (1992) at 80%. So the basic terms such as *emergency, hazard, risk* become the head of many collocates that revolve around like satellites (cf. Annex 1). Risk. heads represent naturally the events, their members express processes, actions, states, localizations and properties ; they specify, identify and determine the head. In spite of word class differences, these members quantify, qualify, and share a predicative function. Lingual combinatorics contributes to the conceptualisation of the key terms by perspectivation, more and more precise information due to increased knowledge, and their lexicalisation confirms acceptance by the expert and the common speaker communities. These compound terms are normalized and have a rigid form. Their fixity is a constraint for the use and the acquisition of language of special purpose ; lexical substitutions and insertions are nearly impossible, and only limited grammatical variations and syntactic transformations are allowed, but the fixity of these collocations makes technical communication precise and economic. For these reasons phraseology of language of special purpose is at the moment the main challenge for terminography.

Crosslingual comparisons are of particular interest (cf. Annex 2). MULTH works on English, French and German risk collocations. This corpus confirms the observations made in the other technical domains : in the head function of English and French collocations we find terms which are or are becoming general and common, in German collocations, the head and collocate members conserve their technical origine : *Risikokzeptanz, Katastrophenmanagement*. Another comparative explanation concerns the members' syntactic form and distribution that behave very systematically according to the rules of each language : word groups and phrases due to separate graphics in English and French : *risk analysis / analyse du risque, climate change / changement de climat,* word formations, especially compounds due to continuous graphics in German : *Risikoanalysen , Klimaveränderung*.

In the three languages examined, risk vocabulary is less metaphoric than medecal and economical terms. But crosslingual differences strike on the lexical level where the explanation is historical as well as cultural, and refers to national mentalities. So the multilingual index version (cf. annex 2) reveals the following concordances :
Emergency / urgence / Not(fall),- (hilfe) for the basic terms, but
Emergency management / gestion de catastrophe / Katastrophenmanagement for the noun phrases, whereas *catastrophe / Katastrophe* represent the equivalent of *disaster*. If *risk /risque / Risiko* is unproblematic, *hazard,* very idiomatic in English for all noun collocators, corresponds very systematically to *Gefahr* in German, to *danger* and *risque* in French. *Vulnerability / vulnérabilité* and *vulnerability analysis / analyse de vulnérabilité*, are totally equivalent in English and French, they correspond to word formations in German *Anfälligkeit*, a derivation and *Verträglichkeitsbewertung*, a compound. In more word terms lexical equivalents behave differently than in mono-lexems; for technical writing and translation, they cannot be spontanously invented, they have to be memorized and thesaurized.

Complexity of risk terms is furthermore provided by the risk inherent « uncertainty » alias « probability », already mentioned, which contravene logical hierarchies and causality relations and open interpretation margins between the important number of risk related terms as *hazard, danger, disaster, emergency, crisis…* in fussy conceptual networks with *risk*, that make definitions unavoidable. According to Pawlowski (1985, 233-243), family ressemblance with and between the related terms is particularly important for concepts close to human sciences, where they function as partial definitions. Intra- and interlingually, related terms compensate for and complete semantic description. MULTH glossary attaches great importance to formally and semantically correct definitions, necessary to resolve ambiguity and reduce vagueness, coming from scientific and institutional authorities, able to explain and to regulate.

« Uncertainty » seen as epistemic, « probability » as plausible, lead necessarily to decisions and actions. These semantic considerations on *risk* alias *safety*, common to SSR 2006 and MULTH, are essential, because they lead from logic to pragmatics. Therefore,

it is hardly surprising that Habermas (1985), should infer from these notions' distinctive features individual and collective behaviour : starting from the « epistemic uncertainty », characteristic of *risk* (Bonß 1995), he follows the « civil and public duty » for *safety*, that leads to the « necessary decisions » in politics. *Awareness* and *management of risk* exemplify convincingly the necessary symbiosis, i.e. interaction presupposing the contiguity of serveral domains. So in the 20th century, science of risk developed interdisciplinarily, moving from philosophy of language to natural and social sciences (Bachfischer 1978, Luhmann 1991), particularly medecine (Meier-Dallach 1996), economics and politics. Very recently, Carrozon (2005) has distinguished ontology as a philosophy and as a technology , and according to Gruber (2005) *risk management* is knowledge constitution, knowledge representation as well as action, therefore it needs both : logical reflexion and technical innovation with applications. Nowadays ontologies process the content of information technically, so that technology cannot be bypassed for the broadest dissemination of differentiated risk-knowledge and natural language remains the first source for knowledge constitution and for the organic and immediate link to the action and the participants of the risk scenario. Case grammar allows the perspectivation of the risk scenario by the identification of the agents, victimes, objects, place and time, damage and other consequences. These semantic analysis can be important for judgments and legal decisions.

There are several linguistic reasons for the action orientation of risk phraseology (cf. Annex 3).

- the high frequency of predicative nouns expressing action as members in the noun phrases themselves : *acceptance, aid, assessment, change, degradation, identification, management, mapping, planning, reduction, response…*
- the verb phrases*: a distaster occurs, to cause a disaster, to establish emergency services, to exert influence on the hazard, to improve risk awareness, risk detection, risk management, to reduce vulnerability….*
- but above all the fixed sentences themselves, formulas, routines, patterns, functioning as speech-acts, pragmatic rules, normalized instructions in all three languages, that

require immediate response and therefore prohibit lexical and syntactic transformations and do not leave time for lexicon consulting. Here, fixity becomes overwhelming, it is extended from language to situation and becomes an important user constraint ; efficient emergency rescue depend on the standardized expression in the precise moment ; Wahlverwandtschaft develops between context and text and interlingual correspondances save properties and human lives : *: Imminent danger! inform the fire brigade! Inform the police ! Stay at home ! Listen for warnings on the radio ! Turn on radio and television ! Find out what protective measures to take ! Get off the street! Find shelter! Take protective measures! All-clear ! Danger has passed! Listen out for TV and radio announcements!*

Face to the highly technical revolution of risk science on one side, and the wellknown insufficiency of traditional ordinary language dictionaries concerning risk on the other , MULTH appeals radically to the scientific positions of linguistics mentioned, in order to improve international risk communication. In this special language poly-morphology expresses complexity of concepts ; risk terms are defined by differentiated specific features and risk expressions by idiomatic pragmasemantics ; these collocations are of sommativ meaning and their semantic density is a difficulty for definitions, that multiple and comparison of definitions help to overcome. The phenomenon risk transgressing state- and language borders, multilinguality is the first priority for a European and global risk management. Multilingual and multiple definitions reveal cultural similarities and differences, unavoidable on the way to continental and global decision-making and action, the transboardery efficiency of which demands interculteral knowledge and skill. Related terms forming conceptual networks by family ressemblance improve accuracy and the quality of writing and translation for administration and press.

Unavoidably, risk needs alternativ glossaries, MULTH being one of them is not at all a novelty,. Let me conclude by a quotation of the hungarian linguist Fonagy (1997, 157) specialist of multilingual combinatorics in ordinary language : « bilingual glossaries of ‘formulas’ spread over Europe at the time of Carol the Great (*Formulae Marculfi*) and dictionaries of multilingual ‘phrases’ existed in Mesopotamia two thousand years before

Christ. It is more than probable that dictionaries of ‘phrases’ preceded the first grammars ».

Annex 1

Emergency
emergency aid
emergency managemen
emergency measure
emergency plan
emergency planning

Hazard
hazard analysis
hazard assessment
hazard identification
hazard map
hazard mapping
hazard probability
hazard zone
geological hazard
major hazard
man-made hazard(s)
natural hazard
hazardous material

Risk
risk acceptance
risk analysis
risk assessment
risk management
risk map
risk mapping
risk reduct

Annex 2

- *emergency / crise / Notfall*

emergency aid / aide d’urgence / Nothilfe
emergency management / gestion de catastophes / Katastrophenmanagement
emergency measure / mesure d’urgence / Notfallmaßnahme
emergency plan / plan d’urgence /Notfallplan
emergency planning / planification des mesures d’urgence / Notfallplanung
emergency response / intervention d’urgence / Notfallmaßnahme

- *hazard / danger / Gefahr*

hazard analysis /analyse des dangers / Gefahrenanalyse
hazard assessment / analyse des dangers / Gefahrenbewertung
hazard identification / identification des dangers / Gefahrenerkennung
hazard map / carte des dangers / Gefahrenkarte
hazard mapping / cartographie des dangers / Gefahrenkartierung
hazard probability / probabilité des risques / Gefährdungswahrscheinlichkeit
hazard zone / zone de danger / Gefahrenzone
hazardous material / substance dangereuse / Gefahrengut

- *risk / risque / Risiko*

risk acceptance / acceptation du risque / Risikoakzeptanz
risk analysis / analyse du risk / Risikoanalyse
risk assessment / estimation du risk/ Risikoabschätzung
risk management / gestion du risque / Risikomanagement
risk map / carte des risques / Risikokarte
risk mapping / risk mapping / Risikokartierung
risk reduction /réduction du risque / Risikoreduktion
safety / sécurité / Sicherheit

annex 3

1. predicative nouns expressing action as members in the noun phrases themselves : *acceptence, aid, assessment, change, degradation, identification, management, mapping, planning, reduction, response…*
2. the verb phrases*: a distaster occurs, to cause a disaster, to establish emergency services, to exert influence on the hazard, to improve risk awareness, risk detection, risk management, to reduce vulnerability….*
3. Fixed sentences: *rules and instructions / consignes /Befehle, Verhaltensmaßregeln, Verhaltensregeln ;*
   Imminent danger! / Danger en approche ! / herannahende Gefahr !
   Inform the fire brigade / informer les pompiers / die Feuerwehr,
   Inform the polic / informer la police ! / Polizei informieren !
   Stay at home ! / rester chez soi ! / zu Hause bleiben !
   Listen for warnings on the radio ! / se mettre à l'écoute d'un programme de radio ! / Warnungen über Radio beachten !
   Turn on radio and television / Brancher radios et télévisions ! / Schalten Sie Radio- und Fernsehgerät ein !
   Find out what protective measures to take / Se renseigner sur la conduite à tenir ! / Informieren Sie sich über Verhaltensschutzmassnahmen ;
   Get off the street! / Quitter la rue! / Verlassen Sie die Straße !
   Find shelter! / Rejoigner des abris ! / Suchen Sie schützende Räumlichkeiten auf !
   Take protective measures! / Prendre des mesures de protection ! / Schutzmabnahmen ergreifen !
   Listen out for TV and radio announcements! / Ecouter les messages radio et télévision ! / Durchsagen in Radio und Fernsehn beachten !
   Danger has passed! / Fin du danger ! / Ende der Gefahr ! All-clear / Fin d'alerte : son de 30''/ Entwarnung

Quoted Bibliography

Arntz/Picht 1991 : Einführung in die Terminologiearbeit. Hildesheim, Olms
Bachfischer R. (1978): Die ökologische Risikoanalyse. München.
Bonnefous S., Massuelle M.H, Richard V., Aspects Semantiques du Risque, ASR,1996. http://www.rdtrisques.org/biblio/semantique/aspects%20semantiques.pdf/view?searchterm=Feu
Bonß W. (1995): Vom Risiko. Unsicherheit und Ungewißheit in der Moderne. Hamburg.
Bundesanstalt für Gewässerkunde, Hydrologische Fachtermini Dt- Eng, 2000, http://elise.bafg.de/
CEDIM (Center for Disaster Management and Risk Reduction Technology c/o University of Karlsruhe), Glossar: Begriffe und Definitionen aus den Risikowissenschaften, 2005, http://www.rz.uni-karlsruhe.de/~gd202/www.cedim/download/glossar-gesamt-20050624.pdf
Corrazon R. (2005) : « Ontology. A resource guide for philosophers ». www.formalontology.it
Covello V.T., Mumpower J.A. (1985): "A Historical P erspective ". Dans Risk Analysis 5, 103-120.
Fonagy I. (1997): "Fgement et changement sémantiques". In Martins-Baltar (Ed.): La locution en langue et usage, 131-165
Goffin R. (1992): "Du synthème au phraséolexème en terminologie différentielle". In Terminologie et traduction 2/3, 431-438.
Goodman N.(1981): "Wge der Referenz". IN Zeitschrift für Semiotik 3.1, p.11-22
Greciano G. (2005) : « The ontological basis of new lexicography". Proceedings of Eu-Riskproject Meeting. Ispra.
(2002) : "Phraseographische Prioritäten, erfüllt und unerfüllt". Akten des XI. Internationalen Symposions zur Lexikographie. Kopenhagen (in Druck).
(2001) : "L'harmonisation de la terminologie en Sciences du Risque." In Proceedings of Security Conference, Montpellier XII. Council of Europe-FER.
(2001) : "Les sciences du risque: convergences interculturelles." In Proceedings of Risk Conference, Strasbourg X. Council of Europe-FER,
(2001) : "Pour un glossaire combinatoire plurilingue du Risque." Proceedings of Risk-Conference, Mèze V. Council of Europe-FER.
(2000): "Die lexikographische Wende". Wien, Akademie der Wisenschaften

(1989) : « Auf dem Weg zur Sistologie ». In Faucher/Hartweg/Janitza (Eds) : Sens et Etre. Mélanges en l'honneur de J.M.Zemb. Nancy, PUN (81-91).
(1980) : « Qu'est-ce qu'un objet ? A propos de la théorie de la perception d'Alexius Meinong ». In Etudes Danubiennes IV, 1(33-43).
Gruber T.R. (2005) : « What is an ontology ». www-ksl.stanford.edu

Habermas J. (1991): Erläuterungen zur Diskursethik. Frankfurt
Hartmann K.K.K. (1994) : « The use of parallel text corpora in the generation of Translation ». In Martin W. et alii (Eds), EURALEX 94, 291-297, Amsterdam.
Kampits P. (1980) : « Österreichische Philosophie von Bolzano bis Broch als Ausdruck Mitteleuropäischer Kultur ». In Etudes Danubiennes IV,1(44-54).
Luhmann N. (1991): Soziologie des Risikos. Berlin/New York
Maison de la télédétection du Languedoc-Roussillon (2005) : Glossaire des termes scientifiques ». Montpellier
www.teledetection.fr/index.php?option=com_glossary&Itemid=214&lang=fr
Massué J.P. (2001): "Mobilisation de la Communauté scientifique au service de l'amélioration de la gestion des risques". Mèze, FER-EUR-OPA
Meier-Dallach Hans Peter (1994) Sozialwissenschaftliche Forschung und Kompetenz im Industriebereich. Workshop 19/20/XI/1993 in Balsthal. Schweizer Wissenschaftsrat. FER-Bericht, Bern
Meier-Dallach Hans Peter/Rolf Nef (1996): "Risiko und innere Sicherheit in der Wahrnehmung der Bevölkerung". Dans V. Preuss (Ed.), 214-322.
Mel¹cuk 1996
OECD- ISDR (2001) : Updated and Expanded Terminology on Disaster Reduction. Geneva, 2001
Pawlowski T.(1980) : Begriffsbildung und Definition. Berlin, de Gruyter (Göschen 2213).
Rasmussen J. (1986): Information processing &human-machine interaction. An approach to cognitive engineering. Amsterdam.
Rubise P./Gautier Y. (1995): Les risques technologiques. Paris
SKKK (2003): Ständige Konferenz für Katastrophenvorsorge und Katastrophenschutz. Wörterbuch des Zivil- und Katastrophenschutzes. Köln.
Sylvan R. (1987) : Wissenschaft, Mythos, Fiktion : Sie alle überschreiten die Grenzen des Wirklichen und manchmal des Möglichen ». In Zeitschrift für Semiotik 9,1-2 (129-152).
TESEC-EUR-OPA (2001): Glossary on Emergency Management. Strasbourg, Council of Europe/Kiev