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Coping with Vulnerabilities of the Modern Society

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INTRODUCTION

The presentation starts with some reflections on:

- Changes in the risk picture, from traditional risks to modern types of risks.
- The scope and variety of risks and vulnerabilities.
- The work by the Norwegian commission on the vulnerable society.
- The recommendations from the commission.
- Perspectives on complexity, uncertainty, and ambiguity.
- Alternative risk and uncertainty management strategies.
- Concluding remarks.

Since the German sociologist Ulrich Beck published the book "Risikogesellschaft: Auf dem Weg in eine andere Moderne" in 1986 a lot has happened which can be attributed to the contents of the phenomena he describes as the "risk society", e.g. the globalisation of the world economy, the ICT revolution, cyber war, gene technology, climate changes, Al Qaida, the mad cow disease and SARS. Risks have become more global. New risks are continuously discovered and linked to changes in technology, biology, social tensions and politics.

A main difference from traditional risks is that new risks cross

national borders and are independent of the place where you live or work. Radiation is spread by wind, toxic materials are spread by rivers and ocean currents, IT viruses are spread by global networks and epidemic diseases are spread by airline travellers. Modern risk awareness is not about our own experiences or the current statistical risk picture of deaths and injuries, but about an uncertain future. Fear and anxiety of these threats which we are uncertain or ignorant about, are a great challenge for risk and vulnerability management even though the probabilities for such events may be microscopic. When we do not control risks we feel frightened and become victims. Well-known, everyday risks such as dangerous driving behaviour, smoking, falling from a ladder, etc., may worry us to a lesser extent than travelling on an aeroplane due to the risks of terrorism or SARS.

However, I have no evidence for claiming that risks have increased lately. Life in the “old” industrial society could be dangerous, but we had some understanding of the risks’ sources and causes, magnitude and local effects. The new technological risks, nuclear, chemical, ecological, genetic, and political and social risks, such as terrorism, are, according to Ulrich Beck, difficult to separate and survey in time and space, or to explain by rules of causality, to address guilt and punishment, to compensate or to insure. The new risks represent “produced uncertainties” in the terminology of Beck.

SCOPE OF RISK AND VULNERABILITY PROBLEMS

Figure 1 illustrates the scope and variety of risks and vulnerabilities. The vertical axis indicates some of the challenges of linking different levels and layers in risk management, i.e. the links between the global, international, national, regional, local and individual levels in dealing with risks.

The horizontal axis illustrates that the field covers everything from “acts of God” type events and man-made, including technology-caused disasters, to the intended, ill-natured acts against others and even self-destructive behaviour. At the level of managing societal

vulnerabilities, frequent events such as road traffic accidents, occupational accidents and traditional, everyday crime are normally excluded. Societies have to a large extent accepted or tolerated these types of risks, and have tools for dealing with them, i.e. an ability to absorb those problems. The term societal vulnerability usually addresses problems related to the survival and recovery of vital societal functions, i.e. threats to infrastructure related to energy supply and ICT, pandemics, etc.



Figure 1: **The vertical macro-micro perspective on risk management combined with types of hazards/threats and events (Hovden, 1998).**

What is the meaning of the term “vulnerability” for the world, for a nation, or for a local community, a group of people and the individual? In the research literature a common definition is: “An expression of a system’s problems of functioning when it experiences an unwanted event (accident or intended action), and for the system’s problems of recovery from damage (restore normal operation)”. But the concept can also be described by sayings such as “Great events have small beginnings” (Perrow), or Murphy’s law:

”Everything which can go wrong, will go wrong, - and at the worst possible point in time”.

THE CONTENTS OF THE REPORT FROM THE NORWEGIAN COMMISSION ON THE VULNERABLE SOCIETY.

The Norwegian Government established a commission in September 1999 for exploring the threats and vulnerabilities of society and making recommendations for increased preparedness and resilience. The report from the Commission was published July 2000 (Willoch et al, NOU 2000: 24). I was a member of the Commission, which consisted of representatives from all political parties represented in the Parliament, governmental experts, and two external experts. The report made a risk assessment of selected risk arenas and some specific threats and hazards. For each of them a number of recommendations were proposed to the Government. Finally, the report included an overall discussion of the need for changes in the regulatory structure to cope with the new vulnerabilities.

Contents of the report:

- The current regulatory control regimes, and the organising of emergency and crisis management.
- New threats and challenges.
 - Increased vulnerability and dependability:
 - technology development, especially ICT.
 - globalisation, organised crime and terrorism.
 - man-made disasters – major accidents in transportation and natural catastrophes.
- Means for reduced vulnerability in prioritised areas:
 - Protection of ICT and energy supply.
 - Safety in transportation.
 - Supply contingencies.
 - Oil and gas exploration, production and distribution.
 - Infection protection, pandemics.
 - Food safety.

Clean water supply.

ABC threats.

Mass flow of refugees (especially the border to Russia).

Organised crime, terror and sabotage.

Information contingencies, information warfare and cyber war.

- The need for political/administrative changes at national, regional and local levels.
- Recommendations on radical changes in the organisational structure of regulatory and rescue bodies. Principles for the division between operational functions and control functions.
- The need for research and development

The Commission states that today's society is much more vulnerable than it used to be. The failure of just a few key main stays and functions within modern society could result in wide-scale problems. The loss of telecommunications and energy supply would be particularly disrupting. Other aspects contributing to greater vulnerability and security problems include the following:

- Technological changes
- Increasing complexity of modern society
- Increasing demands for efficiency and cost effectiveness
- Fewer personnel in numerous sectors
- Increasing privatisation of public services

ANALYSES AND RECOMMENDATIONS FROM THE COMMISSION

The challenges in preserving the security of modern society have changed dramatically in just a few years. With regards to certain specific actions, e.g. sabotage or terrorism, the threat scenario of today is characterised by a shift away from the manual towards the electronic. The tremendous changes in the use of information and communications technology have altered the meaning of national borders in the context of safety/security and national preparedness. The analyses were inspired by the "American President's Commis-

sion on Critical Infrastructure Protection” (1997).

The Commission observed that there was an institutional and regulatory lag between the current control and response regimes and the need for coping with the new threats and dynamics of the risk picture. The responsibility for societal risk management is scattered around most of the ministries and is operated through numerous directorates and control bodies. The total risk and vulnerability management system is very complex, difficult to grasp, it has functional gaps and overlaps, and reveals inconsistencies in principles, logic and practice. This diversification in safety/security and rescue governance becomes even more confusing and ineffective at the regional and local levels of public administration.

The safety and rescue institutions and regulatory regimes have developed as “muddling through” processes over more than hundred years mostly as responses to the revealed risks of the industrial society and the “Cold War”. The consequence is an over-complex “jungle” of safety institutions made for the needs for risk control in the past, and not adapted to the post-industrial threats and the dynamic changes in the risk picture.

To improve risk and vulnerability management in the Norwegian society the Commission recommended the following:

- Merging of the public safety and rescue authorities within the jurisdiction of a single ministry with national safety and preparedness as its main task
- A co-ordinated strategy for the possible merging of relevant safety and security authorities
- A joint investigation commission for major accidents and crises

A main objective was to split the responsibilities for controlling risk and vulnerability from the operational responsibilities of risk management at all levels and layers. Secondly, to establish a clear separation between the regulatory and control functions from the business interests of the activity or system.

The Commission believed that a co-ordinated strategy and method of operation should be developed for the various regulatory bodies. A number of these agencies should be merged, especially within the transportation sector. As a rule, any safety control function should be allocated to a ministry other than the one with administrative responsibility for promoting the business of the sector in question. One ministry or directorate should be vested with the entitlement and responsibility to assess weaknesses in the operative risk and vulnerability management of other ministries and across the different sectors.

During the work of the Commission, two major accidents happened (a train and a high-speed ferry), in addition to a near catastrophe of burning gas tanks nearly blowing up the whole city of Lillestrøm, outside Oslo. These events demonstrated the importance of the report to media and the political environment. The September 11 2001 events resulted in renewed media and public attention on the report.

The report's conclusions were followed up as an integral part of a governmental renewal program for the public administration. The report was sent to public hearing, and the results of the processes were a white paper to the Parliament (Storting) on means for reducing vulnerabilities (Ministry of Justice, 2002). A white paper on organising the regulatory authorities was presented January 2003 (Ministry of Labour and Government Administration, 2003). These two white papers resulted in some changes in priorities and in the organising of regulatory and rescue institutions.

The white papers revealed six groups of issues, which are assumed to be of general relevance. These are (Hovden, 2003):

1. Confusions on *problem identification and definition*, i.e. how it is organised today, how it functions, and what is the problem
2. Alternative *principles of organising*, i.e. how to solve problems of fragmented responsibilities, lack of integrity and independence; ways of grouping by activity and

industrial domain, types of risk phenomena, or by consequence management criteria. How to achieve simplification of regulations, and reduction in number of control authorities and down-sizing of staff without increasing the risk levels?

3. Choice of *change strategies*, i.e. renewal of public administration and services is conditioned by special needs within groupings of safety institutions. Which institutions should be phased out, and which new institutions should be established? Change is risky.
4. The balance between *public care and market demands*, i.e. how to cope with the pressure for deregulation and globalisation, and with the demands for cost-effectiveness and the needs of the users. Can privatisation – by standardisation and certification – substitute public care control regimes? Are such substitutions cost-effective?
5. Conflicts on *models of reality* and risk management strategies, i.e. are risk control and emergency organisations value adding or is loss prevention mainly a cost factor? Can we trust risk calculations? Whose perception of risks is true? How to balance between the frequent accidents and damages, the exceptional disasters, and the uncertainty related to new threats and risk phenomena with unknown causes and/or consequences? How to prioritise resources across sectors and domains? What are the consequences for the choice of risk management strategies?
6. The overall problem: questions related to influencing the political agenda. What are the key factors for successful renewal of safety institutions, i.e. quality and competence versus quantity, and the needs for authority and power bases for reform and implementation? How to achieve trust and confidence?

The main results from the work on the report on a vulnerable society and the related white papers are the establishment

of the new *Directorate for Civil Protection and Emergency Planning*, encompassing the old Civil Defence Directorate, rescue institutions, plus the established control and operational bodies regarding fire and explosions in industry, etc.; i.e. a better co-ordination of resources from fire brigades and civil defence crews, assurance of a comprehensive and broader perspective of societal risk and vulnerability management. The reorganisation of other health and safety control authorities has focused on more independence between these authorities and the ministries partly symbolised by locating them in cities outside the capital Oslo.

In general, the Commission's report has contributed to increased attention being paid to vulnerability issues in the public sphere, - and hopefully also to a more enlightened and balanced debate on issues related to coping with vulnerabilities and means for improved resilience of infrastructures and vital functions.

THE COMPLEXITY, UNCERTAINTY AND AMBIGUITY OF THREATS AND HAZARDS REVISITED

The risk picture has changed. Nevertheless, there is a lot to learn from history and established knowledge in risk management. The earthquake in 1755 in Lisbon made the French philosopher Jean Jacques Rousseau attribute the responsibility for more than 100 000 fatalities to human decision-making, asking: "*Why have we accumulated 20 000 houses with six to seven floors in a notably seismic location?*" The question gave birth to a philosophical basis of a science of risk, a shift from a religious and fatalistic risk attribution to expectations on rational actions in risk handling.

In dealing with risk and vulnerability issues we can even go back to citing Aristotle: "*It is probable that the improbable will happen*", or the Roman historian Pinty the elder: "SOLUM CERTUM, NIHIL ESSE CERTI"; and continue with more modern quotations such as "*Great events have small beginnings*" (Perrow, 1984) and the so-called "Murphy's Law" which can be phrased as follows: "*Everything which can go wrong, will go wrong, - and at the worst possible point in time*".

At the micro level, in everyday life, I will assume that everyone have experienced some support for that “Law”.

Social scientists look at risk issues and uncertainties regarding the current development of technologies and societies as a transaction period to a new modernity, a post-industrial era named “the risk society” by Beck. The last century, and in particular the last decades, have brought about accelerating, dramatic changes in the living conditions. *We are far safer than our ancestors in most areas.* Still, in many ways we are living in “the age of uncertainty” (Galbraith 1977) and approaching the “risk society” (Beck, 1992). The uncertainty is tied to the rate of change. Our value systems, social institutions like the core family, political institutions like parliaments and political parties, public administration, education systems, etc. were formed a century ago, based on the needs of that period. The wish for social and economic development may not correspond with the need for social stability and predictable risks, which we know how to handle or we are used to deal with.

In many cases the introduction of new technology has created more efficient and reliable, but also more vulnerable socio-technical systems. This may be described as what Perrow (1984) calls “system accidents” and OECD uses the term “systemic risks”. System accidents imply an unforeseen interaction of multiple faults in a complex high hazard system. If the consequence potential is fatal, and the system properties are such that one is left with a remaining risk of the kind “little strokes fell great oaks”, then it may be better to stick to Murphy’s law and precautionary principles instead of probability assessments as a basis for risk management.

RISK AND UNCERTAINTY MANAGEMENT STRATEGIES

Finally, I want to draw attention to the need for alternative risk acceptance criteria and risk and vulnerability management strategies. Common features and delimitations of methods for risk assessment of importance for risk and vulnerability management, are described by Klinke (2002) as follows: They rely on relative

frequencies, statistical data, as means to express probabilities. The undesired effects are confined to physical harm to humans and the ecosystems, thus excluding social and cultural impacts. Only rough estimates for socially induced risks such as sabotage, terrorism, and human errors are part of the modelling. Probabilities and the magnitude of adverse effects are normally multiplied, i.e. *an expected value approach*.

Some of the challenges for risk assessment are: 1) Enlarging the domain of effects (such as social impacts). 2) Using better tools to assess socially induced risks. 3) Placing more weight on catastrophic potential and their secondary impacts. 4) Using better models for incorporating system interactions (geographic; functional; systemic) 5) Taking account of long time durations. 6) Providing better rationales for balancing risks, benefits and perceptions.

An attempt to respond to these risk assessment challenges is the proposed *risk classification* by the Global Change Council of the EU Commission (Klinke, 2002):

- Probability
- Potential for harm
- Uncertainty (variability, statistical, genuine, ignorance)
- Ubiquity
- Persistence
- Delayed Effects
- Equity Violations
- Potential for Social Mobilization

Combining these dimensions of the risk concept Klinke and Renn (2001) developed six main types of risks determining the choice of risk management strategy. These risk types, named after metaphors from Greek mythology, are comprised by the following characterisation of risks:

Damocles: high catastrophic potential, probabilities (widely known).

Cyclops: no reliable estimate on probabilities, high catastrophic potential at stake.

Pythia: causal connection confirmed, damage potential and probabilities unknown or indeterminable.

Pandora: causal connection unclear or challenged, high persistency and ubiquity (bioaccumulation).

Cassandra: intolerable risk of high probability and great damage, but long delay between causal stimulus and negative effect.

Medusa: perception of high risk among individuals and large potential for social mobilisation without clear scientific evidence for serious harm.

Frequent accident risks with relatively low consequences, e.g. road accidents and occupational accidents, are not included in the typology, i.e. the accident risk type which are dominant in killing and injuring people. When these six risk types are presented in a risk diagram, see figure 2, we get an visual impression of the uncertainties related to the different risk types, i.e. the areas covered by the actual risks.



Figure 2. Risk classes. Source: WBGU, German Advisory Council on Global Change. The figure is a copy from a presentation by Klinke & Renn (2001).

As practised in most risk evaluation processes, figure 2 also distinguishes three categories of risk: the normal, the intermediate and the intolerable area. As most other social scientists, they avoid the terms acceptable/ALARP region/unacceptable due to possible moral implications. The terms “tolerable/intolerable” are not so emotional or sensitive for ethical considerations. In practice, in decision-making the meaning is almost the same.

To deal with the important features for the six risk types, Klinke & Renn (2001) propose three alternatives, - or combined risk management strategies:

- Risk based or risk informed management strategies (Damocles and Cyclops)

Sufficient knowledge of key parameters

- Precautionary or resilience based strategies (Pythia and Pandora)

High uncertainty or ignorance

- Discursive management strategies (Cassandra and Medusa),
High ambiguity

Risk-Based Management is characterised by emphasising scientific assessment, reduction of exposure and/or probabilities, risk management according to expected values on risks and benefits, and reliance on inspections, auditing and routine controls. Examples are: industrial plants, large dams, bridges and highways, LNG Terminals, transportation (road, railway, shipping and aviation), classic infectious diseases, deterministic health risks (threshold).

Resilience-Based Management is characterised by trans-disciplinary, research and investigations, containment of application (in time and space), constant monitoring, redundancy and diversity in safety design, (strict) liability, and no tolerance policy for risk control, - in extreme cases: prohibition. Examples are: biotechnology, Internet sabotage, new epidemics (new mutations), BSE, and extreme weather events due to global climate change.

Discourse-Based Management is characterised by reaching political consensus or agreement, importance of procedure and transparency, establishment of trust-generating institutions, investment in risk communication, involvement of stakeholders, including industry and governmental organisations, plus public participation. Examples are: genetic engineering, “industrial” food production, biochips for human implementation, electromagnetic fields, and consumers’ way of life risks.

The main conclusion in Klinke & Renn’s article is that risk management strategies need to be tailored according to the main characteristics of the risk source in question.

CONCLUDING REMARKS

The research on the risk society focuses on what Klinke & Renn (2001) call “problematic risks”, i.e. that the traditional “old” risks of modern industrial society are ignored in this literature. The risk society literature deals mainly with the uncertainty aspect of the risk concept. This literature is not occupied with the statistics of fatalities and injuries related to dangerous phenomena, activities and arenas.

People have always been more worried about major hazards and disasters than all the frequent small-scale accidents dominating the statistical risks. As mentioned in the introduction, the modern risk awareness is not about our own experiences or the current statistical risk picture of deaths and injuries, but about an uncertain future. It is also well documented that groups and communities can develop tolerance for living with high risks. We also have a greater tolerance for risks we feel that we can sense, control and relate to. This may look irrational. But to quote Bertrand Russel: “What man desire is not knowledge but certainty”. We are exposed to the rare major accidents, disasters and global risks of terror, epidemics and dangerous substances every day through mass media news. These are the risks of risk society, i.e. risks which we cannot control and cope with as individuals or as local communities. Risk research

and risk management cannot remove uncertainty from this world and its future, but it may help to improve our skills to cope with uncertain events and their undesirable consequences.

The Norwegian case is not unique, even though the administrative systems differ between countries. According to a comparative study in the report (Willoch et al, 2000) on how countries like Sweden, the Netherlands, Germany, Switzerland, Great Britain, and the US have organised their safety, security, and crisis and emergency organisations, the concrete principles and ways of organising these institutions and services differ a lot, i.e. the regulatory “jungles” are different. None of them can demonstrate a superior system to the others. Behind each of the system designs one can trace traditions, political cultures and contingencies specific for each country. However, what they have in common as challenges, are lack of transparency, co-ordination, and ambiguous lines of responsibility.

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