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Health risks are front-page news. Be it BSE, global climate change, genetically modified organisms or radiation from transmitter stations or mobile phones, the popular press puts out a constant stream of risk warnings and sensational reports about potential health threats. The lecture will look at how the general public perceives such information and draws some conclusions about acceptance of these risks. The term *perception* as used in cognitive psychology applies to the mental processes through which a person takes in, deals with and assesses information from the environment (physical and communi-cative) via the senses.

Perceptions have a reality of their own: Just like the characters in animated films who, suspended in mid-air, do not plunge to the ground until they realize their predicament, people construct their own reality and evaluate risks according to their subjective perceptions. Intuitive risk perception is based on how information on the source of a risk is communicated, the psychological mechanisms for processing uncertainty, and earlier experience of threats. This mental process results in perceived risk - a collection of notions that people form on risk sources relative to the information available to them and their basic common sense. Human behavior is fueled by perceptions not the “facts” or what scientists pose as “real” risks. Research on risk perception has identified a range of perception models used by society in perceiving and assessing risk. Looking specifically at technological and natural hazards, the following perception models can be identified (Table 1):

<b>1. Emerging Danger (fatal threat)</b>
<ul style="list-style-type: none"> <li>• artificial risk source</li> <li>• large catastrophic potential</li> <li>• inequitable risk-benefit distribution</li> <li>• perception of randomness as a threat</li> </ul>
<b>2. Indicator for an Insidious Danger (slow killer)</b>
<ul style="list-style-type: none"> <li>• (artificial) ingredient in food, water or air</li> <li>• delayed effects; non-catastrophic</li> <li>• contingent on information rather than experience</li> <li>• quest for deterministic risk management</li> <li>• strong incentive for blame</li> </ul>
<b>3. Stroke of Fate</b>
<ul style="list-style-type: none"> <li>• natural risk source</li> <li>• belief in cycles (not perceived as an random event)</li> <li>• belief in personal control (can be mastered by oneself)</li> <li>• accessible by human senses</li> </ul>
<b>4. Gamble</b>
<ul style="list-style-type: none"> <li>• confined to monetary gains and losses</li> <li>• orientation towards variance of distribution rather than expected value</li> <li>• asymmetry between risks and gains</li> <li>• dominance of probabilistic thinking</li> </ul>
<b>5. Personal Thrill (desired risks)</b>
<ul style="list-style-type: none"> <li>• personal control over degree of risk</li> <li>• personal skills necessary to master danger</li> <li>• voluntary activity</li> <li>• non-catastrophic consequences</li> </ul>

TABLE 1: THE FIVE SEMANTIC IMAGES OF RISK IN PUBLIC PERCEPTION

*Risk as an emerging danger (fatal threat):* In many areas of technology, particularly industrial technology, major accidents involving safety system failures can have catastrophic effects on humans and the environment. In technical safety philosophy, the main aim is to reduce the likelihood of such failure occurring to ensure that the product of probability and impact is as small as conceivably possible. But the stochastic nature of such an event makes it impossible to foresee when it will actually occur. In consequence, an event could, theoretically, occur at any time although the likelihood of its occurrence is extremely low. A look at perception of rare random events shows that probability plays hardly any role at all: It is the random nature of the event that poses the feeling of threat.

*Risk as stroke of fate:* Natural disasters are usually seen as unavoidable events with catastrophic effects, but they are also seen as *quirks of nature* or *acts of God* (and in many cases as the mythological wrath of God for collective sinful behaviour) and thus beyond human control. As opposed to the circumstances of technical risk, the random nature of the event is not the fear-triggering factor (because randomness is replaced by fate and not associated with unforeseeable consequences of inappropriate action). Rather, the relative rarity of the event provides psychological reinforcement for risk denial.

*Risk as a personal thrill:* When, despite the considerable risk, Reinhold Messner climbs the world's highest mountains without the aid of breathing apparatus, when drivers drive far faster than the speed limit allows, when people throw themselves off a mountain or a cliff-top with nothing more than a pair of artificial wings to save them and do so in the name of sport, the meaning of risk takes on a new dimension. As is often claimed, the pursuit of such leisure activities is not about accepting risk as a ticket to the pleasurable benefits (feeling the wind in one's hair or enjoying a magnificent view); instead, the benefit lies in the risk itself: The attraction of such activities is the fact that they involve risk. In all these cases, people take risks in order to test their own strength and to experience triumph over natural forces or other risk factors

*Risk as a gamble:* Psychologists have long conducted in-depth studies on risk behaviour in games of chance. These studies show that expected values do not provide the standard on which people guide their betting behavior. The stake must be kept to an absolute minimum while the main prize must be particularly attractive. Players tend to under-estimate the probability of rare events and are thus more willing to play if their stake remains below their pain threshold.

*Risk as an indicator for insidious danger:* In recent times, public debate has acquired yet another definition of risk. Increasing reports on environmental pollution and its long-term impacts on health, life and nature have forced scientific risk assessment to adopt a role as early warning indicators. In this risk perception model, scientific studies help early detection of lurking danger and the discovery of causal relationships between activities or events and their latent effects. This definition of risk is used, for example, in cognitive handling of low doses of radiation, food additives, chemical crop protection products and genetic manipulation of plants and animals. Perception of such risk is closely related to the need to find causes for apparently inexplicable consequences (e.g. seal deaths, childhood cancer, or forest dieback). Unlike in the technology-medical risk model, the probability of such an event is not seen as a significant deviation (i.e. it can no longer be explained by chance) from natural variation for the event in question, but rather as the degree of certainty with which a single event can be traced to an external cause.

Probability and severity of adverse effects are not the only and certainly not the most important components that people use as yardsticks for perceiving and evaluating risks. It is rather the context in which those risks are experienced that determines their fate in risk perception. This dependence on the supporting circumstances is not random, but rather follows certain principles that can be identified by systematic psychological investigation.

What benefits can scientists and policymakers gain from the study of risk perception? Actual acceptance, as the analysis so far has shown, relies on numerous factors of which many can hardly be described as normative principles of political action. Perceptions rely partly on erroneous judgements and simple lack of knowledge, opinions on risk are often tied to symbolic attributes that are only indirectly related to the advantages and disadvantages of a specific risk source, preferences among the population are often inconsistent and, finally, the question of how to aggregate individual preferences "for the good of all" remains unsolved. Should the majority decide, even if only a minority is affected? Who has the right to make collectively binding decisions? The simple solution - leaving the conflict surrounding risk to the powers that be - may well increase the acceptability of political decisions, but hardly their suitability.

However, ethical acceptability cannot be entirely removed from factual acceptance. In a democratic society, it is the people who determine the circumstances under which they wish to shape their future. The political task of risk management and regulation will lie in explaining the anticipated advantages and disadvantages to those affected, i.e. the risks and opportunities of the available options, and, on this basis, communicating to them the possibility of rational judgement.

The further development of pragmatically oriented risk policy will depend on how much more is learned about the causes and effects of risk perception. Available knowledge on the intuitive processes of risk perception, including the

perception of combined risks, can help decision-makers and risk regulators to better anticipate conflict regarding the tolerability of risk sources and to take preventive action. Identifying the elements that lend themselves to generalization in intuitive risk perception will help society establish improved normative theories for risk source selection. Conflict resolution and risk communication programmes are likely to be rejected by the general public as long as the teaching and communicating processes are not conducted in parallel. While public perception and common sense cannot replace science and policy, they can certainly provide impetus for the decision-making process. At the same time, if decision-makers take into account the factors and needs of public perception, then public willingness to accept rational models for decision-making is likely to increase.