Vabilo na seminar

prof. Pier Roberto Danesi:

SEVALNA, TEHNOLOŠKA IN DRUGA TVEGANJA V SODOBNI DRUŽBI

Torek, 30. marec 2004, 9:00 – 14:30

Izobraževalni center za jedrsko tehnologijo
Reaktorski center Podgorica

Cilj seminarja je omogočiti primerjalno analizo različnih tveganj s čimveč dejanskimi informacijami, ne le o sevalnih tveganjih, temveč tudi o drugih tehnoloških in običajnih tveganjih vsakdanjega življenja

Živimo v zapletenem, tehnološkem svetu. Karkoli storimo ali se nam zgodi, pomeni nekaj tveganja za naše zdravje in blagostanje. Ni absolutne varnosti in ni življenja brez tveganja.

Zaznavanje tveganj je pod močnim vplivom miselnih vzorcev, predsodkov, verovanj in medijev. Mnogo ljudi je prepričanih, da nas je moderna tehnologija obremenila s celo vrsto novih tveganj in se bojijo katastrof ter dolgoročnih vplivov, nekatera tveganja (npr. letalski promet, jedrska energija, pesticidi) se zdijo še posebno velika.

Trčimo tudi ob etična vprašanja. Kako varno je dovolj varno? Koliko to stane? Zmanjševanje tveganja vedno stane denar, ki bi ga lahko porabili za druge dejavnosti. Dobronamerna moralna vzvišenost glede določenega tveganja se utegne izkazati kot družbeno nemoralna.

Za sprejemanje smiselnih dolgoročnih odločitev o tveganjih v sodobni družbi moramo torej, kolikor to le dopuščajo konkretni podatki, napraviti primerjalno analizo.

Pier Roberto Danesi

Prof. Danesi je doktoriral iz fizikalne kemije na Univerzi v Rimu. Bil je direktor Laboratorija za fizikalno kemijo Italijanske komisije za atomsko energijo in starejši znanstvenik v Argonne National Laboratory (ZDA), od l. 1986 do svoje upokojitve l. 2002 pa je kot direktor vodil laboratorije Mednarodne agencije za atomsko energijo v Seibersdorfu. Bil je profesor na univerzah v Padovi, Sassariju, Linzu, še vedno predava v Pavii.

Zaradi zagotovitve prostora vas prosimo, da svojo udeležbo sporočite ge. Saši Bobič (**sasa.bobic@ijs.si**, 01/588-5302) do 20. marca 2004.

PUBLIC AND EXPERT PERCEPTION OF RADIATION AND OTHER TECHNOLOGICAL RISKS:

some elements for a more rational and ethical approach to comparative risk assessment

by

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ABSTRACT

We live in a complex, technological world, and everything we do or is done to us, carries some risk to our health and welfare. Therefore there is no such thing as zero risk or absolute safety. This holds for all technologies including the power and non-power applications of nuclear and radiation technology.

Although full agreement exists on the mathematical definition of risk (specialists define risk as the product of the probability that an unpleasant event will occur and the consequences that this event will produce), the issue of comparative risk assessment (i.e. a quantitatively meaningful comparison among different risks) has been rather controversial. The reason is that risk has many attributes and to rigorously compare risks, all factors, circumstances and assumptions that are not explicitly presented in the risk characterisation and quantification, should be mutually equivalent. This multi-dimensional character of risk often creates considerable problems. For example the question often arises of how to weigh the mutual differences in severity of the possible harmful consequences.

In a world where technology rules such a large part of our lives, where so many decisions are taken out of our hands, we may feel threatened by our simple inability to do much about anything. Indeed, many people do think that technology is imposing a whole set of new risks on us, such as the burgeoning use of synthetic chemicals, artificial additives in food, air and water pollution and nuclear radiation. The extraordinary rate of technological change also increases the potential for the introduction of risks that we cannot assess until perhaps it is too late. People often fear disaster, lack of personal control, potential irreversible effects to their children and some categories of risk are especially feared such as nuclear power generation, radiation, pesticide use and acid rain. In the public eye such risks too often overwhelm in importance those more familiar ones we have faced for generations, neglecting the undeniable benefits that scientific progress has brought on the whole to mankind's welfare.

In every society, primitive or sophisticated, there are stimuli that arouse public fears of hypothetical dangers, vague and uncertain, as they may be (e.g. collision with asteroids or invasion by extra-terrestrials). Fear arises when a hazard is imaginatively conceived, but its reality is not detectable or difficult to measure. Hypothetical fears may arise form idle rumours, or scaremonger hyperbole intended to create public support for a cause. The corresponding risk then becomes a political reality, and may dominate public policies and world issues. We can quote as recent examples food irradiation, depleted uranium, genetically modified organisms and foreign viruses.

Moreover, often the fears and the associated risks perceived by society have been the result of illegitimate extrapolations either of the frequency of recorded rare events or of known exposure to high levels of a given external agent (or stressor) projected to low levels, in absence of any experimental or convincing theoretical evidence. Frequently the policy choice for non-detectable risks has gone so far as to outlaw the source, a step sanctified as the "precautionary principle", forgetting that this principle is not necessarily correct as it is well demonstrated by the many external agents that at low concentrations or doses can have a beneficial effects (e.g. chemical elements, UV and visible radiation, vitamins). We know that in these cases it is actually the dose which determines if an agent is either a "remedy" or a "poison". Last but not least the precautionary principle is a retreat and not an answer and when carried to the extreme, it maintains the *status quo* by stopping economic and public health progress.

It is also too often forgotten that public health issues have to be considered by the policy makers together with a mix of complex political objectives such as economy, employment, ecology, national security, etc. Therefore in practice policy decisions have to be compatible with the national resources available in practice. It follows that resource allocations among different social needs are determined by a judgmental comparison of the public welfare values of proposed alternatives. If any alternative is too heavily weighted by hypothetical public fears, the decision process may be unintentionally flawed with serious negative consequences for all members of a society.

Radiation fear at low doses delivered at low rates is an example of a minor public health hazard being raised to a major issue by its proponents. It also illustrates that the moral high ground assumed by well-meaning activists may well be socially immoral, when evaluated by the welfare of the total population. This can be appreciated when one considers that presently there are countries that consider acceptable spending about US $ 2.5 billion to save one human life by implementing the present radiation protection regulations, but are reluctant in saving lives by improving highway safety, providing school lunches or immunising people living in developing countries against common diseases such as measles, diphtheria and pertussis, costing the latter measures about 50 to 100 US$ per life saved.

At any rate, in everyday reality, when we have to take decisions on how to assign resources to minimise risk associated to various technologies and activities, aggregation and condensations of the consequence components have to be made. Otherwise, the problem of multi-dimensionality would always make choices and decisions impossible. Therefore, in order to make sensible decisions about risks, we need information and, to the extent that available data permit, have to put risks in perspective, assigning numbers that allow as far as possible their rating. Quantification also helps to manage and control risk. Scientific principles can be used in association with full appreciation of human values, to fulfil the aim of all of us, namely to gain the greatest possible benefits to mankind from any technology or activity we perform at the lowest possible cost. This means minimising the risk of unnecessary early death or illness, while at the same time maximising the happiness of life.

Comparative risk analysis, in spite of its limitations, is one of the best tools to reveal the probable consequences of society's choices among alternatives as can help us to

allocate resources to reduce those risks which in a given period of time can cause the major detriment to human society.

Objective of this seminar is to contribute to the comparative assessment of different risks by providing factual information not only about radiation risk but also other technological and common risks we experience in our everyday life.

Several aspects of the public perception of nuclear and radiation risks are first described and analysed taking into account sociological and psychological factors. Elements for a more quantitative, rational and ethical approach are then presented. These are based on probabilities derived form historical mortality rates, epidemiological studies, calculated fault and events trees, and extrapolation of animal experimental data. Utilizing a risk quantification based on probabilities, comparison among some typical risks is presented.

Finally the role that assuming a linear relationship between detrimental health effects and radiation dose also at low doses (the so called "linear-no-threshold hypothesis or LNT) has played in generating radiophobia (the irrational fear that any level of ionising radiation is dangerous) is discussed. Epidemiological and radiobiological evidence against the validity of the LNT is examined and some of the socio-economic costs associated to the LNT are reviewed.