"Systemic risks shape the 21st century"

What does the coronavirus have in common with microplastics? Risk researcher Professor Dr. Ortwin Renn explains how risk perspective can help address global challenges and understand public concerns.

Mr. Renn, your institute deals with the influence of humans on our planet, the associated risks and possible solutions. One example is the distribution of microplastics on land and in the sea. Where do you start there?
Our aim is to look at problems in an interdisciplinary and transdisciplinary way. Interdisciplinary means incorporating all relevant disciplines involved. Transdisciplinary also includes integrating non-scientific knowledge to identify problems and explore solution spaces. For the problem of microplastics, we need ecology, process chemistry, behavioural science, political science and economics, among others. It is very important that all appropriate disciplines are involved, otherwise we will not recognise all the facets of a problem. To find solutions for a problem, it is also essential to work in a transdisciplinary way, meaning involving all participants and their practical knowledge.

How do you do justice to the complexity of the problems?
In my view, the risk perspective is the link. A risk concept assumes that there is a risk driver or agent and a risk-absorbing system. The risk drivers can be divided into main categories. In terms of the physical drivers, they are energy, substance and biota, i.e., bacteria, viruses and fungi. In terms of the social drivers, they are information and power. This allows entire cascades of risks to be explained. In most cases, they are interlinked. For example, an earthquake can trigger the collapse of a chemical plant. In addition to kinetic energy as a risk driver, toxic substances could be released as a consequence of the kinetic energy destroying a tank with chemicals. False information about the event that reaches the population can be a third driver to amplify the negative health effects.

Are most risks so complex that we need several disciplines to understand and possibly minimise them?
We investigate systemic risks at our institute. These are risks that can jeopardise the functionality of an entire system. Systemic risks usually go beyond the sector in which they originate.

Like the coronavirus pandemic that is currently the cause of all our worries?
Exactly. It triggers major effects beyond its system boundaries – the health system – to other systems, such as the economy and education, and induces a complex chain of effects. Such systemic risks will shape the 21st century. We have made great progress in localised, conventional risks. For example, in food safety. All statistics show that we can minimise risks here through effective risk management and regulation. We do not yet have the right tools for dealing with systemic risks.

Are systemic and conventional risks perceived differently in terms of being seen as a threat?
Not necessarily. Systemic risks are sometimes underestimated because they have an impact on other areas and consequently fade from the view of the spectator. For example, the loss of biodiversity does not seem so dramatic to many at first because the indirect effects are hidden. Many will object that the world won't be worse off with fewer animals. However, most people as-

Professor Dr. Ortwin Renn
is Scientific Director at the Institute for Advanced Sustainability Studies (IASS) in Potsdam and holder of the Chair of Sociology of Technology, Risk and Environment at the University of Stuttgart.

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sess risks to a lesser extent according to the statistical estimates of risk but more according to psychological and social risk characteristics; among these are the voluntary nature of risk or the dread with respect to the perceived consequences.

What other risk characteristics play a role in perception?
Familiar and natural risks, for example, tend to be underestimated. There are also topics that evoke very strong emotional responses such as radioactivity. Another important point is the image of the actor who initiates an activity that poses risks to others. If we don't like this actor, for example a specific industry, the risk seems greater to us. If we believe we have agency over the risk, we tend to underestimate the risk, like with alcohol or smoking. In comparison, the risks posed by pesticides trigger great fears and concern because they can endanger our health without our consent

Scientific uncertainty plays a role in risk assessment. How does this affect the subjective perception of risk?
This is often unclear. I have the impression that when the people affected have to change themselves, they interpret ignorance in their favour. Someone who is used to wrapping everything in plastic is more likely to downplay the environmental risk than someone who is constantly annoyed that food is already wrapped in plastic in the shop.

What can scientific institutions take into consideration when communicating uncertainty?
The state of research is still not conclusive on this question. There are cases where too much emphasis has been placed on communicating uncertainty and people thought that if science doesn't even know, then the situation must be dangerous. And there are cases where uncertainty was not addressed. This resulted in allegations of concealment. For risks regarding food, the population has a high level of risk awareness. Scientific uncertainty tends to be unsettling in this respect. A suitable strategy appears to be to communicate "background noise". So, even with 100,000 studies that have not proven a risk, we know that we cannot statistically prove that there is no risk at all, but we can be sure that it is very low. ◘