

Remarks at Closing Session of the
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First, I want to commend the IRGC for its efforts to tackle the challenge of coming up with a strategy for identifying and managing the risks associated with nanotechnology in such a way that the anticipated benefits will be safely and broadly realized—both near and long term.

The previous two speakers have nicely covered many of the issues associated with risk assessment of nanotechnology. I threw out my previously prepared remarks and instead will use my time to emphasize a few points.

After listening for the past two days to individuals from many perspectives and from around the world (although mostly from the northern hemisphere), I have the following thoughts and observations that I would like to share:

1. **Ecosystem vs. hierarchy.** Some aspects of the scheme that the IRGC proposes are hierarchical and imply some rank or temporal order. Hierarchies can be very useful, but the process of moving forward from where we are today with respect to risk governance of nanotechnology to where we will need to be at some point in the future, will rely on interactions among many stakeholders—or actors—in what might be better described as a “risk governance ecosystem.” There will be roles and responsibilities for governments, research communities, manufacturers, civil societies, standards development organizations, and others. Each element of the ecosystem must be “healthy” in order for good risk management to be developed and take place.
2. Building on the concept of an ecosystem, **risk governance of nanotechnology must be adaptive.** The field is changing rapidly and so any system that is adopted should be set up to incorporate new knowledge and to allow for modification of approaches as necessary or appropriate.
3. While there are more and more activities that bring together experts from areas other than the disciplines of science and engineering for discussions that are important to our ability to make sound risk-related decisions, there is a need for even greater capacity to do research and to provide input on societal and ethical implications. In the United States, NSF recently funded a Network for Nanotechnology and Society that will receive \$14.3 million over 5 years. Such efforts are also underway in other countries. These activities will be important in providing a clearer view of the perspectives of different regions into the processes that guide risk governance.
4. The development of standards—especially in the near term the standards for nomenclature, metrology, and methods of testing and characterization—will be critical. **Voluntary, consensus-based standards are a key to successful diffusion of benefits as well as the ability to monitor and protect people and the environment.** While

already underway, for example at the ISO, the work will continue for years to come and I would encourage stakeholders to consider becoming engaged in their respective nations' efforts if willing and able to contribute.

5. I want to support the recommendations in the IRGC white paper that call for **implementing “good governance” principles of transparency and allowing for stakeholder input and feedback.** These will be vital to developing and maintaining public trust.
6. **Governance, even of something that is developing globally, will not and should not emanate from just one international body.** Many risk governance activities will take place at national or regional levels (e.g. the Asian Nano Forum). This reflects, in part, differences in culture and norms around the world. But international efforts are also important due to the global scale of many activities.
7. **Establish channels and mechanisms for sharing information.** In my experience coordinating the many US departments and agencies that are part of the National Nanotechnology Initiative, the most valuable aspect for agencies may well be the exchange of information. One senior government official said that in his 30 years as a government employee he had never seen the kind of coordination that takes place on the subject of nanotechnology.

I would note that sharing information touches on all parts of risk governance. It improves and informs the task of risk analysis and risk assessment by regulators, industry (including insurers), and others. It is a key aspect of risk management. For example, risk management clearly is aided by sharing of information among industrial hygiene professionals and by agencies that govern workplace safety. And, of course, information sharing is at the heart of risk communication—whether with interested stakeholder groups or the general public.

8. Having said that there should be greater sharing of information, it is **essential that the information being shared is accurate and as complete as possible and that the sources are credible and trusted.** Although the discussion over the past two days has focused on processes, roles and actors, and frames, I feel it is important to explicitly call for the need to do the research that is necessary to enable sound risk decision-making. Effective development and sharing of information across the nanotechnology risk governance ecosystem requires contributions from experts in many areas. It requires research individually and jointly by social scientists, economists, philosophers and others in the humanities, as well as those in the physical and life sciences. It requires engagement experts in risk assessment, management, and communication, with journalists and perhaps even with the entertainment industry. [I am waiting for the viral videos on nanotechnology to appear in my email inbox.]

These are some personal thoughts on the discussions of the past two days. I commend you all for your thoughtful participation and I look forward to seeing the next draft of the white paper.

Thank you.