Key findings of the Workshop on 'Science-Society Interface in Emerging Technologies'

27-28 March 2008 at TERI Gram, Gurgaon

- Globalization, inter alia, is affecting the ethos of science and has already transformed science from public good to a market commodity. With rapid pace of development in science and technology and the innovation cycle being reduced in emerging technology there is a need for more interdisciplinary research on science-society relations. Further, as the pace of change with regard to technology development is very fast, there is a chance that policy intervention will not be able to keep pace with the developments in the technology. Therefore, it is important that policies should co-evolve with technological development.

- In the context of science-society interface in emerging technologies there should be focus on identifying 'stakeholders' and ways to bring them together. Moreover, to create a science and society dialogue, it is imperative to analyze the level of people participation in projects and the corresponding impacts of projects on people. In this regard there is a need for designing a well-defined structure for feeding in public input of discussions into decision-making.

- Civil society groups should be represented both in the production and consumption of knowledge. There is a need to rethink on technology/democracy - science-society relation with a strong basis for co-production of knowledge and 'inclusive' mode of knowledge production. This co-production of knowledge needs to be institutionalized otherwise there is a danger of 'science becoming violence.'

- The area of professional ethics is of crucial importance in technologies like nanotechnology where information would need to be accessed in a clear and effective manner. Interestingly the civil society debates that have taken place in the context of technologies such as biotechnology in India; have also contributed to an increasing public demand for equal treatment (of vulnerable groups) and also accountability of decision makers within the establishment. In this context legal instruments like the Right to Information Act has been crucial in expanding and enabling public debates on a host of issues.

- Ethical standards and codes evolve over a period of time. Ethics can be at various levels viz., individual, institution, professional, communities etc. At the level of philosophical level the concerns may be related to genetic testing, gene therapy, organ transplant etc. While at the professional level it could be responsible conduct of research, integrity to scientific values. Similarly at the regulatory level the issue of

ethics could be biosafety, clinical trials, field trials. For the scientific and sustainable use of emerging technologies, such as biotechnology demands resolution of bioethics.

- Science policy making should be perceived from an ethical point of view. In this regard, it is not only important to highlight the distributional impacts of adoption of new technologies like nanotechnology (who bears the risks and who receives the benefits), but also to consider the distributional impacts of public investment in technology.

- Risk studies are based as much in academics as activism. Although much of positive influence has come through activist in the STSS in past technologies, a deep routed academic exercise in this area is required. There is no quantification of risks and government should focus equally on risk assessment and technology development and it should be done on case-to-case basis. Further, there is a need for assessing the risks of new technology, which would involve calculation of social costs and benefits arising out of new technology. Also, assessment of technology with respect to issues such as social justice and equity needs to be carried out.

- Emerging technologies are transformative in nature and pose various risks to the society. Therefore, public has a right to full disclosure of information regarding these technologies. Currently public is being excluded from decision-making process and science policy design. There should be greater engagement of public in policy making.

- There is a need for the government to enable some kind of a regulatory oversight especially given the occupational health and safety aspects of nanomaterials, nano tubes and nano particles. However, commercial enterprises producing nano particles did not support such a suggestion because such measures could potentially raise the bar for small enterprises entering into manufacturing, as the investment to achieve regulatory conformity is likely to be quite high. Technology should always be looked at as technology with both potentials and potential hazards

- It was agreed that regulation is required even at preliminary research stage. However, it should be based on sound scientific research. But since long-term risks are always difficult to ascertain, precautionary approach must be adopted. Besides, risk is not the only reason for regulating. It is also important for checking monopoly.

- Indian technology and regulatory scenario cannot and should not be based on any external prototype. In the Indian context, regulatory transparency and accountability are the real issues. Also enforcement and implementation are crucial in the efficacy of regulation.

- From a research institute's perspective, main issues are
    - large scale manufacturing still an issue, as the fabrication processes often tend to be specific to the product
    - There aren't too many (successful) technology based start-ups
    - Lack of direction as to who should the technology be transferred to
    - There is a lack of entrepreneurship amongst students. This is partly because; nanotechnology, being a new and emerging technology carry

significant business risks. This phenomenon is further aggravated by the booming service industry that offers high salaries. This creates difficulties in attracting adequate students to specialize in the technology. Further the fact that the number of technology based start-ups (in non IT fields) is fairly low, means that there is a lack of prior experience and this compounds the problem.

- Service based industries (the ones who can take risk) are usually interested to know about these technologies, get involved initially, but not too keen to go all the way
- There is a need for investment in social sciences research for emerging technologies
- Building multi-disciplinary teams in universities/ organizations is a challenge since a strong polarization/divide exists between scientists & engineers. Currently, there is no platform to invite researchers from different disciplines.

- It is essential that the innovation should be need based. In this context it becomes important to question that, whether emerging technologies are catering to the needs of the poor or its advantages are being reaped by a certain segment of the society only. This becomes more important from a developing countries perspective having limited fund for S&T and where scientific research and development is mostly public led.

- It is important to understand that scientific information and communicating science are not the same. Communication is more about people involvement and creating a sense of trust in the public. In this regard science communication is not only the prerequisite of journalists but also of scientific community.

- Communication of policy issues, issues of occupational health hazards, impact of science on gender empowerment is a key to bridge science and society. There should be fund available for carrying out training in science communication.

- Communication of science and technology is a cultural process. It is important to realize the 'cultural distance' that exist between people's everyday experiences and the knowledge we want to convey. In this regard it is important to identify how and what to communicate.

- Books, films and media could be one of the efficient instruments of science communication. Development of centers for media studies in academic institutes, universities focusing on theoretical constructs, analysis and publications could be one of the key measures of bridging science and society gap

- There is a need for social science investment for new technologies along with dispute resolution mechanisms, public resolution platforms with a larger transparent dissemination of information.