

Research Project: Sustainable Technologies and Responsible Innovation: Nanotechnology Risks.

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Background: Nanotechnologies are described as ‘technologies of the tiny’, although there is no universal international definition, it is generally accepted that nanotechnologies involve "*the design, characterisation, production and application of structures, devices and systems by controlling shape and size at the nanoscale*" (BSI, 2005). Nanoscale particles have one or more dimension of the order of 100 nanometres or less. Nanotechnologies comprise a disparate array of unrelated technologies that cut across many traditional scientific disciplines, including chemistry, materials science, engineering, physics, biosciences, medicine and environmental sciences. The pace of development within nanotechnologies is resulting in an explosion of commercial activity, with predictions valuing the world nanotechnology market between \$1 and \$3 trillion by 2015. The production of nanomaterials inevitably raises questions about safety, especially in light of the paucity of risk information relating to human health or the environment. There is little agreement, however, over their health and environmental implications, and the most appropriate approach to managing associated risks. These uncertainties are exacerbated by a number of issues including the wide range of materials and devices covered by the term ‘nanotechnology’, the many different industrial sectors involved, and the fact that many areas of nanotechnology are still at a relatively early stage of development.

Aims & objectives:

- Provide an understanding of processes of public perception of nanotechnology uncertainties, risks, and benefits;
- Develop new methodologies to deal with some of the specific challenges of understanding public responses to nanotech;
- Compare US and UK public responses to perceived nanotech risks and benefits;
- Explore the communication implications of public perceptions of nanotech risks.

About the research: This research project has involved both empirical research examining public perceptions of nanotechnologies and the potential for associated risks, and broader work reflecting on the processes of public engagement through which understanding of the technology is both assessed and promoted. BRASS Researchers Professor Nick Pidgeon and Dr. Adam Corner were part of a working group on ‘*Risk Perception and Social Response to Nanotechnologies*’ with the Centre for Nanotechnology in Society, University of California Santa Barbara working on a US National Science Foundation funded study into risk perception and public responses. This cross-national deliberative study into nanotechnology involved analysing and developing the notion of ‘upstream public engagement’ and exploring public dialogue on the potential roles for nanotechnology for health and enhancement, and for energy futures, through deliberative workshops in the US and UK. They have also been contributing to the development of a national nanotechnology survey which focuses on amplification effects in risk perception. Study of perceptions, at so early a stage in the development trajectory of a technology, is probably unique in the risk perception and communication field. As such it also brings new methodological and conceptual challenges. These include: dealing with the inherent diversity of the nanotechnology field itself; the unfamiliar and intangible nature of the concept, with few analogies to anchor mental models or risk perceptions; and the ethical and value questions underlying many nanotechnology debates.

Results and outputs: The results of the innovative comparative USA–UK public engagement experiment based on deliberative workshops debating energy and health nanotechnologies, revealed

an unexpectedly high level of commonalities between the two countries given their different risk regulatory histories. Participants focused on benefits rather than risks and, in general, had a relatively high regard for science and technology. Application context was much more salient than nation as a source of difference, with energy applications viewed in a substantially more positive light than applications in health and human enhancement in both countries. More subtle differences were present in views about the equitable distribution of benefits, corporate and governmental trustworthiness, the risks to realizing benefits, and in consumerist attitudes. A key implication of the results is the importance of “upstream public engagement” as a means of managing perceived public and consumer risk for novel and emerging technologies such as nanotech.

The reflections on the nature of public engagement processes employed for nanotechnologies (and potentially for other emerging contentious technologies) revealed that these processes can fulfil two roles, one of ‘restoring trust’ and the other of ‘building robustness’ into the technology’s development. Assumptions held by policy-makers and business actors about the strategic value of narratives of restoring trust, together with deeply embedded assumptions about how technological innovation creates the future, could act to make the restoration of trust more difficult. This research also concluded that the debate about the sustainability of nanotechnology has been overly narrowly constrained by viewing it purely as an issue of risk. This creates a specific framing in terms of politics and ethics, but it can be argued that a broader framing based on concepts of contingency and finitude would create a better understanding of the ethical significance of nanotechnologies, that can deal with the multi-dimensional social nature of technological uncertainty.

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Impacts achieved/potential for impact: Understanding public perceptions of nanotechnology risks and their acceptability is of considerable value both to companies seeking to develop the technology and engage with the public in their role as consumers, and to policy-makers seeking to both promote and appropriately manage a technology with considerable economic potential but which may pose new challenges in terms of regulation (see Project A14). The results of the research were also presented at some key industry orientated conferences including the 2010 *Corporate Responsibility and Emerging Technologies* and the 2010 *Nanomaterials* Conferences in London.

Groves provided the OECD with case studies for its programme on the impact of nanotechnologies which sought to draw policy insights from a case study approach. The UK government had committed to providing case studies to the OECD and Groves was able to provide these drawing on the BRASS empirical work (for DEFRA) on CSR and nanotechnology (see below at A14).