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Public Engagement and Nanotechnology in Australia

SALLY DALTON-BROWN

Abstract: Upstream engagement is commonly regarded as necessary for the smooth implementation of new technologies, particularly when there is an impact on health. Is the healthcare context in Australia geared toward such public engagement? There are established engagement practices for issues of healthcare resourcing, for example; however, the situation becomes more complex with the introduction of a new technology such as nanomedicine.

Keywords: nanotechnology; public engagement in science; nanotechnology regulation

In 2007, Australia became one of the first counties to initiate a wide-ranging, independent review of nanotech regulation focused on the potential human toxicity of nanotechnology. Between 2010 and 2014 the Australian government committed A$9.4 million to public engagement as part of its National Enabling Technologies Strategy.

However, common objections levied at such public engagement of nanotech exercises suggest, in Australia as abroad, a desire to legitimize the current nanotechnology strategy rather than evoking significant debate; recent reports suggest a "disconnect between nano-related research, development and commercialisation, and community interests and concerns" in Australia. If efficacy is to be achieved, policymakers must develop increasingly sophisticated models of public engagement.

Public engagement with scientific and technological innovation, particularly when there is a potential impact on health, is globally seen as a necessary component of building trust between the public and policymakers. In the EU, for example, upstream engagement, which involves deliberative methods such as focus groups, citizen juries, and other fora for discussion of new technologies, is, particularly after the GM food debate in the 1990s, seen as essential to the smooth implementation of such technologies. Potential public rejection can be diminished by good public engagement processes that can lead (ideally) to public input into policy, and also into research and product development. However, as a 2012 study stated, "that good public engagement on contentious science and technology applications leads to better product and policy outcomes is fairly easy to get an agreement on. But as to what good engagement in this area actually looks like in practice—that isn't so clear."[1]

The chief criticism of public engagement exercises is that they lack effectiveness. However, it can be argued that such engagement is useful for global

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ethics and global policymaking in the context of new technologies in that it offers new, broader, and pluralistic methods of governance for twenty-first-century technologies, reflecting the growing sense that technological innovations are seen as outcome of social networks that incorporate a range of actors;[2] addresses the public trust deficit associated with many new technologies; and provides a method of awareness raising, particularly with regard to complex new technologies that may not be described effectively by governments or the media.

The level of complexity of the issue is a significant problem. Take the example of healthcare provision and fairly easily comprehended matters of resourcing and patient advocacy. Australia's Department of Health launched the Private Heath Networks (PHNs) initiative in 2015 with an opportunity for citizens to consult on the discussion paper "Better Outcomes for People Living with Chronic and Complex Health Conditions through Primary Health Care," written by the government's Primary Health Care Advisory Group. Around 2,000 Australians participated via online or workshop events. Yet comments on the PHNs framework have suggested that it has rather weak language on community engagement, as indicated by the following example: "Community Advisory Committees . . . will provide a community voice into the Board decision-making and activities, particularly in regard to service gaps [and] . . . will provide the community perspective to PHN Boards to ensure that decisions, investments, and innovations are patient centred, cost-effective locally relevant and aligned to local care experiences and expectations."[3]

However, this merely exposes the ongoing issue of distributive justice in healthcare systems—that is, that limited resources will always require care priorities to be set; economic inequalities permitted by Rawls's difference principle may cause health inequalities, but accountability for reasonableness or risk/benefit analysis processes should allow for sufficient public engagement and, hopefully, greater equity and consensus. For example, a 2008 study by the Consumers Health Forum of Australia (CHF), a nongovernmental organization (NGO) that represents consumers and involves them in health policy and program development, suggested that consumer engagement at the national and state/territory policy and program development level is working, "involving consumers in discussions and decisions about national health policies and programs such as the National Charter of Health Care Rights and the National Health and Hospital Reforms. It also includes participation in national committees, for example, through the CHF Consumer Representatives Program."[4]

The situation becomes rather more complex when it involves the introduction of esoteric new technologies, such as nanomedicine. The Australian Centre for Nanomedicine, launched in 2011, has as its directive a focus on one of the six strategies outlined by the Australian government's National Enabling Technologies Strategy (NETS), which focuses on biotechnology and nanotechnology: namely, "to encourage greater community participation in debates about the development and use of enabling technologies."[5] Between 2010 and 2014 the government committed A$9.4 million to public engagement as part of the NETS.

Public Anxiety

What are the potential issues that worry those of us living in the new nanotech age? Scholars of nanotechnology ethics have suggested that toxicity risk

management and, in particular, nanoparticles and their effect on health, their potential military usage, and their effect on distributive justice (given that nanotechnology has immense possibility for developing countries but that "little yet has been aimed at products that might benefit the poor")[6] may be areas of global concern. There are also concerns deriving from more futuristic scenarios relating to human enhancement. The multiplicity of contexts within which nanotechnology innovation can be applied, from nanomedicine to tennis balls, positions it as a broadly disruptive technology that may overreach current safeguards. A Chatham House briefing paper in 2009 identified the pace of change as a particular challenge, given that the long-term effects of nanoparticles are still unknown.[7]

Does nanotechnology, as a future technology that may introduce challenges currently not covered by toxicity risk-management frameworks, require new, specific regulatory approaches? There are two global standardization bodies—the Globally Harmonised Scheme for Classification and Labelling of Substances (GHS) and the International Standards Organization (ISO)—that regulate the classification, labeling, and safety data sheets of chemicals (at the national, regional, and worldwide level); however, their regulations are not legally binding for the member countries of the United Nations.[8] Many countries and regions have published their own complementary regulations or standards. There is no particular agreement on what a new system of regulation should look like, or how it might be achieved; new risk assessment, greater public participation, and new global codes of conduct are just some of the pathways suggested.[9]

In the EU, regulatory systems include registers (the UK Voluntary Reporting Scheme, for example); risk-management systems such as the Cenarios (Certifiable, Nanospecific Risk Management and Monitoring System) system, introduced in Germany in 2008; codes of conduct generated by governmental agencies, NGOs, or business initiatives; and actual regulatory policy, which is the only legally enforceable system. Currently nanotech risk is considered to be covered by existing legislation, and the first international law designed specifically for nanotechnology (on cosmetic applications) was implemented in 2013.[10] The governing body REACH (Registration, Evaluation, Authorisation and Restriction of Chemical Substances) plays an important role: REACH addresses classification, terminology, and nomenclature; metrology and instrumentation, including specifications for reference materials; test methodologies; modeling and simulation; science-based health, safety, and environmental practices; and nanotechnology products and processes.[11]

What is the situation in Australia? In 2012 the Australian Academy of Science's National Nanotechnology Research Strategy was launched with a warning that economies and industries that fail to invest in nanotech-inspired developments might be left behind as current products are replaced by those with improved or new functionality. The national strategy called for industry, academia, and government to form an alliance to maximize the economic, social, and environmental gains made possible through nanotechnology.[12]

Australia was one of the first counties to initiate a wide-ranging, independent review of regulation focused on the potential human and environmental impact of nanotechnology. Bowman, Hodge, and Ludlow's 2007 report on this review, found that

> while there is no immediate need for major changes to regulatory regimes,

> there are many areas of Australia's regulatory system which will need amending through a long term effort across many agencies as new knowledge about the potential hazards of nanotechnology becomes available. The report identifies six major gaps in current regulation, including the potential failure of regulators to distinguish between nano forms of products that differ in properties from their equivalent conventional forms.[13]

In a 2012 analysis of the impact of that 2007 review on policy, Bowman and Ludlow outlined regulatory developments since the report's publication, such as a new administrative process "for the notification and assessment of industrial nanomaterials that are considered new chemicals" brought in in 2011.[14] A 2010 examination of nanotech regulation stated that the country's four national chemicals assessment and registration schemes are continuously developing new measurement reference frameworks for exposure measurement capability; these schemes are subject to case-by-case review by the National Industrial Chemicals and Assessment Scheme (NICNAS) and rely on the global body REACH for information on oversight of manufacturing and premarket approval.[15]

A 2015 report by the Australian Pesticides and Veterinary Medicine Authority (APVMA) recognized that

> the state of the science in relation to nanoparticle toxicology has undergone rapid development in recent years so there may be instances where a novel nano-particulate material has toxicological endpoints that are not addressed through standard guidelines. . . . The APVMA notes that most of the accumulated knowledge related to human health risk assessment of nanoparticles relates to relatively simple nanoparticles. It will be important to monitor and periodically revise the validity of the current conclusions as the development of nanotechnologies allows the manufacture of more sophisticated materials.[16]

As nanomaterials become increasingly complex in their engineering, this "novelty," as Bowman and Ludlow noted in their 2012 report, may expose potential gaps in nanotech regulatory and oversight frameworks.

Public Participation

Australia's 2012 draft paper on the national nanotechnology research strategy recommended that the Government should continue, and expand, its best practice efforts at communicating the benefits and risks of nanotechnology to the public, as "effective translation of nanotechnology into new products and industries is increasingly reliant on public awareness and understanding of the benefits and risks."[17]

What actions have in fact been taken in Australia? A 2009 study examined two workshops held in 2004 on nanotechnology, concluding that their research "underlines a real public desire for openness, transparency and engagement on the part of research institutions and an expectation on science organizations to be more proactive in understanding the needs and priorities of Australians."[18] The study offered a conclusion that is fairly common in global science and technology public consultation exercises: that much work remains to be done to strengthen the impact of such exercises on policy and on the research governance of new technologies. The workshop's recommendations were not adopted.

A 2008 study stated that "in Australia, processes for public deliberation on nanotechnology generally are occurring much more slowly than in the UK and US."[19] However, 2007 had seen the

announcement of the Public Awareness and Engagement Program from the Australian Office of Nanotechnology, with fora held across 2007 and 2008. This was followed by the more limited (i.e., statewide rather than countrywide) Nanodialogues exercise (2008).

Criticisms directed at these fora have included the self-selected nature of participants; it is suggested that this limits their reach in terms of social engagement and, in particular, shows a lack of engagement with marginalized groups. A 2015 study of the role of sociologists in facilitating public engagement in bioknowledge suggests that marginalized voices are essential, citing a nanobionics discussion of eye and ear implant users and their carers.[20] The denial of dissent has been a further and related criticism, with a 2010 study arguing that government nanotechnology community engagement activities are designed to favor and advance industry interests, with community stakeholders only engaged in downstream consultation.[21] The NETS has been accused of a strong proindustry bias, and "in recognition of the seriousness of this bias, in 2011 the NETS Advisory Council requested an independent review of public engagement materials produced and funded as part of the NETS."[22]

The three common objections against public engagement exercises—the lack of wide and potentially dissenting community engagement, the disassociation of such fora from policy, and the prevalence of downstream or belated consultation, when research trajectories are already locked in—suggest, unsurprisingly, a desire to legitimize current nanotechnology strategy rather than evoke significant debate. Such exercises are seen therefore as focused more on consciousness raising (falling within the area of science communication rather than public participation) with no meaningful effect on regulation.

Phone market research studies in 2005, 2007, and 2008 have found that the Australian public's attitudes toward nanotechnology are similar to those in the United States and EU—that is, they generally expressed a positive understanding of the potential benefits. Particular benefits envisaged from nanotechnology included cervical cancer vaccination, renewable energy and biofuel technology, and computer technology. Support for medical benefits, such as using nanomachines to clear blood clots, was at 94% in 2008.[23] However, a 2013 study of public perception of nanotech risks and benefits argued that "the Australian public perceives greater risks from manufactured nanomaterials and shows less trust in scientists and the health department to provide protection from possible health effects than academic, business and government stakeholders in the nanotechnology sector."[24]

The study thus argued that public engagement studies tends toward broadness rather than specificity not only of participants but also of information sources (and thus of authority sources), suggesting that further variation in the often rather general public engagement exercises might show less clear data (but might raise more useful points about public concerns).

Arguably, there are two essential aspects to the development of new public engagement models: greater sophistication in understanding public attitudes toward such sources (the authority issue, which is considerable in Australia given recent distrust of the previous Abbott government) and greater sophistication in terms of understanding discrete public attitudes toward new technologies. In Australia, an Ipsos poll in 2012 (conducted for the Department of Industry, Innovation, Science, Research and Tertiary Education) on community attitudes toward

nanotechnology recommended more segmentation analysis—that is, more understanding of distinct attitudinal groupings within communities.

In short, public engagement models, in their often rather generalized constitution, lack meta-awareness of the agendas underpinning participation on both sides. A recent study on Dutch nanotech fora has argued for "better individual engagement events" but also more understanding of the "social and political context, in which the events take place" to shape the process and outcomes.[25] As Cormick has stated, "in order to do justice to the complexity of ways in which the public relate to new technologies we must embrace more complex ways of viewing the public, as we embrace more complex ways of viewing new technologies—as well as embracing more complex ways of viewing the relationships between them."[25]

In 2012 the National Nanotechnology Coordination Office (NNCO) offered open debate related to improvements to, and opportunities for public engagement via, the National Nanotechnology Initiative's public website, Nano.gov, a primary mechanism for public engagement, redesigned in April 2011.[26] In the same year an industry/public workshop was held on the societal implications of nanotechnology, under the STEP (Science and Technology Engagement Pathways) framework facilitated by the National Enabling Technologies Strategy—Public Awareness and Community Engagement (NETS-PACE) program, and in May 2013, a group of 62 citizens (randomly selected via a telephone book) was invited to a nanotech debate; however, it is unclear whether any of the recommendations had any effect.[27] A 2013 report on the effectiveness of public engagement related to nanotechnologies argued that governmental claims of best practice do not altogether interlock with "practices that frequently fall short," and it identified "an alarming disconnect between nano-related research, development and commercialisation, and community interests and concerns."[28] More work clearly needs to be done.

Inspiring Australia, the country's coordinated approach toward science communication,[29] announced on December 8, 2015, that, in line with the Australian government's new "ideas boom" strategy to encourage a nation of scientific entrepreneurs, it would be investing in four strategies, including citizen science and community engagement initiatives. No details of these are as yet available.[30]

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