

Science for Environment Policy

Governance of new technologies: recommendations for responsible innovation in nanotechnology

Effective risk governance is important when developing new technologies.

This study assessed the approaches to governance of nanotechnology in Europe, based on a comprehensive review of literature and practices, complemented by discussions with key stakeholders. The study provides a new analytical framework for exploring the strengths and weaknesses of governance strategies and makes recommendations specific to nanotechnology.

Innovative technologies are key to tackling Europe's [societal challenges](#), from climate change and sustainable energy to healthy ageing and food security. Yet, society can also represent a barrier to their development. Public preferences must be considered during development in order to avoid negative perceptions, as demonstrated by the case of GM foods, the commercialisation of which has been hampered by societal rejection. Public acceptance and successful adoption of new technologies requires responsible governance approaches that assess the potential scientific, economic and political risks of emerging technologies.

These researchers aimed to support such an approach, by conducting a foresight study focused on the governance of nanotechnology. Nanotechnology has been identified as a key enabling technology that is anticipated to drive innovation, economic competitiveness and societal development in Europe. However, the risks and uncertainties surrounding it pose a challenge to its development and uptake and a policy debate has emerged regarding appropriate regulation, making it a high value case study for the governance of new technologies.

The researchers, whose work was supported by the [European Chemical Industry Council \(Cefic\) Long-Range Research Initiative \(LRI\)](#), first provided an overview of the governance landscape for emerging technologies, based on the findings of comprehensive review of publications and approaches. This was used to inform discussions with key stakeholders from a range of backgrounds, including industry, government, academia and NGOs. The researchers asked the stakeholders: "What might affect the governance of nanotechnologies in Europe in the next 20 years?"

Using the results, they developed four alternative future paths (foresight scenarios): *Nano-Phobia Phobia* (in which the public is wrongly perceived as not accepting of nanotechnology), *Size Still Matters* (where the mistaken belief that the public does not accept nanotechnology leads to a focus on size and perception of nanotechnology as 'special'), *Nano for Growth* (the public are accurately perceived as accepting nanotechnology, which is used as a driver for economic growth) and *Open Channels* (companies are open about their use of new technologies). Each scenario was expressed as a narrative, describing how the governance landscape may appear by 2034¹.

Stress testing was used to see how four key elements of governance — social and ethical assessment, technology assessment and value-sensitive design; health, safety and environmental risk assessment; adoption of standards; and commitment to codes of conduct — might perform in the scenarios. The authors considered these to be the most practical, tangible and realistic tools currently available and available for nanotechnology governance.

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1. To read the scenario descriptions in full, see: <http://onlinelibrary.wiley.com/doi/10.1111/risa.12470/supinfo>

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(continued)

A further group of stakeholders participated in a face-to-face dialogue session designed to rate the performance of each element. The majority (87.5%) of elements performed neutrally or positively across the scenarios, which suggests the key elements of governance for nanotechnology in Europe would present few significant challenges to implementation over the next 20 years.

Next, an analysis of the strengths, weaknesses, opportunities and threats (SWOT) of the governance landscape was undertaken. Strengths included the fact that many governance initiatives have been developed in a timely manner and often using a precautionary approach, while weaknesses included inconsistencies in implementation and lack of data on potential risks. Future opportunities include incorporating knowledge on good practice from other emerging technologies, while threats include the discovery of unforeseen hazards.

Finally, the authors provide recommendations for improving governance of new technologies. First of all, they say the interaction of stakeholders is important and should be used to clarify, test and then implement a plan or vision for optimal governance. They recommend mapping out possible futures, stress testing, and developing proactive measures to prepare for potential negative events. They then suggest testing the vision using an expanded SWOT analysis, as well as evaluating existing governance approaches. Finally, when implementing the method, policymakers should develop a roadmap that outlines the steps needed to deliver robust governance and create good practice guidelines, including codes of conduct.



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