

Policy Implications for Global Pervasive Nanotechnology Innovation

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Nanotechnology is a fast growing branch of engineering that usually deals with dimensions and tolerances of less than 100 nanometers. Nanotechnology is an emerging and disruptive technology at the crossroads of several scientific fields, ranging from medicine (e.g. cancer nanotheranostics) to electronics (e.g. biosensors) [1-3]. Due to its potential in fast innovation and its socio-politico-economic impacts worldwide, it creates new opportunities and challenges that address global issues. Nanotechnology is promising “more for less” to several long-standing environmental and human concerns. Nevertheless, in some segments (e.g. medicine, food and cosmetics), nanosafety and “nano-ethical” concerns still require to be better addressed [4]. Indeed, according to one of my preliminary randomized surveys involving worldwide participants (n=100) aged from 15 to 80 years, 45% felt skeptical about nanotechnology, 35% felt good/enthusiastic and 20% did not know it, although the reality is that we use nanotechnologies in our everyday life (Figure 1).

Many countries have developed nanotechnology programs since the US National Nanotechnology Initiative was announced in 2000 [5-8]. According to the World Economic Forum’s Annual Global Competitiveness Report 2011 [9], nanotechnology is attracting more public and private fundings than any other area of technology worldwide, estimated in US \$ multi-billion. Regulation of nanotechnology by the establishment of internationally-agreed policies is a must to objectively deal with several topics of increasing governmental interest such as international trade of nanoproducts, intellectual property, and nanotechnological transfers. The issue of nanotechnology global governance (i.e. conciliation of diverging interests *aka* “coherent standardization agreement”) and its overall impacts (including risks) are at the crossroads [10]. Therefore, the intervention of the worldwide societies (i.e. developed and developing countries), worldwide policy-makers (e.g. OECD, UNESCO, ISO, IBSA, WPMN, WPN, FDA), stakeholders (e.g. private initiatives such as ICON, IRGC, public funding institutions such as WHO and UNEP) and the financial and insurance sectors, is required to undertake fairest decisions and define an appropriate model for nanotechnology regulation, considering the model of “responsible/pervasive innovation” [10]. Further, a framework for global legal authority and transjudicial cooperation is needed [11]. Besides, nanoscience and nanotechnology indicators shall give insights [12]. For instance, indicated stage of maturity of a given

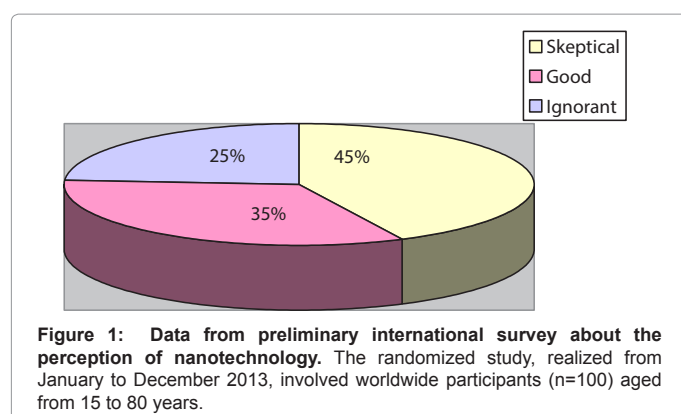
nanotechnology can be used to depict scenarios for future evolution and for decision makers to design an appropriate strategy [12]. Also, key issues to reach a more objective dialogue include potential or confirmed risks, data transparency and accessibility (e.g. via open-access online publications), society’s opinion. Eventually, a balanced approach of risks and benefits of research and development (R&D), commercialization and trade of nanoproducts, arising among public and private decision-makers, is important in an economy perspective.

Up-to-date, several countries including the BRICS (Brazil, Russia, India, China, South Africa), all the European Union Member States, most of the OECD (e.g. Japan, Taiwan, Israel), and also Korea, Argentina, Malaysia, Turkey, Morocco, Saudi Arabia, have adopted public policies supportive of research and innovation in the field of nanoscience and nanotechnology (i.e. precautionary approach with regards to health, environment, legal and ethical issues) [10].

Nanotechnology and below scales technologies (e.g. picotechnology) are quite promising for R&D applications worldwide, then impact our societies by bringing new solutions but shall be quite well regulated to avoid that these small worlds generate big issues.

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