Woodrow Wilson International Center for Scholars

News Release

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Contact: Sharon McCarter
Phone: (202) 691-4016
sharon.mccarter@wilsoncenter.org

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New Inventory of Research into Nanotechnology's Health & Environmental Effects Shows Need for More Resources, Strategy, & Public-Private and International Partnerships

WASHINGTON – A new inventory of research into nanotechnology's potential environmental, human health, and safety effects (EH&S) shows the need for more resources, for a coherent risk-related research strategy, and for public-private partnerships and international EH&S research collaborations. These are the key conclusions drawn from the first single inventory of largely government-funded research projects exploring nanotechnology's possible EH&S impacts.

This unique inventory is publicly available online at: www.nanotechproject.org, or www.wilsoncenter.org/nano. It was compiled and released by the Project on Emerging Nanotechnologies at the Woodrow Wilson International Center for Scholars. The Project is a partnership of The Pew Charitable Trusts and the Wilson Center.

"For the first time, policymakers, corporations and others can access and assess the scope, quality and efficacy of federally-funded research projects examining nanotechnology's potential human health and environmental effects. The inventory gives government officials and scientists in industry and academe the opportunity to work together. It enables them to develop a coherent research roadmap and to set research priorities. It helps makes possible the planning necessary to create public-private sector partnerships and international collaborations for risk-related nanotechnology research programs in the future," said Dr. Andrew Maynard, the Project on Emerging Nanotechnologies' chief scientist.

Total U.S. spending on all nanotechnology research and development (R&D) now stands at approximately $3 billion per year—about one-third of the estimated $9 billion invested worldwide by the public and private sectors combined. By 2015, the National Science Foundation projects that nanotechnology will have a $1 trillion impact on the world economy and employ 2 million workers globally.

Too Little Being Spent on Future Effects of Nano Toxicity

"The federal government's National Nanotechnology Initiative estimates that approximately $39 million annually in government funds—out of total expenditures of about $1 billion—are directed at environmental, health, and safety R&D. The Project on Emerging Nanotechnologies' inventory identifies about $27 million currently being spent by the U.S. government to explore possible adverse health, environmental and safety impacts of engineered nanomaterials or nanoparticles," said Maynard. "That limited investment is focused on research into human toxicity studies and some direct environmental impacts. Very little is being spent to investigate common workplace safety issues like the risk of explosion in production of nanopowders."

"In addition, most of this investment focuses on first generation nanotechnologies, many of which are already in the marketplace. Virtually none deals with future generations of nanomaterials," according to Maynard.

Little funding is allocated to explore possible links between exposure to nanomaterials and diseases of the lung, heart or skin. Similar to last year's Royal Society and Royal Academy of Engineering study (July 2004), the Project's scientists are not able to identify U.S. government-sponsored epidemiological research looking at the relationship between exposure and possible long-term health outcomes during the manufacture of nanomaterials like carbon nanotubes.

"Specifically, out of a total of 161 federally-funded, risk-related projects, the Project's scientists found only 15 relevant to occupation-caused physical injury (totaling $1.7 million), and only 2 highly relevant projects on the long-term environmental and occupational exposures that potentially could cause disease (totaling $0.2 million). These are important gaps that must be filled to ensure that nanotechnology is safely commercialized and accepted by the public as not harmful," stated Dr. Maynard. "In particular, more research is needed to address the potential life-cycle impacts of nanotechnology-based products as they move from manufacture to use and to eventual disposal."

Inventory Is Critical Start, But Global Action Is Needed

"This first inventory is not comprehensive, but it is the best available, detailed and scientifically-classified collection of data about nanotechnology EH&S risk-related research that exists either inside or outside government," declared Dr. Maynard. "It is intended to be international and expanding, and will be regularly updated."

Project on Emerging Nanotechnologies Director David Rejeski noted that "Some experts suggest that existing funding for risk-related nanotechnology research must be doubled or tripled. Realistically, no single country is likely to have adequate resources to cover all risk assessment needs, especially as nanotechnologies advance and become more complex and pervasive. What is clear from the inventory is that increased funding must be associated with an overarching research strategy and partnerships, if critical issues are to be addressed with 'due diligence.'"

"We need an international Nanorisk Research Program built on shared knowledge and a clear set of priorities. This inventory is an important tool for building partnerships between governments, and between governments and industry, which will ensure that risks to workers, consumers, and the environmental are adequately understood and addressed," suggested Rejeski.

Global Risk Research Funding Also Inadequate

"The good news," said Dr. Maynard, "is that the U.S. appears to be spending more on EH&S research than any other government. The second largest funder of risk-related research is the European Commission, which spends an estimated $7.5 million per year in partnership with industry through its multiyear NANOSAFE2 and other programs."

"The bad news is that current spending levels are not adequate to begin to answer the difficult environmental and human health impact questions raised by worker exposure to nanomaterials, by rapid consumer product commercialization and eventual disposal, and by concentrated environmental exposures from the possible application of nanoparticles to soil or water for remediation purposes in the future. These questions need answers, even though many of these new nanotechnology uses and applications have the potential to be cleaner and safer than existing alternatives," said Maynard.

"Nanotechnologies hold tremendous promise. Many of tomorrow's medical breakthroughs, new jobs, and communication leaps depend on it. That's why The Pew Charitable Trusts and the Wilson Center created the Project on Emerging Nanotechnologies," according to Rejeski.

"But nanotechnology's future depends on the willingness of government, business and public interest groups—both at home and abroad—to work together to build consumer trust and to tackle any

potential health and environmental issues early. This inventory is a tremendous tool to help achieve this important goal," said Rejeski.

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The **Project on Emerging Nanotechnologies** was launched in April 2005 by the Wilson Center and The Pew Charitable Trusts. It is dedicated to helping business, governments, and the public anticipate and manage the possible human and environmental implications of nanotechnology.

The Pew Charitable Trusts serves the public interest by providing information, advancing policy solutions and supporting civic life. Based in Philadelphia, with an office in Washington, D.C., the Trusts will invest $204 million in fiscal year 2006 to provide organizations and citizens with fact-based research and practical solutions for challenging issues.

The **Woodrow Wilson International Center for Scholars** is the living, national memorial to President Wilson established by Congress in 1968 and headquartered in Washington, D.C. The Center establishes and maintains a neutral forum for free, open and informed dialogue. It is a nonpartisan institution, supported by public and private funds and engaged in the study of national and international affairs.

Project on Emerging Nanotechnologies
Inventory of Research
on Environmental, Health and Safety Implications of Nanotechnology
Key Summary Points

U.S. EH&S Risk-Related Research Investment

- The U.S. National Nanotechnology Initiative estimates that approximately $39 million in government funds annually are directed at environmental, health, and safety R&D. But it is possible to identify only about $27 million currently being spent by the U.S. government to explore the possible adverse health, environmental and safety impacts of engineered nanomaterials or nanoparticles (including $3 million reported by NIOSH in aggregate, but not made available on a project-specific basis).
- The inventory contains a total of 161 projects funded by 8 different U.S. federal agencies, including EPA, NSF, NIH, NIOSH, USDA, DOD, DOE, and NIST.
- There are 53 U.S. projects listed, totaling $7 million annually, with high relevance to engineered nanoparticles: 30 of these, totaling $4 million, focus on human health; 19 of these, totaling $2.5 million, focus on the environment; and 4 of these, totaling $0.5 million, focus on cross-cutting issues.
- There are currently no projects with a primary focus on workplace safety. However, a total of 15 projects, comprising $1.7 million annually, do address some aspect of safety as a part of the research.
- The Department of Defense funds the single largest U.S. project with high relevance to engineered nanomaterials.
- The potential hazard of engineered nanomaterials (46 relevant projects, $5 million) and exposure to engineered nanomaterials (42 relevant projects, $5 million) are the most well-addressed areas of research within the US. In addition to safety, environmental impact and disease (4 relevant projects, $0.5 million) and control (10 relevant projects, $0.5 million) are the least well-addressed areas of research.
- In addition to government-funded research, the inventory includes 8 projects, comprising $2 million, funded by industry, foundations, and other sources. These non-governmental funders include Dupont Corporation, the American Chemistry Council, and the United Auto Workers (UAW) and the International Truck and Engine Corporation.
- Well over 50 percent of highly relevant research within the U.S. is focused on human health implications of engineered nanomaterials, while a little over one-third of all research primarily of relevance to environmental impact.
- Nearly three-quarters of all highly relevant U.S. research in the inventory is related to the lungs, with the remaining research projects covering implications to the skin, central nervous system and the cardiovascular system. There are no projects listed with specific relevance to the impact of engineered nanomaterials to the gastrointestinal tract.

International Risk-Related Research Investment

- The inventory contains 208 projects, totaling $38 million, funded by 6 different countries and regions, including the European Union, United Kingdom, Canada, Germany, and Taiwan.
- With 12 projects, totaling $7.5 million, the European Union is the second largest funder of risk-related nanotechnology research in the world.
- The EU's largest project is the NANOSAFE 2 initiative, totaling $15 million over 3 years. This initiative is not aimed at solving all the problems related to nanoparticle safety but "intends to treat thoroughly a limited number of reference particles and situations in order to bring the first effective industrial solutions." The project is jointly funded between the European Commission (approximately $8.5 million) and non-government partners (approximately $6.5 million).