EPA
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Agency

Nanotechnology: EPA Research Directions

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EPA Nanotechnology Research Activities

Extramural Grants

- Through 2005, 65 grants awarded for approx. $22 million
- Approx. 50/50 applications and implications research
- Grants for 2006 on implications are in process of final selection/funding by EPA, NSF, NIOSH, NIEHS.
- Information available online at **www.epa.gov/ncer/nano**

In-house Research

- EPA's scientists have done research on toxicity of ultrafine particulate matter and are gathering info on various environmental applications.
- Budget proposal for 2008 provides funding for EPA in-house research

Agency research strategy in development for integrated intramural and extramural research.

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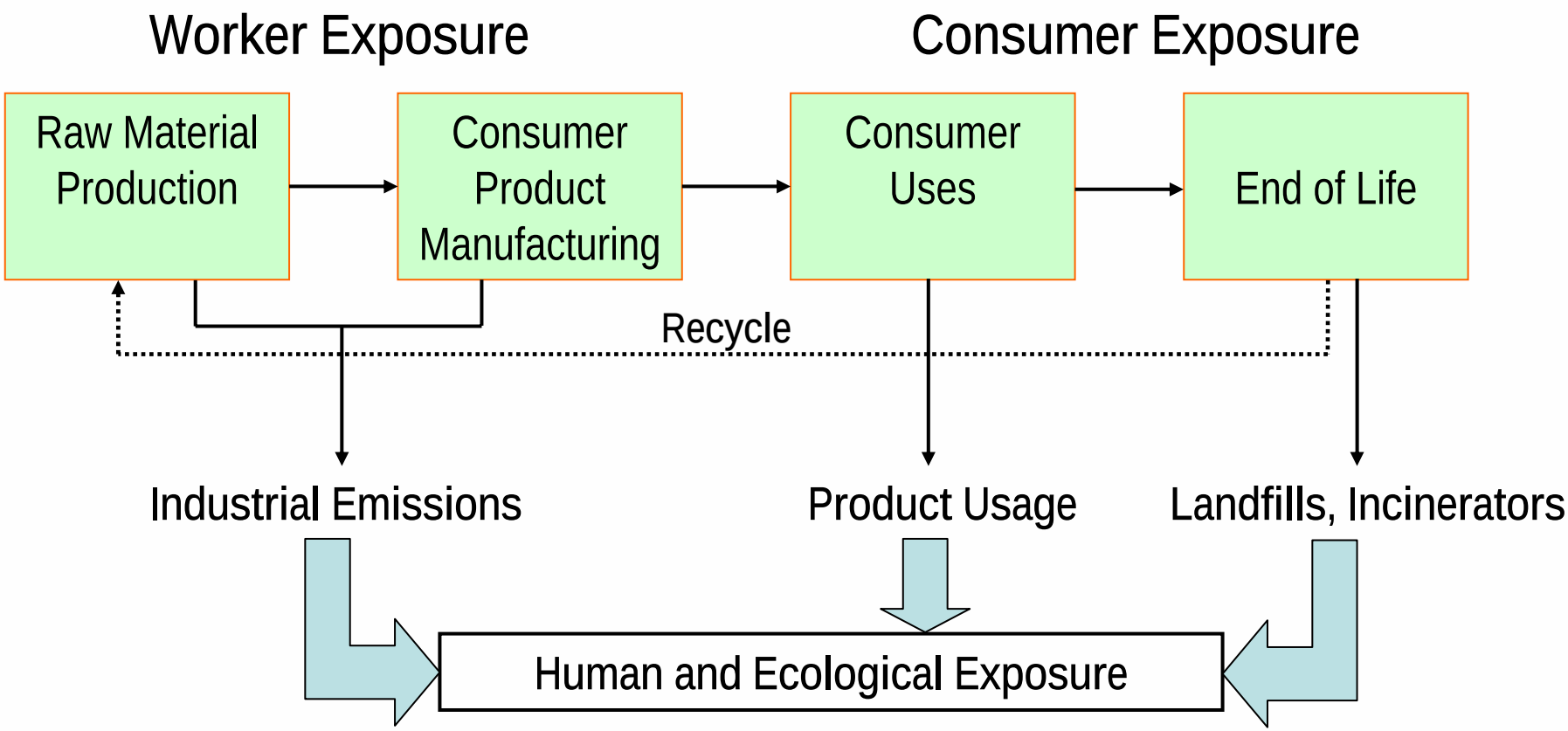
Risk Assessment: Life-Cycle Approach



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Decision Support: Characterization Research Needs

What are the unique chemical and physical characteristics of nanomaterials?

- How do these affect reactivity, toxicity?
- How will manufacturing processes, formulations, incorporations in end products, and alterations in the environment affect characteristics of nanomaterials?
- Are there adequate methods to characterize nanomaterials?

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Decision Support: Fate, Transport, Transformation Research Needs

- **Transport:** How do, and how much do, nanomaterials (NM) move through air, ground and surface water sediment, soil? Do NMs bioaccumulate?
- **Transformation:** Do NMs react differently than their bulk counterparts? How do aggregation, sorption, agglomeration affect transformation?
- **Chemical Interactions:** How do NMs and chemicals sorbed to them influence their respective environmental interactions, mobility, reactivity?
- **Treatment:** What is the potential for NMs to bind to soil, sediment, waste water sludge, binding agents in wastewater treatment facilities? Are they removed by conventional waste water and drinking water treatment methods? Do they impact the treatability/removal of other substances?
- **Detection:** Are existing methods capable of detecting characterizing, quantifying NMs in environmental media?

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Decision Support: Human Health and Ecological Effects Research Needs

- Are current testing schemes and methods (e.g., organisms, endpoints, exposure regimes, dose metrics, analytical methods) applicable to testing NMs?
- What are the effects (local, systemic, acute and chronic) of exposure to NMs or their byproducts?
- What are the absorption, distribution, metabolism, and elimination parameters for various NMs?
- How do variations in manufacturing, processing, surface modifications affect toxicity of various NMs?

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Possible Research Directions

2007 and 2008

- Environmental fate, transport, transformation, and exposure
- Monitoring and detection methods

Resulting data would be used to inform and develop effects and exposure assessment methods, and identify important points of releases for potential management.

2009 – 2012

- Health and ecological effects, understanding toxicity of the altered materials (as identified in 2007-2008). To be informed and refined by case studies, to be initiated in 2007, to elicit information on how to address high-exposure-potential nanomaterials.
- By 2011-2012, develop systematic and integrated approaches to assess, manage, and communicate any identified risks associated with nanomaterials in the environment.

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Activities to Advance These Directions

- Requested $10.3 million under President's budget for nanotechnology research in FY 08, including $4.7 million for an in-house nanotechnology research program.
- Developing a strategic research plan that will focus on fate, transport, transformation, and measurement/detection from a life-cycle perspective.
- Participating with other agencies to develop a national prioritized research plan.
- Participating on OECD working party on the Health and Environmental Safety Implications of Manufactured Nanomaterials.
- Continuing collaborations with federal agencies, industry, professional societies, academia, and international communities.