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Key considerations for environmentally benign nanotechnology: a conceptual framework

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What makes a technology or a material “sustainable”?

Eco-Material discussion in Japan

- Substances and materials that serve the sustainability of human society in harmony with the global environment (Rare Metals Forum, 1991).

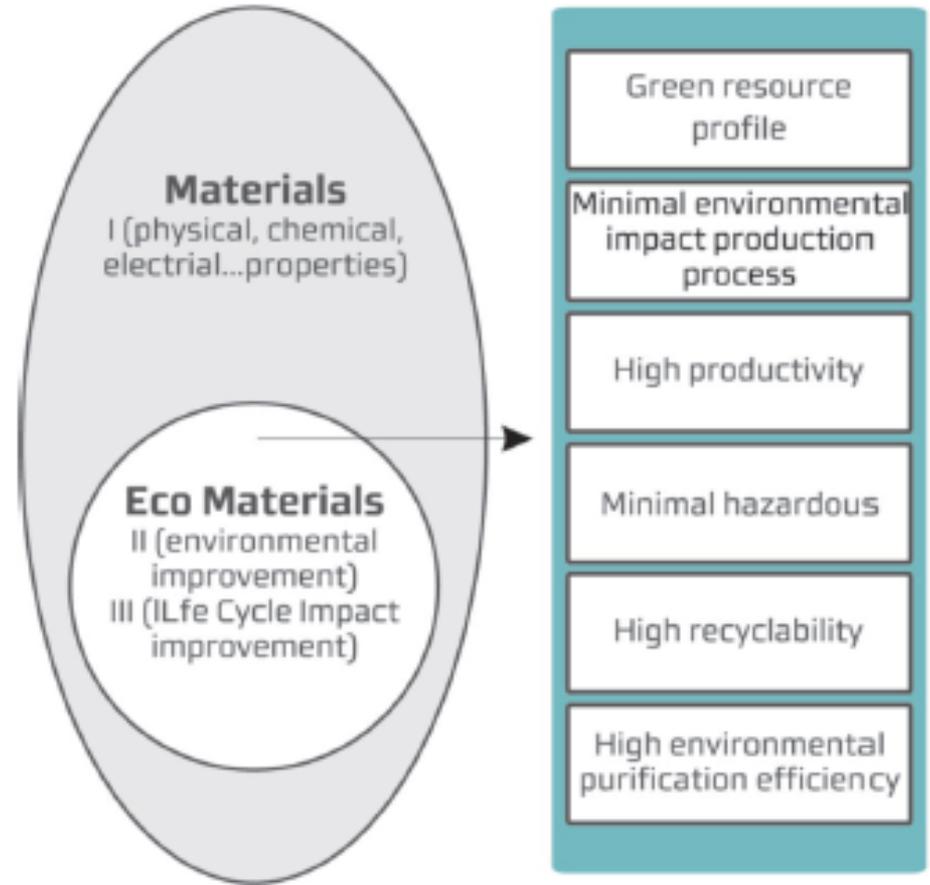


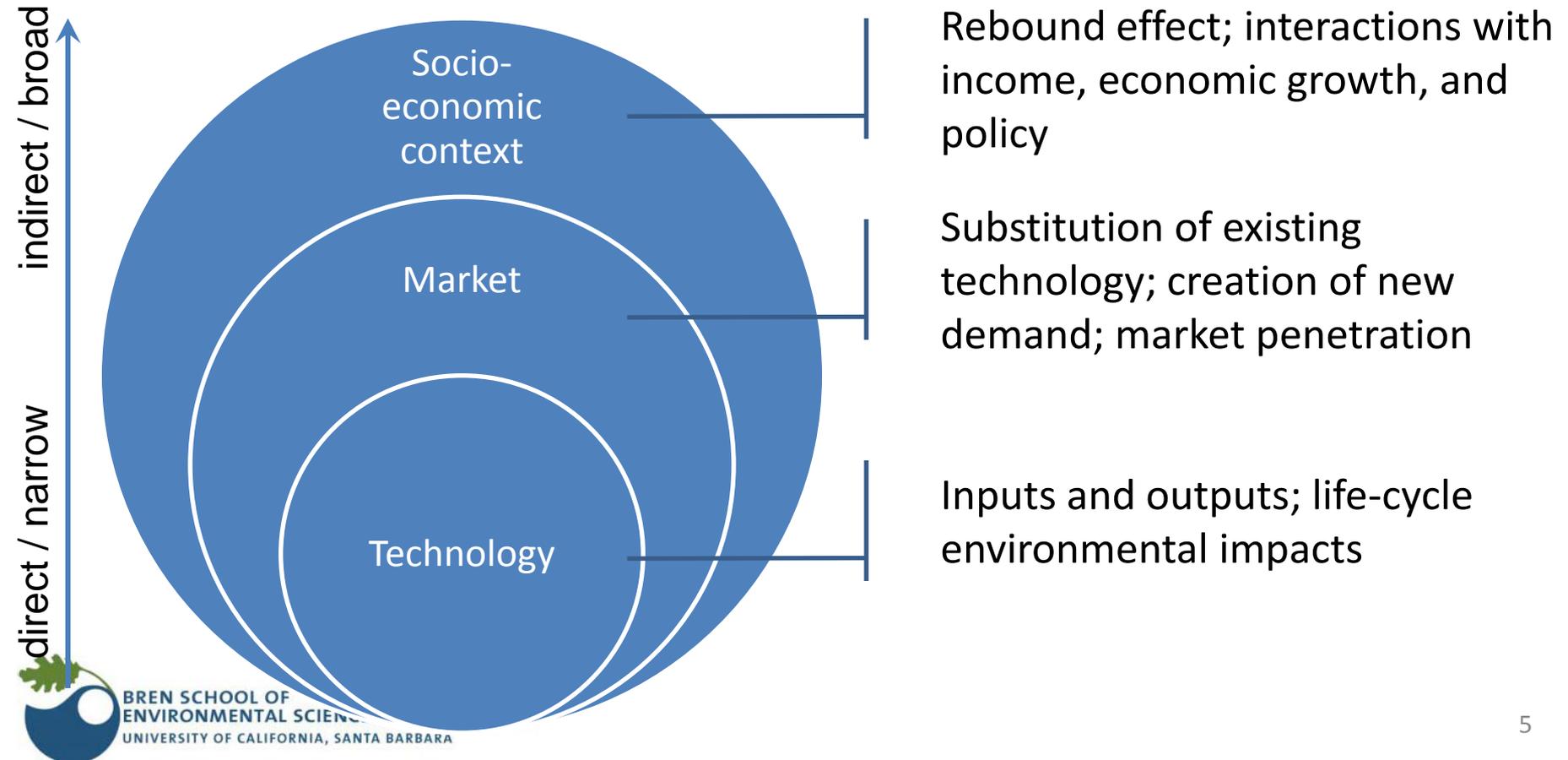
FIGURE 1 CONCEPTUAL MODEL OF ECO-MATERIALS WITHIN THE CONTEXT OF MATERIAL SCIENCE



- Green chemistry consists of chemicals and chemical processes designed to reduce or eliminate negative environmental impacts. The use and production of these chemicals may involve reduced waste products, non-toxic components, and improved efficiency. (<http://www.epa.gov/greenchemistry/>)
- Sustainable Chemistry hierarchy
 - Source Reduction/Prevention of Chemical Hazards
 - Reuse or Recycle Chemicals
 - Treat Chemicals to Render Them Less Hazardous
 - Dispose of Chemicals Properly

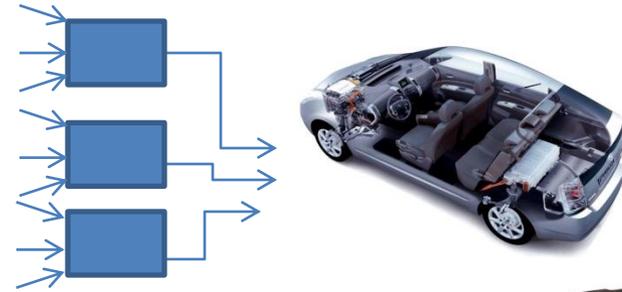
Key considerations

- Three adjoining scales of interaction



Example: hybrid car

- Technology-level
 - Life-cycle environmental impacts of hybrid car production.
- Market-level
 - Marginal displacement or net addition.
- Socio-economic level
 - Implications on additional disposable income.



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Take-home message

- Understanding a technology's or a material's intrinsic characteristics that determine its life-cycle environmental impact is a start.
- Sustainability of a technology or a material can only be manifested through its complex interactions with the market and the socio-economic embeddings under which it is deployed and utilized.

Hybrid Humby is finally here



Thank you!

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