

Managing occupational safety and health risks of nanotechnology

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INSTITUTE OF OCCUPATIONAL MEDICINE

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Who we are?

- Multidisciplinary research, consultancy, training, occupational and environmental health, hygiene, risk
- Core values
 - Independence, Impartiality, Authority
- Deep insight for
 - Problem definition & evaluation
 - Practical solutions
- Charitable status - not for profit
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- Since 1st September 2012
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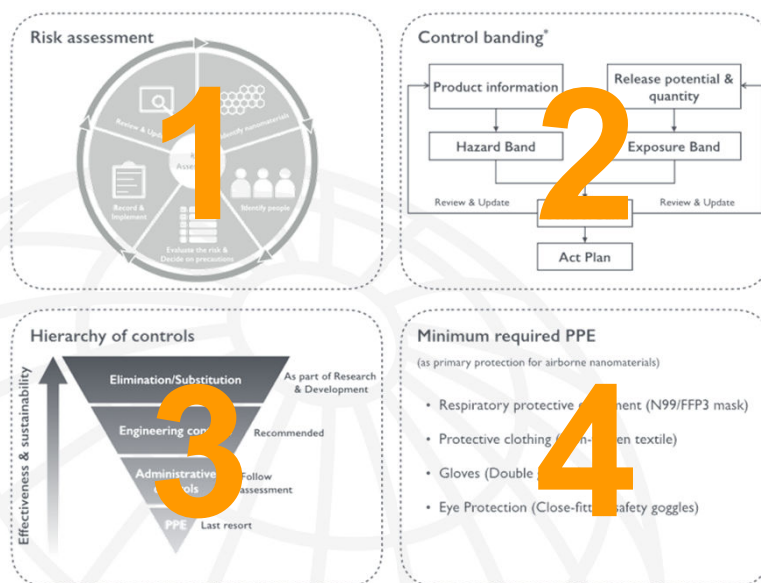
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What you will learn



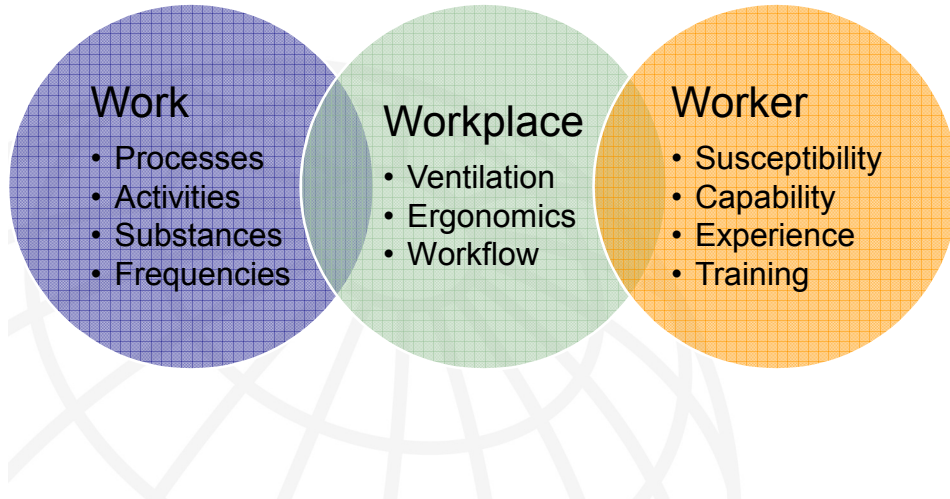
- Risk management starts by understanding the risk and the “risk landscape” i.e. the circumstances
- RiskMapping translates this into an abstract format for strategic decision making by company leaders
- Risk can be “purchased” and “sold” – need to think up and down the value chain
- Risk management: target hazard and exposure
- Managing exposure is easy by controlling release

Classical risk management strategy



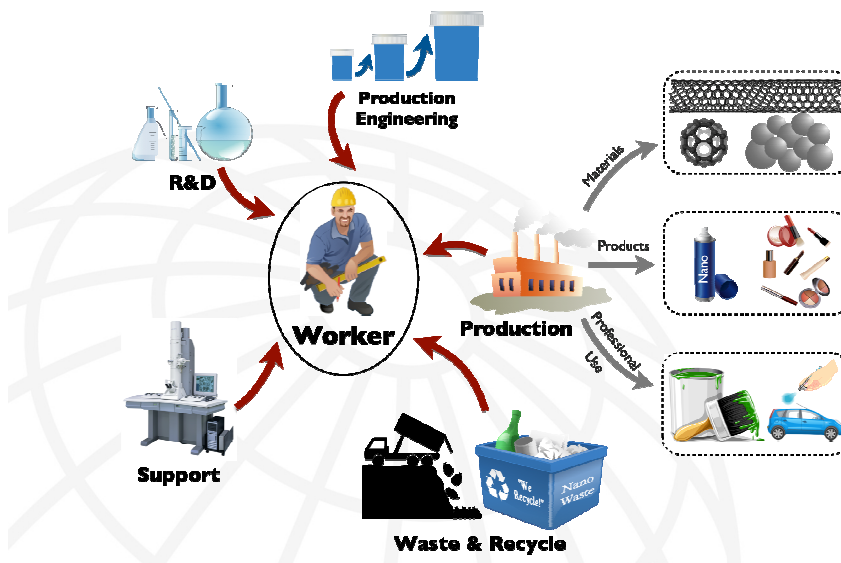
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Classical targets of risk assessment



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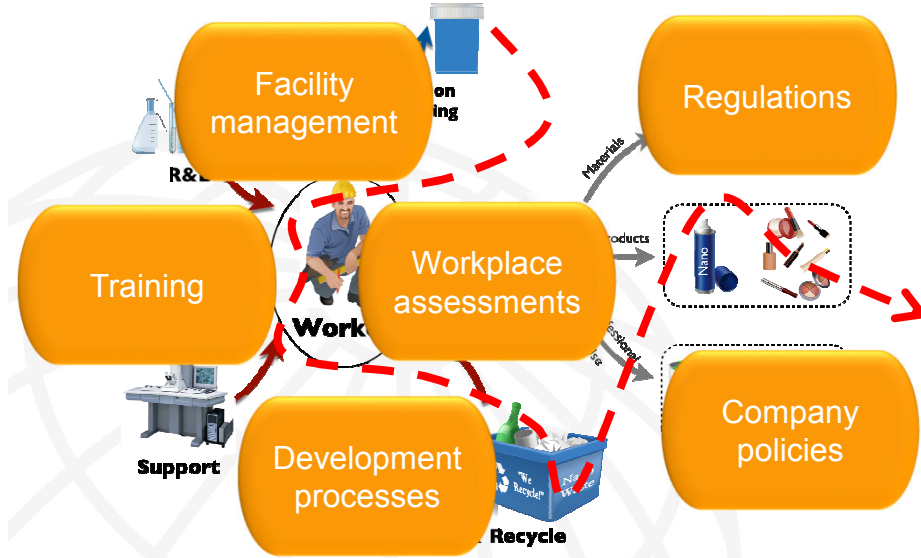
System Definition – very large!



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System Definition – even larger!

Understand Risk Landscape  Risk Mapping



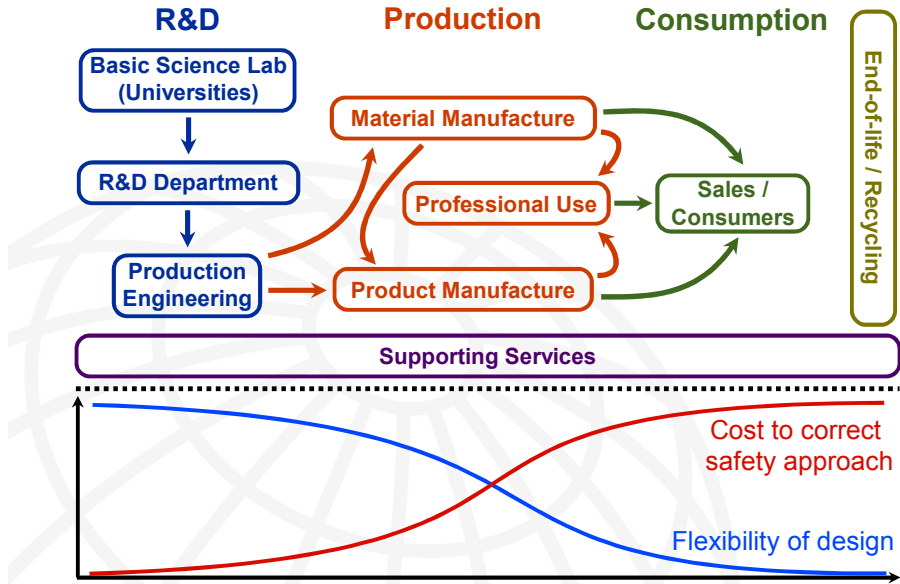
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The RiskMap – get the full picture



www.iom-world.sg/services/safety-of-nano/riskmap/

Risk purchased and sold: Value Chain



Risk management must target hazard AND exposure



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Risk: hazard x exposure



	Low exposure	High exposure
Low hazard	A small white kitten sitting in a blue litter box inside a wire cage. The background is a solid green color.	A close-up photograph of a tabby cat's face with its mouth open, showing its tongue and teeth. The background is a solid yellow color.
High hazard	A tiger lying down in a cage, looking out through the metal bars. The background is a solid yellow color.	A tiger roaring with its mouth wide open, showing its sharp teeth and tongue. The background is a solid red color.

Safer work practices reduce exposure



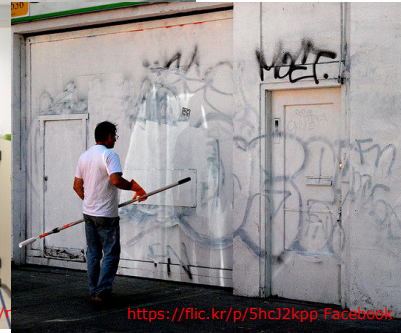
How to safely apply a nano dispersion onto a surface?

Spraying nano TiO₂

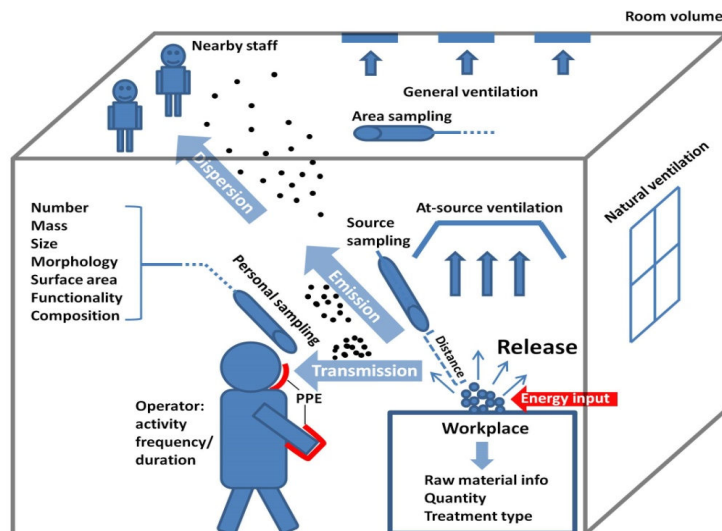
Better protection



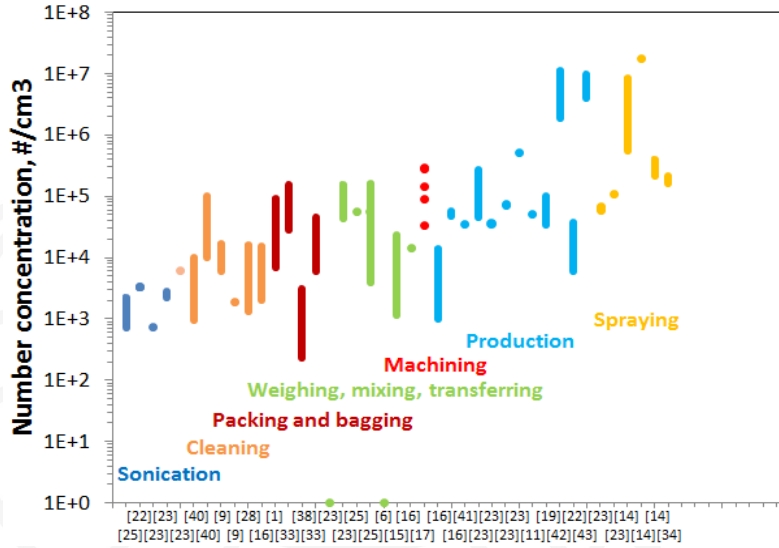
Safer application method



Release controls exposure

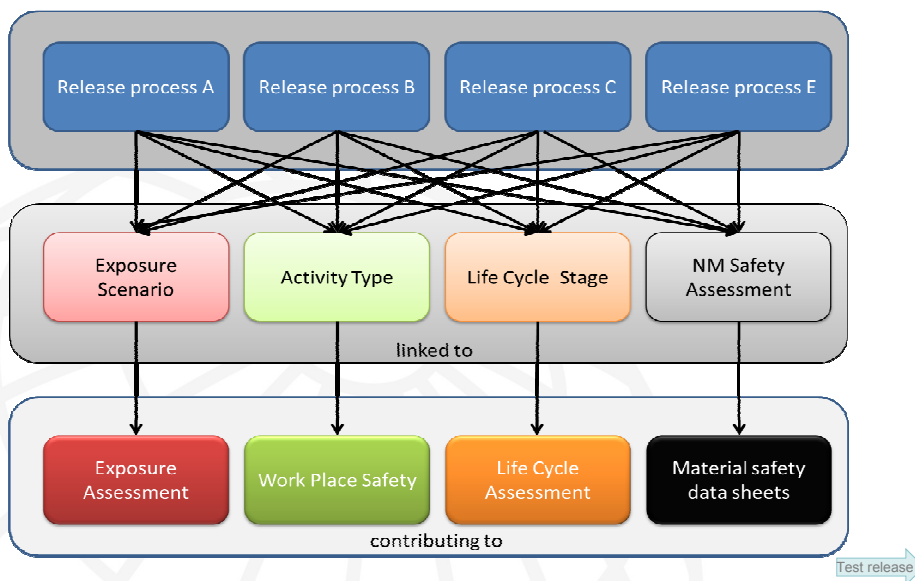


Grouping of release



Ding Y et al. J Hazard Mater. 2017:322, 7–28.

Framework of release



What are the exposure limits?



No official nano-specific Exposure Limits, but...

- **Legal obligation** to protect from risk
- **Recently** introduced new “inert dust” limits
 - Germany: 300 $\mu\text{g}/\text{m}^3$ biopersistent alveolar dust (dust with density 1)
 - Switzerland: 150 $\mu\text{g}/\text{m}^3$ for diesel particulates
- **Recommended Exposure Limits (REL)**
 - nano-TiO₂ (many countries: 300 $\mu\text{g}/\text{m}^3$)
 - CNTs (USA: 1 $\mu\text{g}/\text{m}^3$, UK, CH: 0.01 fibres/ml)
- **In discussion**
 - By precaution, nano OEL = 1/10 * {regular OEL}

Final notes



- Risk management starts with a look at the whole risk landscape.
- RiskMapping creates an abstraction layer useful for strategic decision making by company leaders.
- Risk can be reduced by addressing not just hazard but also release and exposure.
- Smart engineering assesses release as part of the development of new products and processes.

Thank you!



For questions: michael.riediker@iom-world.sg
or visit
www.SAFENANO.org

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