Tools for assessing the value of Nanotechnology

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Background

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- Environmental
  - Recycling
  - Resource efficiency
  - Ecolabel
- Critical materials/security of supply
- Sustainable innovation
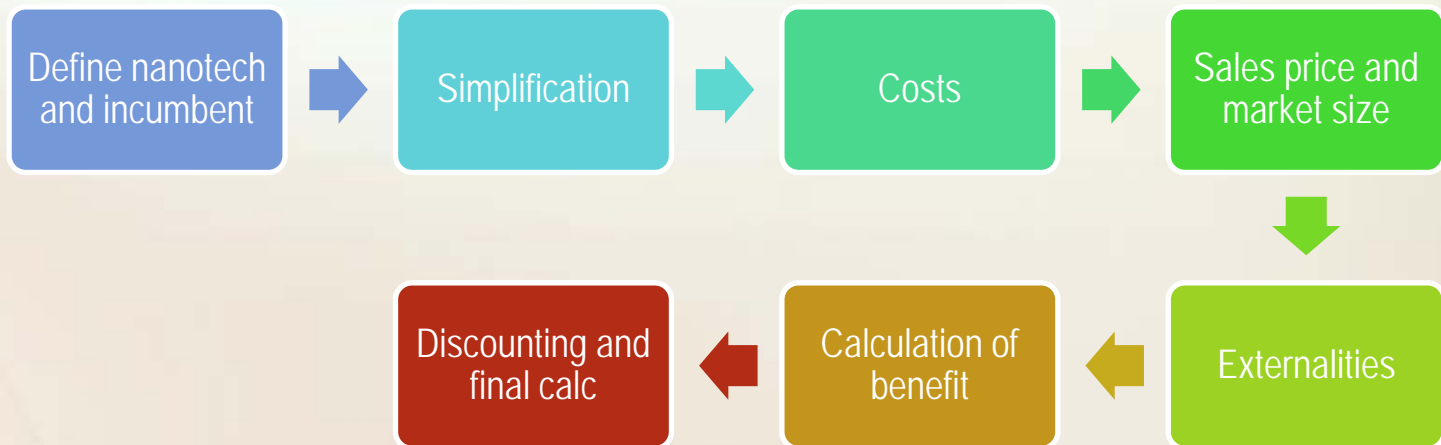 - Project monitoring
  - Nanotechnology

Project

- OECD review methodologies for assessing nano
  - STAR
  - Defra
- Defra (UK) sponsored project
- **Comparative** Valuation of nanotechnology

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The Defra valuation model

$$€ = \begin{array}{c} \text{Consumer Valuation – Sales Price} \\ + \\ \text{Sales Price – Production Costs} \\ + \\ \text{External factors} \end{array} \qquad \left[\begin{array}{c} \text{Consumer surplus} \\ + \\ \text{Producer Surplus} \\ + \\ \text{Externalities} \end{array} \right.$$

Define nanotech and incumbent → Simplification → Costs → Sales price and market size

Discounting and final calc ← Calculation of benefit ← Externalities

Simplified spreadsheet

Variables needed

Insert your figures into the variables in red

For enhanced performance, sum: PA, PB etc to get P0 and CA, CB etc to get CA.

Q_0	1	Market size of the incumbent (step 9)				
P_0	2	Price of the incumbent (step 8)		**Geographic change (step 5)**		note: This is the amount of
C_A	1	Incumbent unit cost (step 7)				geographic region of intere
C_N	0.5	Nano-enabled product unit cost (step 7)		Incumbent	100 %	nano-enabled product. Fig
P_N	1	Nano-enabled product price (step 8)		nano-enabled product	100 %	for products for regions tha
n	20	Time length (step 5)				products

Discount rate	1.04	input 1.04 for technologies on the market 1.08 for technologies with future release dates (step 12)
Years to market	0	Use to insert number of rows for columns C to I in workbooks Scenario I and III and Scenario II and IV (see example workbook for illustration)

Scenario	**II or IV**	Select the scanario from the drop down box (Step 4)

Externality 1 (step 10)

|		
V_A^i	1	Volume of externality emitted for the incumbent (per market unit)
V_N^i	0.5	Volume of externality emitted for the nano-enabled product (per market unit)
c^i	1	Unit cost of the externality

Results

Product	Incumbent	Externalities	Value (over 20 years)
Gas-impermeable packaging	Plastic packaging, reduction in food waste	Waste	£1bn
Fuel replacement catalysts	Fuel	CO_2	£3.3bn
Antifouling paints	Fuel	CO_2	£143m
Remediation with nZVI	Traditional treatment and land depreciation	None	£1bn

Other methodologies

- Biotech, Biopharm, the Human Genome Project, ICT, health research
- Key points:
  - I/O model – very widely used
  - CBA
  - Difficult to draw comparisons (even with Biotech)
  - Different stages of the life cycle

A question of scope
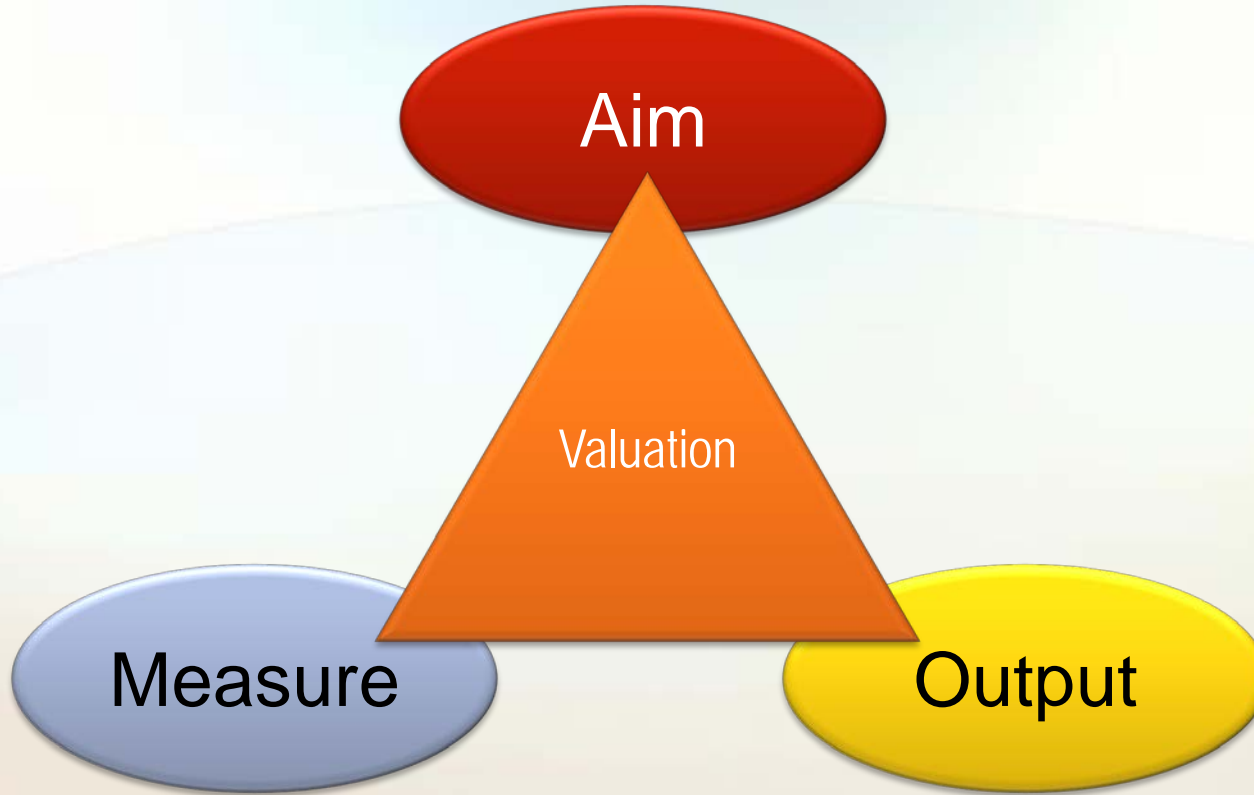
Defra and STARmetrics

Defra model	STAR metrics
AIM	
Government and industry	Government
Influencing spend	influence policy
MEASURES	
Competing technology costs	Spend, patents etc
Focused / small data set	large data set
OUTPUTS	
Forecast / application focused	Retrospective / intra discipline
Money	Other indicators

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Key Considerations

Lack of Information	• Backwards • Forwards
Replacement technology	• Secondary impacts
Investment	• Identification of investment • Disaggregating
Diffusion	• Market uptake
Spillover effect	• Measurement is difficult
Product lifecycle	• Significant uncertainty

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Thank you

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http://www.oakdenehollins.co.uk/sustainable-innovation.php

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Point to consider

- The model is determined by the needs
- Most models focus on current benefit
- Data quality is key