Linking Risk and Sustainability

to meet current and future challenges in circular economy, food safetyand consumer protection

Peter Fantke
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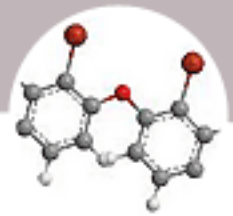
BfR Symposium | Berlin | 1-Dec-2017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Risk and Sustainability Perspectives

Risk assessment

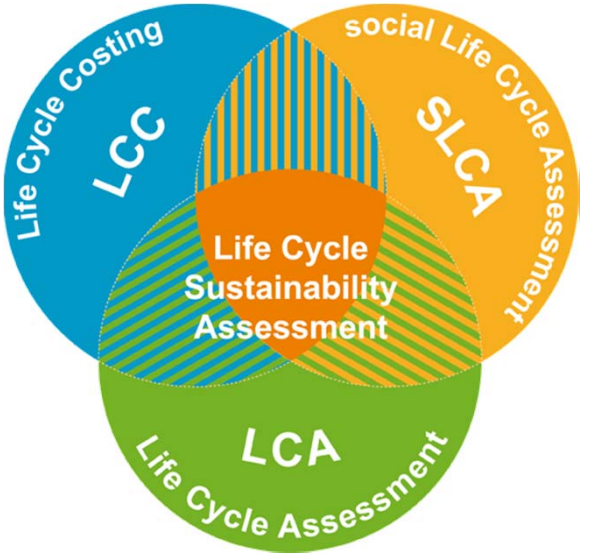
- Inherent hazards
- High precision
- Ensuring safety

Sustainability assessment

- Life-cycle perspective
- All local-to-global impacts
- … also social & economic impacts (17 UN goals)
- Ensuring sustainability

Different questions

- **Is it safe?**
- **Is it sustainable?**

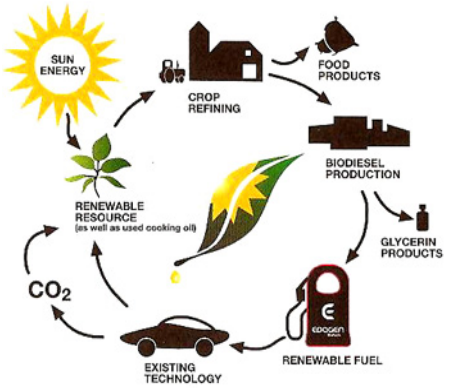


Sustainability and the Life Cycle

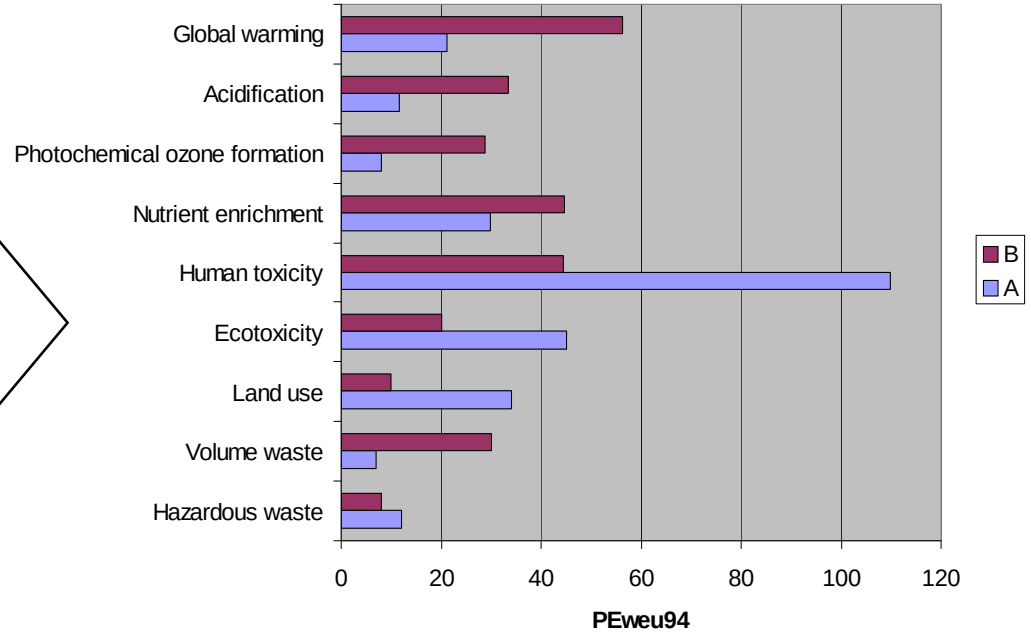
Inventory of environmental exchanges

		Emission	Emission
	CAS.no.	to air	to w ater
Substance		g	g
2-hydroxy-ethanacrylate	816-61-0	0.0348	
4,4-methylenebis cyclohexylamine	1761-71-2	5.9E-02	
Ammonia	7664-81-7	3.7E-05	4.2E-05
Arsenic (As)	7440-38-2	2.0E-06	
Benzene	71-43-2 (cur	5.0E-02	
Lead (Pb)	7439-92-1	8.5E-06	
Butoxyethanol	111-76-2	6.6E-01	
Carbondioxide	124-38-9	2.6E+02	
Carbonmonoxide (CO)	630-08-0	1.9E-01	
Cadmium (Cd)	7440-46-9	2.2E-07	
Chlorine (Cl2)	7782-50-5	4.6E-04	
Chromium (Cr VI)	7440-47-3	5.3E-06	
Dicyclohexane methane	86-73-6	5.1E-02	
Nitrous oxide(N2O)	10024-97-2	1.7E-02	
2,4-Dinitrotoluene	121-14-2	9.5E-02	
HMDI	5124-30-1	7.5E-02	
Hydro carbons (electricity, stationary combusti	-	1.7E+00	
Hydrogen ions (H+)	-		1.0E-03
i-butanol	78-83-1	3.5E-02	
i-propanol	67-63-0	9.2E-01	
copper (Cu)	7740-50-8	1.8E-05	
Mercury(Hg)	7439-97-6	2.7E-06	
Methane	74-82-8	5.0E-03	
Methyl i-butyl ketone	108-10-1	5.7E-02	
Monoethyl amine	75-04-7		7.9E-06
Nickel (Ni)	7440-02-0	1.1E-05	
Nitrogen oxide (NOx)	10102-44-0	1.1E+00	
NMVOC, diesel engine (exhaust)	-	3.9E-02	
NMVOC, pow er plants (stationary combustion)	-	3.9E-03	
Ozone (O3)	10028-15-6	1.8E-03	
PAH	ikke specifik	2.4E-08	
Phenol	108-95-2		1.3E-05
Phosgene	75-44-5	1.4E-01	
Polyeter polyol	ikke specifik	1.6E-01	
1,2-propylenoxide	75-56-9	8.2E-02	
Nitric acid	7782-77-6 (c	8.5E-02	
Hydrochloric acid	7647-01-0 (c	1.9E-02	
Selenium (Se)	7782-49-2	2.6E-05	
Sulphur dioxide(SO2)	7446-09-5	1.3E+00	
Toluene	108-88-3	4.8E-02	
Toluene-2,4-diamine	95-80-7	7.9E-02	
Toluene diisocyanat (TDI)	26471-62-5	1.6E-01	
Total-N	-		2.6E-05
Triethylamine	121-44-8	1.6E-01	
Unspecified aldehydes	-	7.5E-04	
Uspecified organic compounds	-	1.5E-03	
Vanadium	7440-62-2	1.8E-04	
VOC, diesel engine (exhaust)	-	6.4E-05	
VOC, stationary combustion (coal fired)	-	4.0E-05	
VOC, stationary combustion (natural gas fired)	-	2.2E-03	
VOC, stationary combustion (oil fired)	-	1.4E-04	
Xylene	1330-20-7	1.4E-01	
Zinc (Zn)	7440-66-6	8.9E-05	

Analysed life cycle



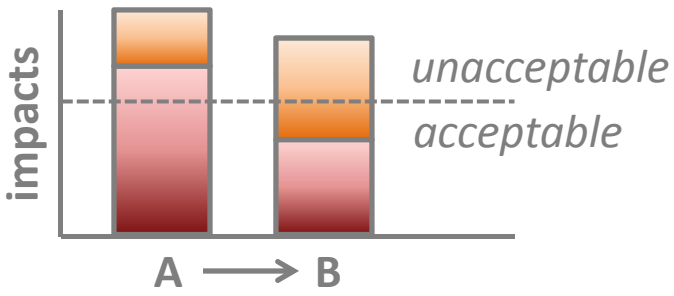
Environmental profile of solutions



Toward Optimal Solutions

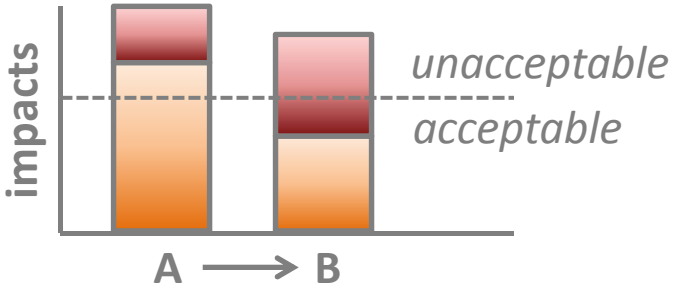
Safe but unsustainable → **unacceptable**

- Ensuring hygiene using disposable equipment
- Using zinc oxide as growth promoter in pigs



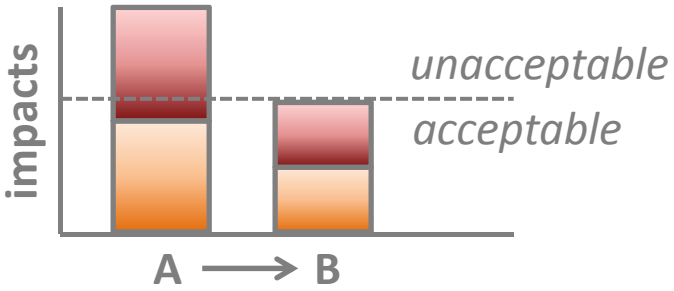
Sustainable but not safe → **unacceptable**

- Gene crops with higher yields but risk for genome
- Recycling of plastics in food packaging materials

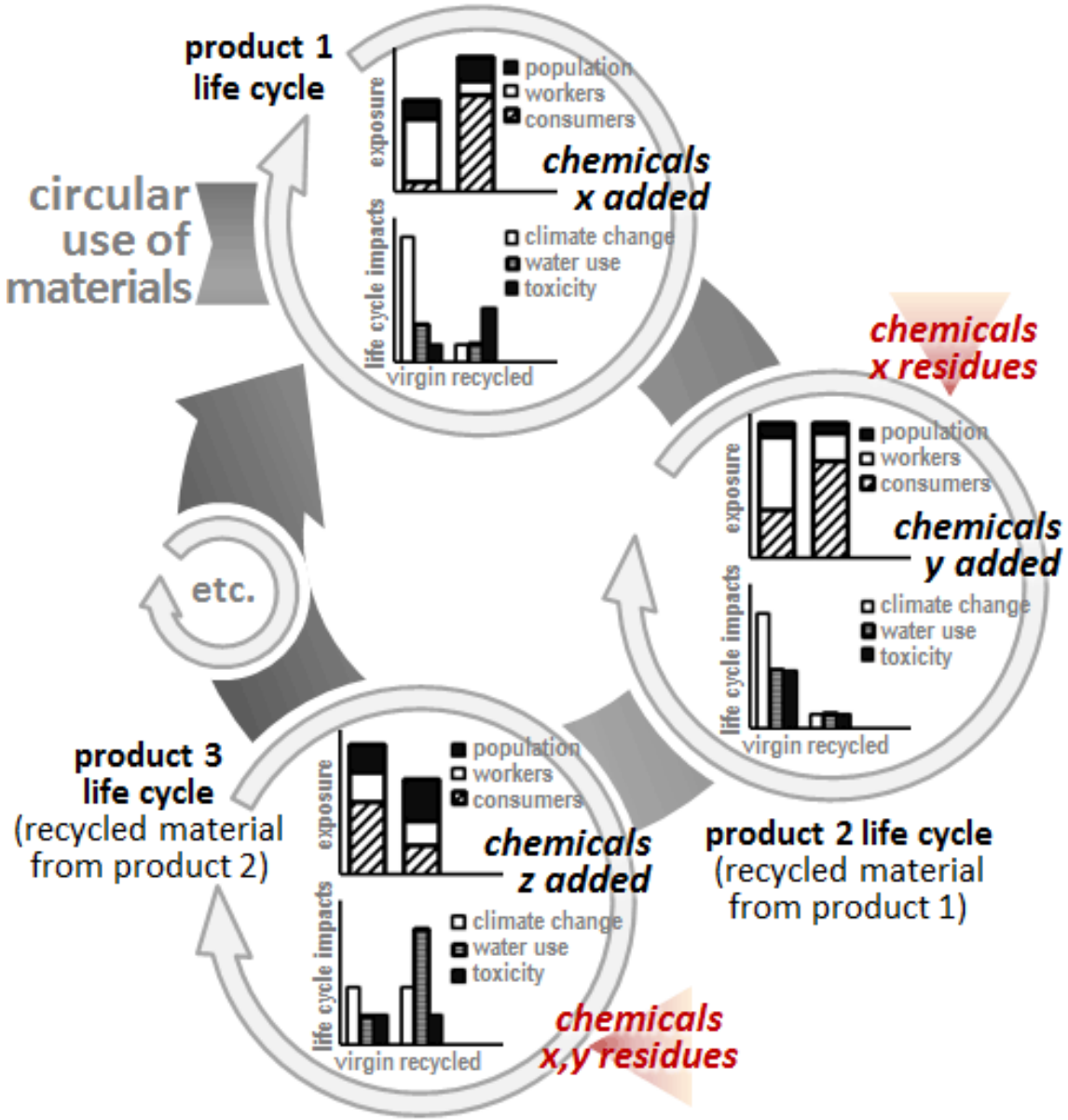


Safe and sustainable → robust solution

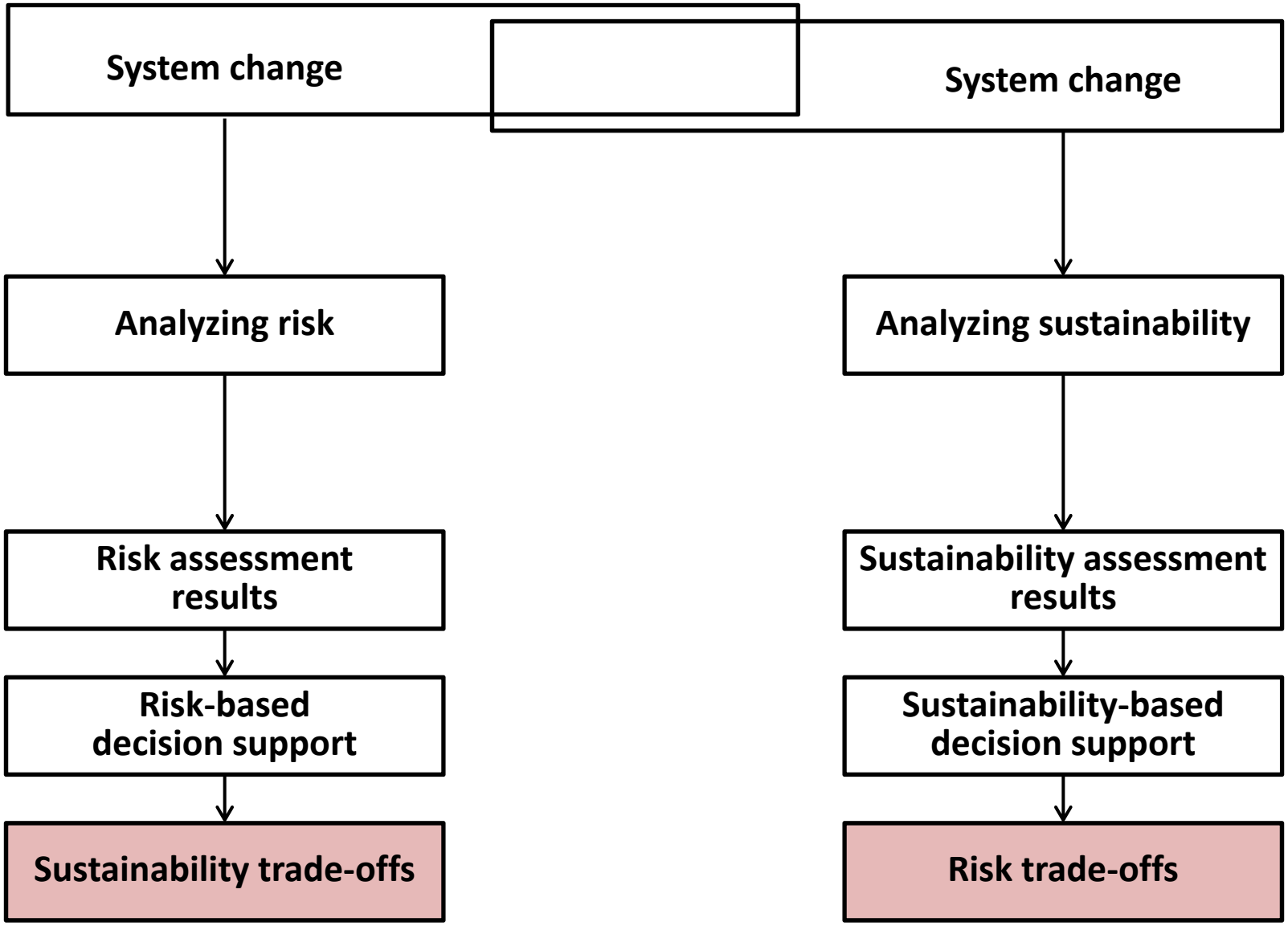
- Set safety requirements that respect sustainability implications and design solutions that ensure desired safety levels in a sustainable manner
- Identify, assess and manage risks accompanying ”sustainable solutions”



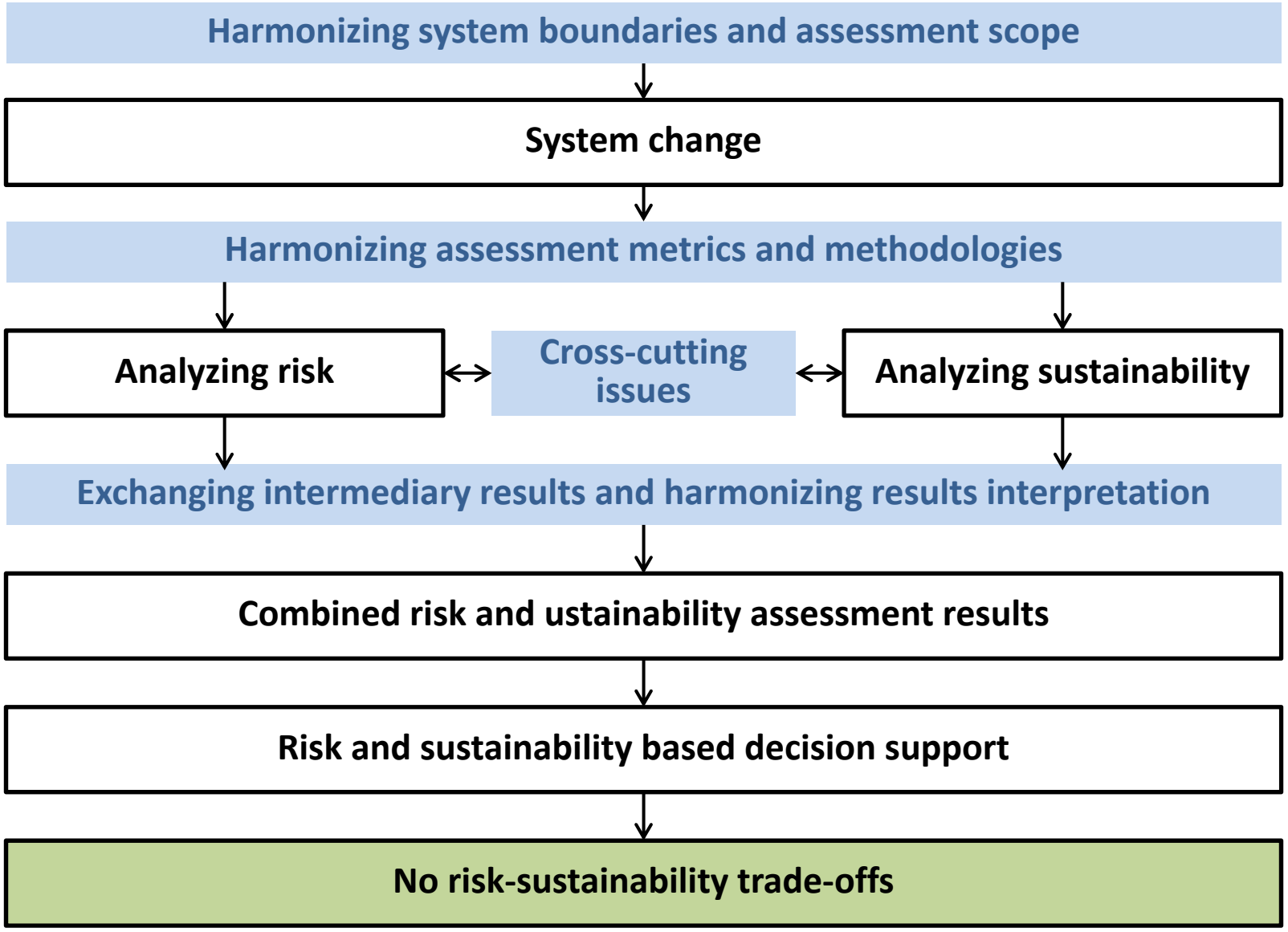
Example: Chemicals in Circular Economy



Risk vs. Sustainability → NO!



Combined Risk and Sustainability → YES!



Thank you!

… but wait …

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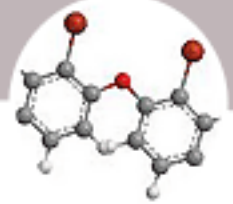


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We Still Have a Challenge

$$I = P \cdot A \cdot T = Pop \cdot \frac{GDP}{person} \cdot \frac{I}{GDP}$$

- *I* : environmental impact
- *Pop* : **global population**
- *A* : **affluence** (material standards of living)
- *T* : **technology factor** (impact per created value)

We Still Have a Challenge

$$I = P \cdot A \cdot T = Pop \cdot \frac{GDP}{person} \cdot \frac{I}{GDP}$$

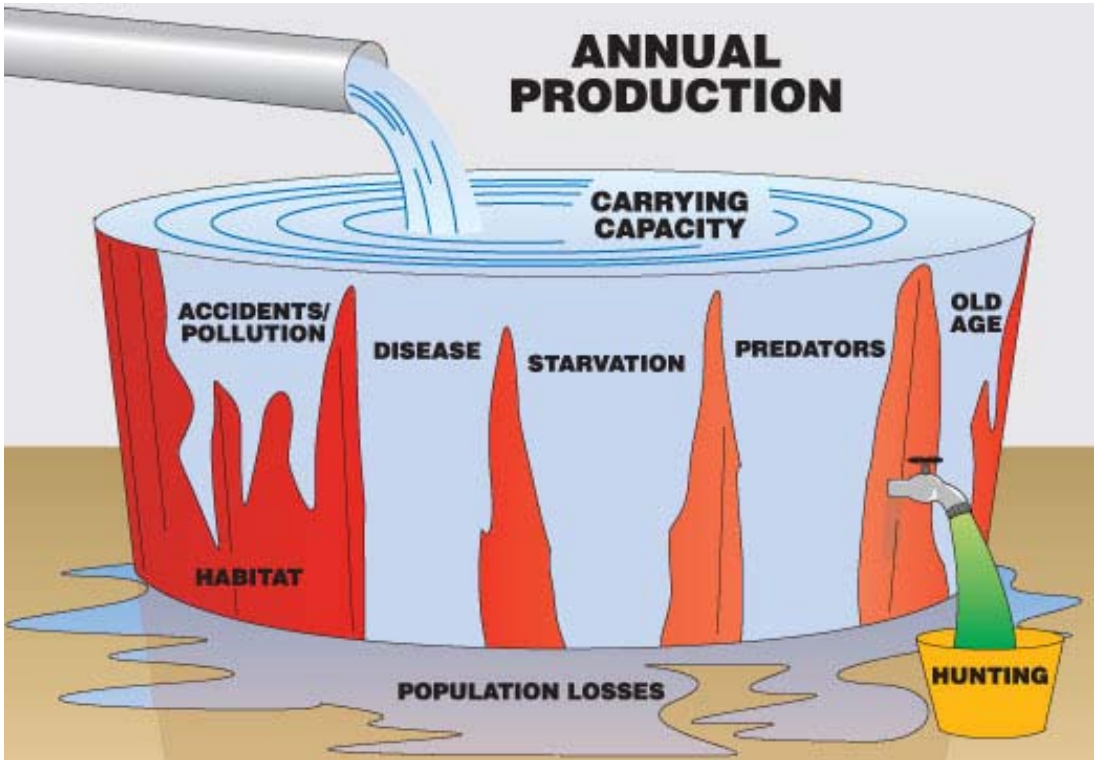
- Population may level off ~10 billion
- Material standards of living will grow strongly in newly industrialised regions(Asia, South America)
- Environmental impact already exceeds sustainable levels in many areas
- **So what is the challenge?**

We Still Have a Challenge

$$I = P \cdot A \cdot T = Pop \cdot \frac{GDP}{person} \cdot \frac{I}{GDP}$$

→ **Decrease impact per created value to be sustainable**

→ **What is ENOUGH?**



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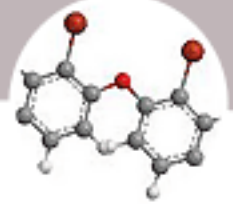


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