Food contact materials in a circular economy and a non toxic environment

Food Packaging Forum workshop 2016
October 25th 2016, Zürich

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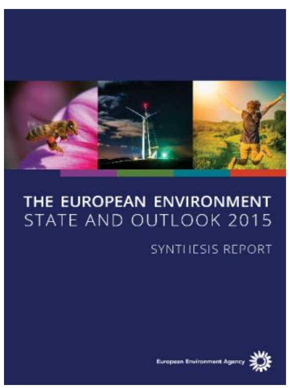


State and Outlook on the Environment Report 2015

European Environment Agency

Policy framework – 7th EAP

‘In 2050, we live well, within the planet's ecological limits.

Our prosperity and **healthy** environment stem from an **innovative**, **circular economy** where nothing is wasted and where natural resources are managed sustainably, and biodiversity is protected, valued and restored in ways that enhance our **society's resilience**. Our low-carbon growth has long been decoupled from resource use, setting the pace for a **global safe** and **sustainable society**.’

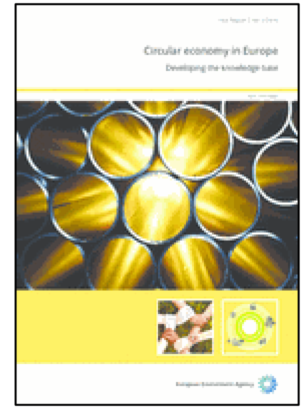
2015: European Commission issued a Circular Economy policy package:
EU recycling targets for municipal waste: 65% by 2030; packaging highlighted

7^{th} EAP: Strategy for a non-toxic environment by 2018

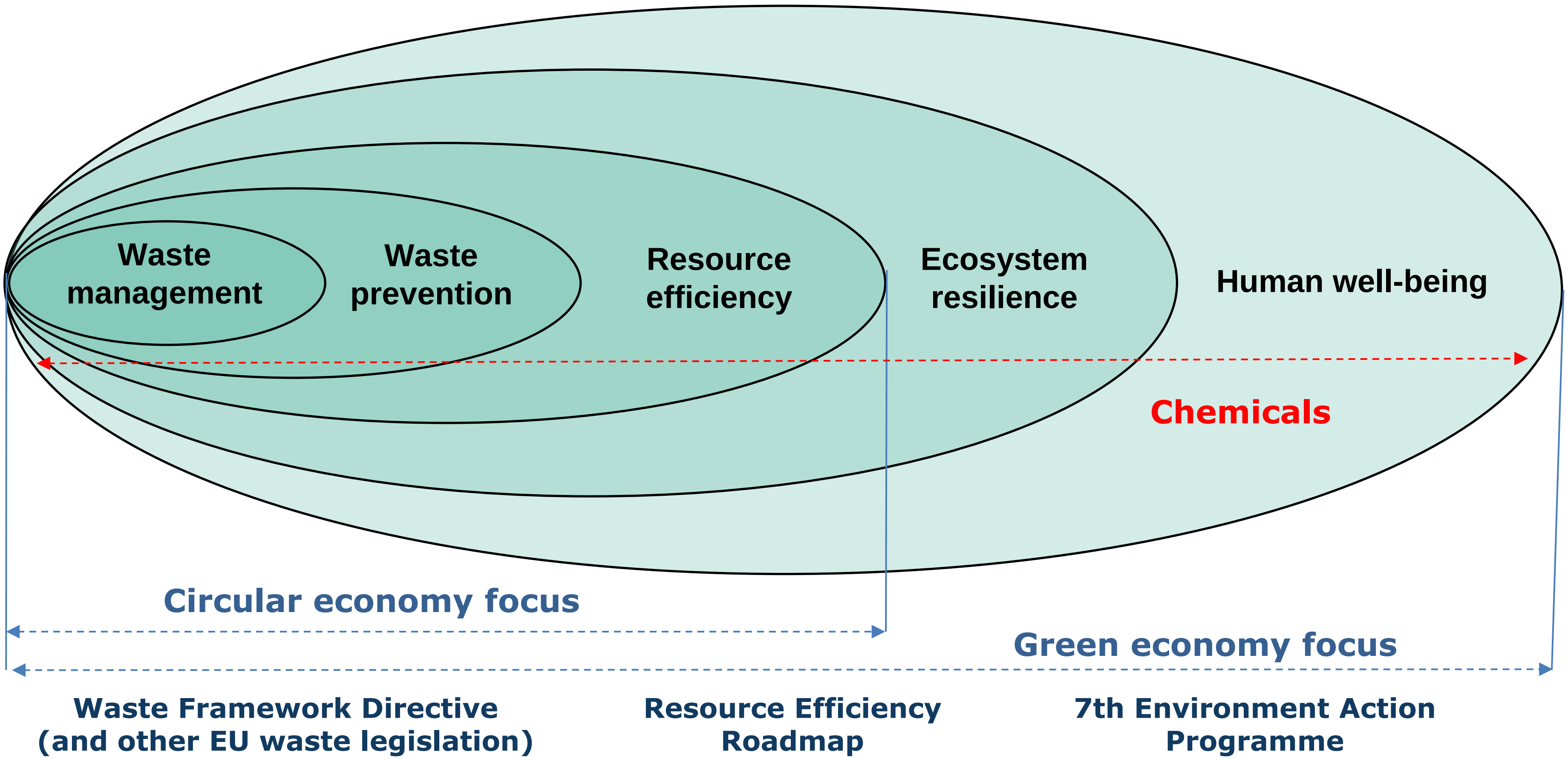
Topics considered

- The safety of children and other vulnerable groups
- Green chemicals
- Chemicals in products and non-toxic material cycles
- Innovation
- Substitution
- Extremely persistent chemicals
- Monitoring and surveillance –
  an early warning system for approaching
  chemical threats to health and the environment

**How to combine high recycling/reuse rates,
with non-toxic material cycles
staying clean over time?**



Chemicals in the circular & green economy



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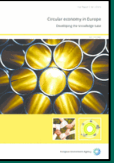


Key enabling factors in circular economy - 1

Eco-design

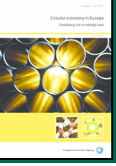
- products designed for a longer life
- product design based on the sustainable and minimal use of resources and enabling high-quality recycling of materials at the end of a product's life
- substitution of hazardous substances in products and processes

Recycling

- high-quality recycling of as much waste as possible
- use of recycled materials as secondary raw materials
- well-functioning markets for secondary raw materials
- avoidance of mixing and contaminating materials
- cascading use of materials

Economic incentives and finance

- shifting taxes from labour to natural resources and pollution
- phasing out environmentally harmful subsidies
- internalisation of environmental costs
- deposit systems
- extended producer responsibility
- finance mechanisms supporting circular economy approaches



Key enabling factors in the circular economy - 2

Business models

- product-service systems rather than product ownership
- repair, refurbishment and remanufacture given priority
- collaborative consumption
- collaboration and transparency along the value chain
- industrial symbiosis

Eco-innovation

- technological innovation
- social innovation
- organisational innovation

Governance, skills and knowledge

- awareness raising
  - making people care!
- participation, stakeholder interaction and exchange of experience
- education
- data, monitoring and indicators

FCM in the circular economy

Chemicals have key role in enabling or disabling the circular economy:

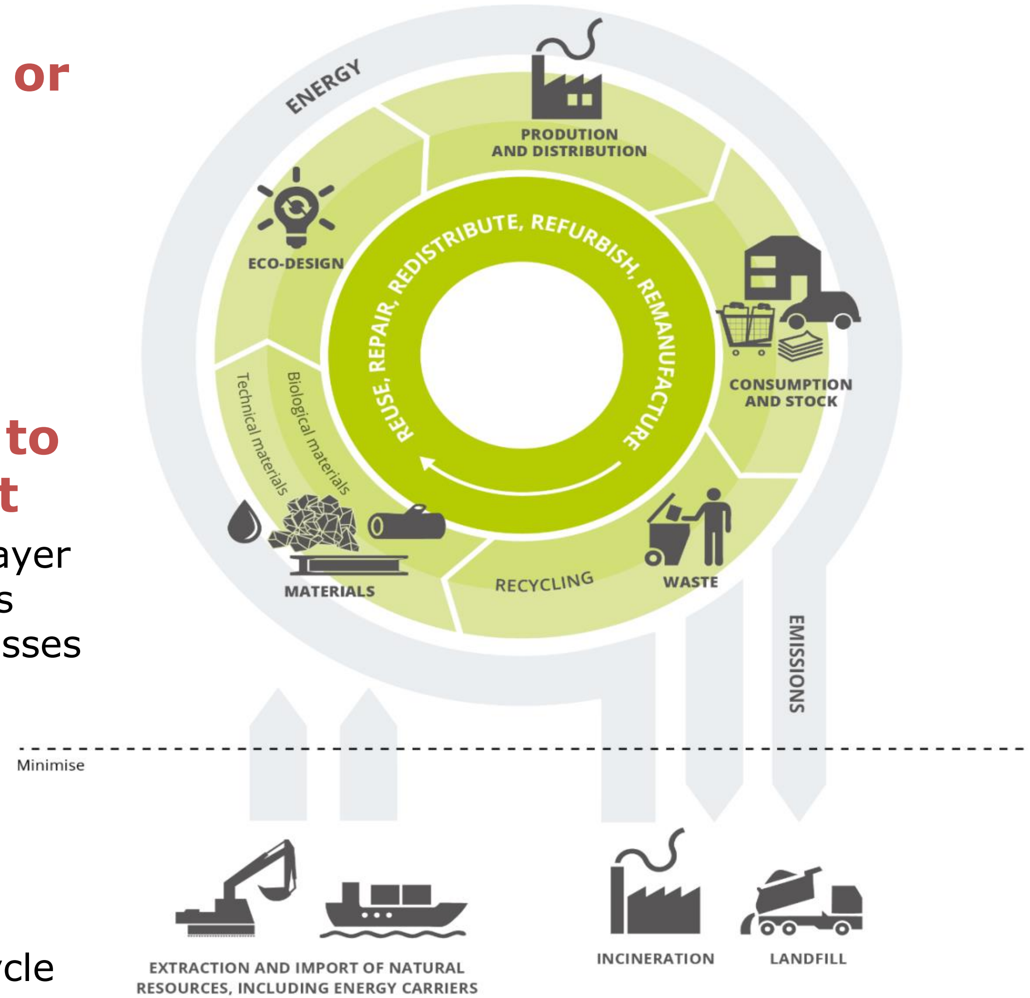
- Contamination/loss of resources and materials
  - Chemicals of concern in recycled materials?
  - Loss of functionality of FCM

FCMs are often combined materials to be barriers to food and environment

- Push towards low weight has resulted in multilayer materials: difficult to separate in waste streams => mixed (down-graded) materials/material losses

Longevity of materials: Number and length of cycles

- Total time a material is used before discarded
- Repeated vs. single use: every 'restart' of a cycle requires energy and resources
- How well are FCMs captured in the waste stream?



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FCM in the circular economy

- **Tracking of chemicals of concern (CoC) in FCMs**
  - Ongoing on which CoCs that are traced in the CE:
  - Motivation: Compliance w/legislation on FCM/workplace/waste, protection of brand
  - Methods: Analytical testing, supplementary documentation of compliance
  - Prioritization of which of the thousands of chemicals in FCM to track:
    - Specific legislation and likelihood of being present/used
  - Challenges:
    - Understanding/communication of information through supply chain
    - Documentation trustworthyness; which CoC will be regulated in the future?
  - Solutions:
    - Procurement standards avoiding groups of chemicals of concern
    - Virgin materials preferred

- **Use of recycled (secondary) materials:**
  - Traceability essential: Recycling within company or use of clean(ed) materials
  - Use of barriers => decrease separability?
  - In each cycle: Risk of increasing migration potential:
    - Processing creating NIAS, addition of new functional additives, compatibilisers to mix different polymers

Risk of **chemicals** in a non-toxic environment

Risk ∝ Hazard x Exposure

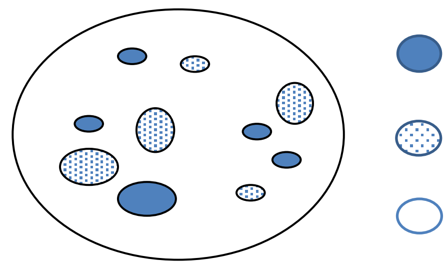
Toxicity
in-vivo, in-vitro, -in-silico, epi.

FCM

FCM 1:
Single chemicals
(intentionally/non-intentionally added)
Chemical mixtures

FCM 2, 3, .., n

\+ **Air** (inddor+outdoor) + **Food** (env. contam., processing, packaging) + **Consumer products?** + **Water** (occurence, intake, uptake) +



Sum of total chemical exposures affects human and environmental health

- To decrease risk: Decrease hazard and/or combined exposure
- How big a risk is/will society allow (the white circle)?

⇒ **Integrated risk assessment to avoid burden shifting between silos**
e.g. Life Cycle Impact Assessment (LCIA) combining human and environmental RA with LCA to evaluate/minimise trade-offs between functionality, sustainability and *toxicity* of FCM

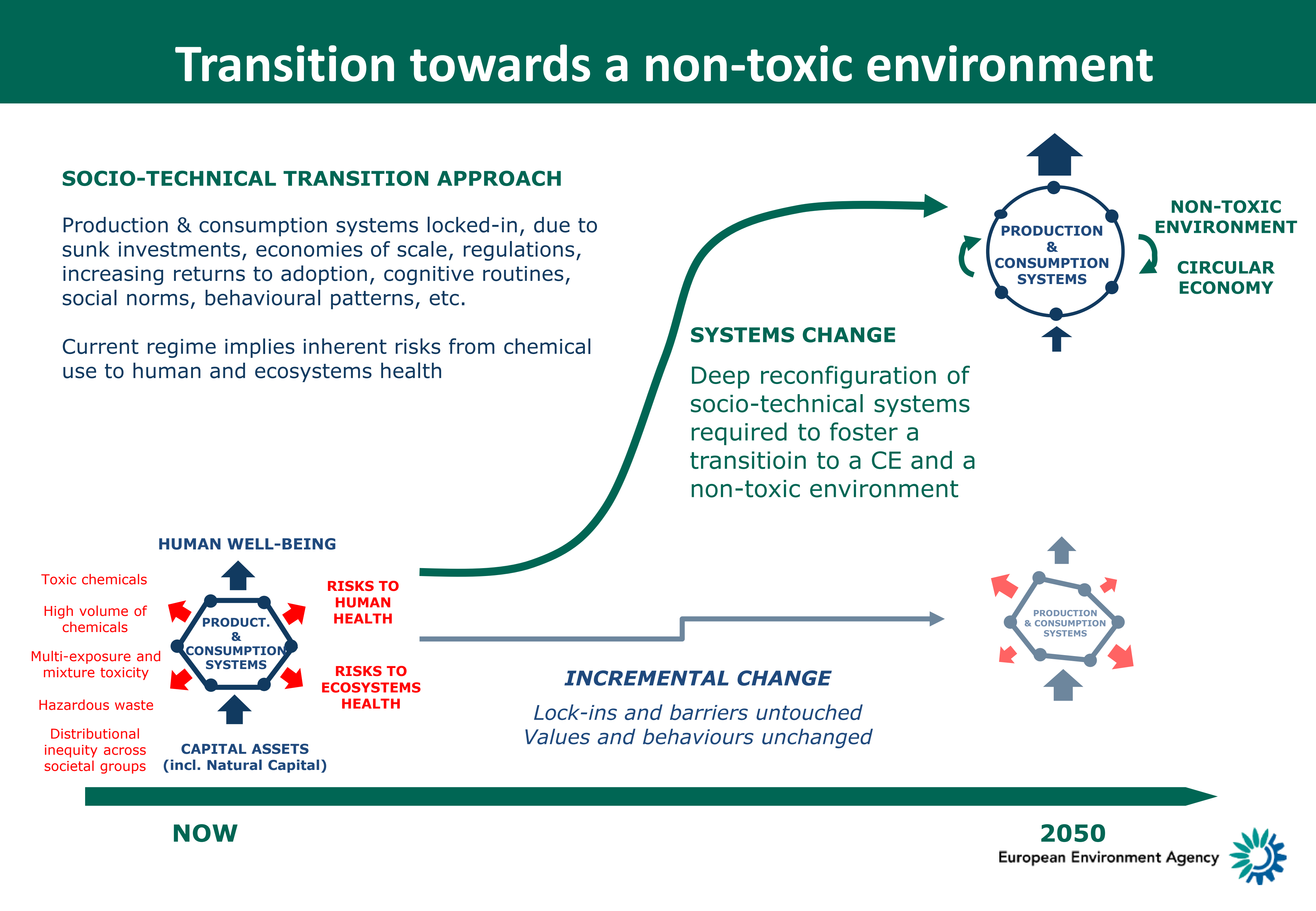
⇒ **Shift to less hazardous substances?**
Benign-by-design/green chemicals, compatible with reuse/recycling

Conclusions and opportunities in a transition phase

- Compliance with specific legislation is main motivation to track CoC in articles and FCM:
  - Majority of chemicals not tracked – risk to human and environmental health?
  - Traceability a barrier to recycling

- Burden shifting between environment and health an issue
  - Further development of assessment methods for impacts on human/env. health
  - Integration of policies across thematic silos?

- Combined transition to a CE and a non toxic environment: Opportunity to re-design production of materials to achieve goals
  - Innovation and design of materials based on
    not requiring chemistry to achieve functionality
    safe 'benign-by-design' green and sustainable chemicals
  - Role of educating of new engineers, chemists and business to use new tools
  - Ecodesign to improve separability
  - Incentives to internalise external costs


Transition towards a non-toxic environment
SOCIO-TECHNICAL TRANSITION APPROACH
Production & consumption systems locked-in, due to sunk investments, economies of scale, regulations, increasing returns to adoption, cognitive routines, social norms, behavioural patterns, etc.
Current regime implies inherent risks from chemical use to human and ecosystems health
PRODUCTION & CONSUMPTION SYSTEMS
NON-TOXIC ENVIRONMENT
CIRCULAR ECONOMY
SYSTEMS CHANGE
Deep reconfiguration of socio-technical systems required to foster a transitioin to a CE and a non-toxic environment
HUMAN WELL-BEING
Toxic chemicals
High volume of chemicals
Multi-exposure and mixture toxicity
Hazardous waste
Distributional inequity across societal groups
PRODUCT. & CONSUMPTION SYSTEMS
RISKS TO HUMAN HEALTH
RISKS TO ECOSYSTEMS HEALTH
CAPITAL ASSETS (incl. Natural Capital)
PRODUCTION & CONSUMPTION SYSTEMS
INCREMENTAL CHANGE
Lock-ins and barriers untouched
Values and behaviours unchanged
NOW
2050
European Environment Agency

Thanks for your attention!

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