



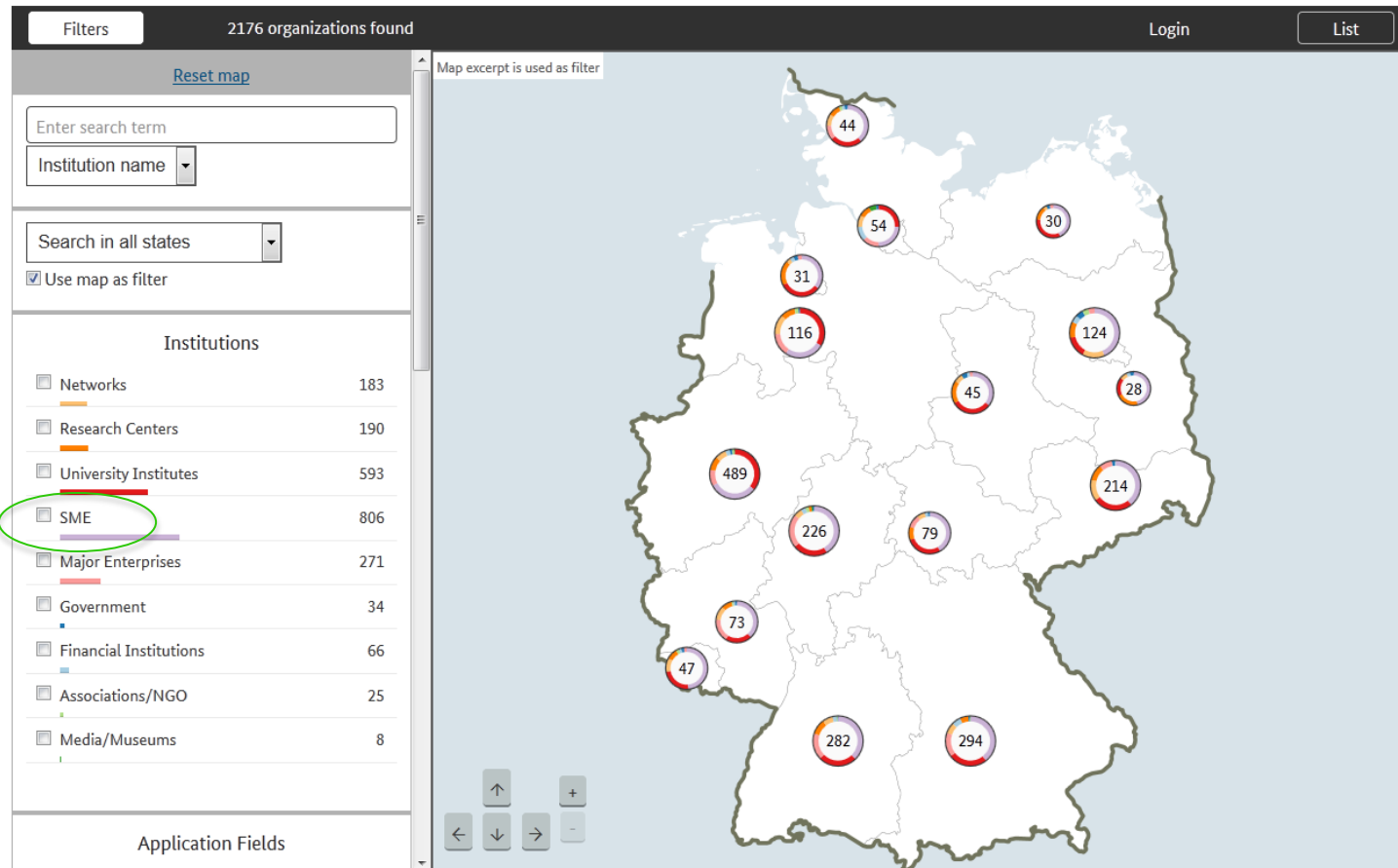
Bundesanstalt für Arbeitsschutz
und Arbeitsmedizin

Communication and Co-operation: Trans-disciplinary approaches for a safe material design

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1. Material development in Germany

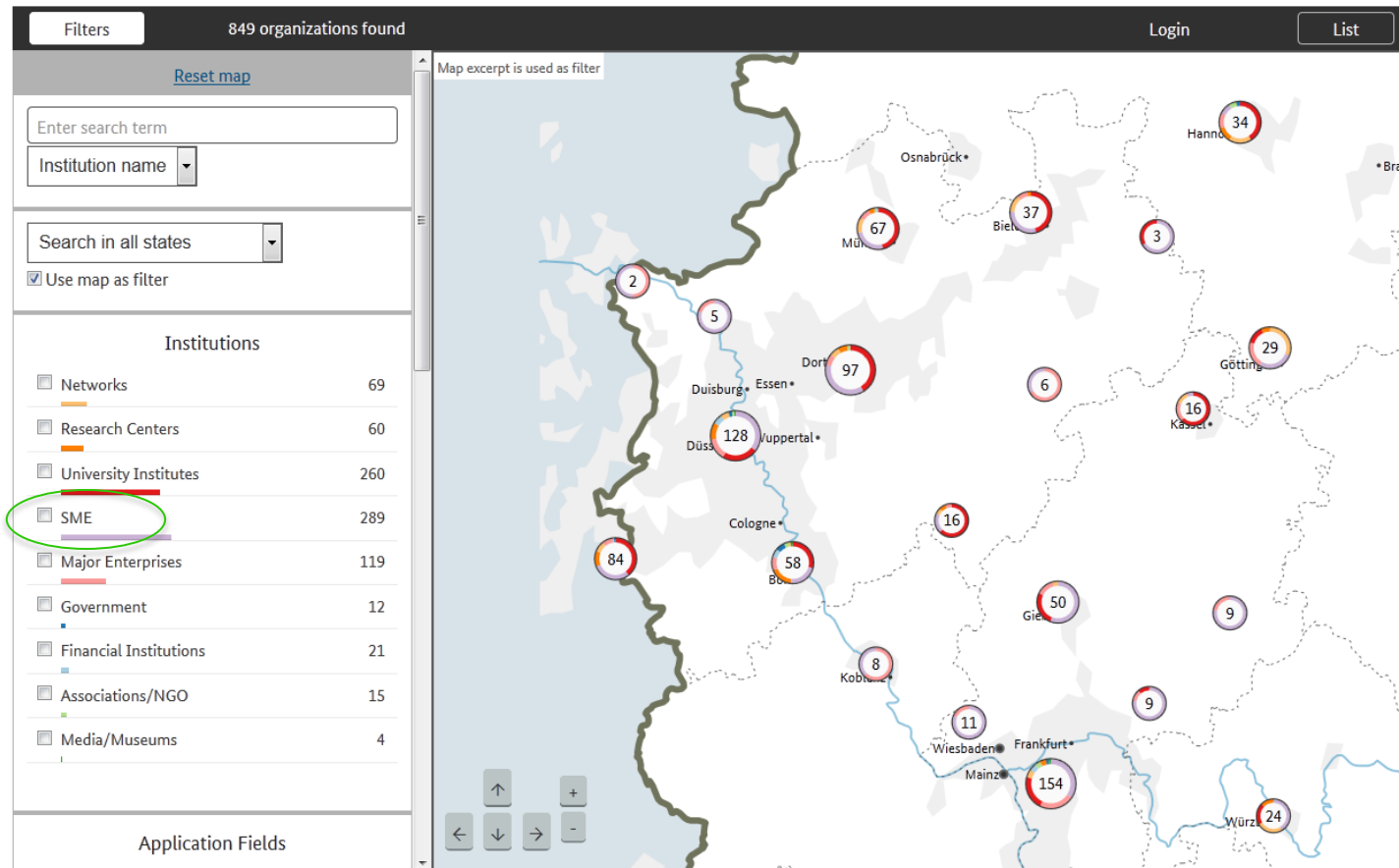
Research map nanotechnology



<http://www.werkstofftechnologien.de/en/competency-maps/research-map-nanotechnology/#!/?nw=u1c3tgxvs7np&se=u26s14u2b7j6>

2. Material development in NRW

Research map nanotechnology



<http://www.werkstofftechnologien.de/en/competency-maps/research-map-nanotechnology/#/?nw=u17g9fhesw5d&se=u0z60rgkeqy>

3. Risk & safety aspects of nanomaterials

Background:

Concern about potential risks of nanocarbons by customers/employees of SMEs/startup enterprises. Insecurity on how to approach the topic health & safety

Latest scientific findings:

Cannot be excluded that certain forms of CNTs, and other rigid fibrous materials with a relevant potential for release of WHO fibers, may put employees at risk comparable to work with asbestos. The IARC evaluated a specific type of MWCNT as carcinogenic; for other materials insufficient data

Approach:

Counteract stigmatization: identification & gradual evaluation of hazardous properties of specific nanocarbon compounds in early stage of innovation process (modification of material designs towards non-hazardous forms incorporating targeted safety and environmentally sound principles)

 **Safe materials before products enter the market**

4. A Safe material design for advanced materials

1. Direct Application Safety

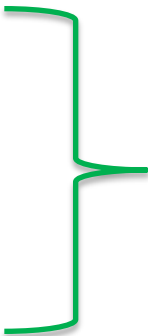
Safe material design: avoiding hazardous properties

2. Integrated Application Safety

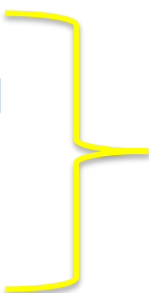
Safe product design: avoiding exposure throughout the product life-cycle, low-emission forms for use

3. Supported Application Safety

Safe workplace design: avoiding health and environmental risks in use & waste disposal by providing user support regarding technical, organisational measures & personal protective equipment



Adequate
sc. data
available



Adequate or
Inadequate
sc. data
available

5. How to realize safe materials? (I)

Collaboration among private & public actors in governance networks
(Reichow, 2015)

Companies, scientists, regulators share resources & learn how to develop materials based on safety principles

Sharing resources → win-win situations

Startups: Information produced materials → expertise safe materials

Regulators: Decision-making authority → insights adequacy regulations

Scientists: Latest scientific insights → applicability of methods, theories

.....?!

5. How to realize safe materials? (II)

Learning types in governance networks (Reichow, 2015)

1. Generation of new *scientific facts* (substantive learning)
2. Development of *trust* among collaborators (strategic learning)
3. Development of *rules* (institutional learning)

For each learning type → conditions under which learning emerges

6. Case study – VCI governance network (I)

Learning in an industry-initiated network (Reichow 2015)

- Analysis of collaborative activities in Germany (3-4 times per year, between 2003-2014) involving business associations, regulators, academics, fed. research institutes

Goal of the collaboration

Making risk assessment applicable to (particular) nanomaterials

Data collection

(Policy) documents related to the activities & 23 qualitative interviews with involved actors

6. Case study – VCI governance network (II)

Substantive learning:

Exchange of knowledge → generation of many new scientific facts relevant for making risk assessment applicable to specific nanomaterials

Strategic learning:

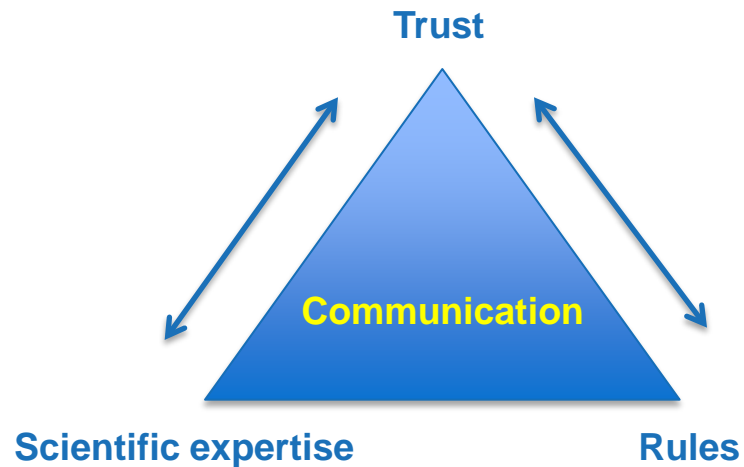
Regular meetings over longer period of time → familiarity, reliance, constructive disagreement, trust

Institutional learning:

Newly generated scientific facts → used to develop soft regulation (guideline to support conducting risk assessment) & later developed into 'hardened' regulation (Hazardous Substances Committee (AGS) Announcement on Hazardous Substances 527)

7. First findings

Trust among private and public collaborators plays a central role in cooperative environments (Reichow 2015)



8. Building on the empirical findings to realize safe materials

Realizing the concept of application safety through 4 BAuA projects

→ Governance network: members NanoCarbon network, i.e. startups, SMEs, research institutions, regulators (BAuA, UBA) & academia

- Project 1** - on high-cycle fatigue performance resins containing CNTs for energy storage applications (2015–2017)
- Project 2** - on toxicological aspects of CNTs (2015–2018)
- Project 3** - on morphological aspects of CNTs (2015–2018)
- Project 4** - on developing an advisory strategy to support the safe and sustainable development of material innovations in startups (2016–2019)

9. Conclusions (I)

Establishing a “safety culture” among material scientists & evoking responsibility for own material innovations

Responsible research & innovation (RRI) under Horizon 2020

“Responsible research and innovation is an approach that anticipates and assesses potential implications and societal expectations with regard to research and innovation, with the aim to foster the design of inclusive and sustainable research and innovation” (European Commission)

→ **Anchoring application safety principles on a political level:**

E.g. linking EC NanoObservatory idea with a governance network approach to support safe material innovations in startups

9. Conclusions (II)

An old problem

How can regulation keep pace with innovation (idea of hare & tortoise)

A new proposed solution

Keeping pace with innovation through early collaboration among regulators, scientists, industry in governance networks

- Joint generation of new risk information & development of science based rules
- Regulated parties are able to comply with rules & are motivated to follow these rules

Thank you !

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