

# › **HUMAN EXPOSURE ASSESSMENT**

eNanomapper hands-on workshop, Feb 2016, Basel

Wouter Fransman

**TNO** innovation  
for life

# WORKSHOP OUTLINE

## › LICARA NanoSCAN

## › Stoffenmanager Nano

## › Nano Exposure and Contextual Information Database



# **LICARA nanoSCAN: evaluating benefits and risks over the life cycle of nanoproducts**





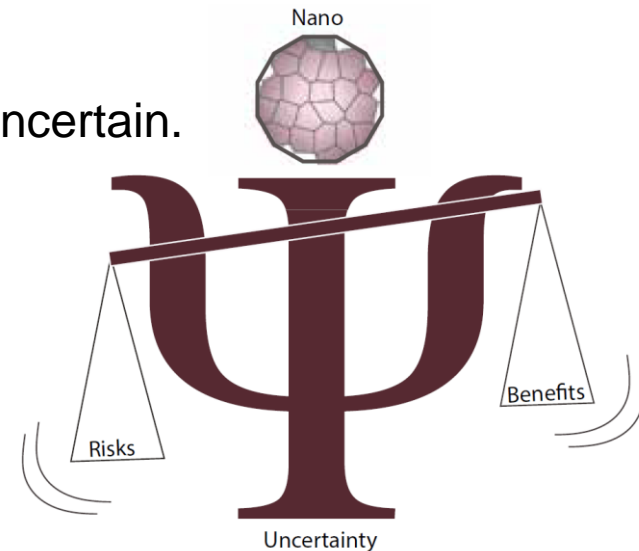
## LICARA project

- › **Life Cycle Approach** and human **Risk Assessment**, product stewardship and stakeholder risk/benefit communication of nanomaterials
  
- › **Aims** to develop an approach for SMEs to assess over the life cycle
  - › the human and environment risks
  - › and the economic, environmental and social opportunities.
  
- › **Deliverables**
  - › Guidelines
  - › Case studies with in-depth assessments
  - › Framework and first version of a tool LICARA nanoSCAN



## Present situation on nano technology development within SMEs

- › Nano products provide benefits and business opportunities
- › However, the possibility of human and environmental risks may spoil the party
- › It is (too) difficult and costly to assess these risks
  - › Risk Assessment and Life Cycle Assessment are complex and costly to perform
  - › data are scarce and if available highly uncertain.
  - › it is difficult to “repair” data gaps





## **Need to support SMEs on decision making in uncertainty on nano product development**

- › Including both benefits and risks
- › Translating present available scientific knowledge into understandable information
- › Tapping on specific know-how of SMEs
- › To sketch the pros and cons of a nanoproduct in relation to a conventional product and over the full life cycle
  
- › Qualitative / semi-quantitative giving the fact that little quantitative data is available with high uncertainties
- › Using existing tools
- › Doing it yourself in a modular approach
- › Next to guidelines a simple first version of a tool LICARA nanoSCAN



## Conceptual framework on nano benefits and risks

### 0. Nanoproduct and legislation

1. Environmental benefits

2. Economic benefits

3. Societal benefits

4. Public health & environmental risks of nano

5. Occupational health risks of nano

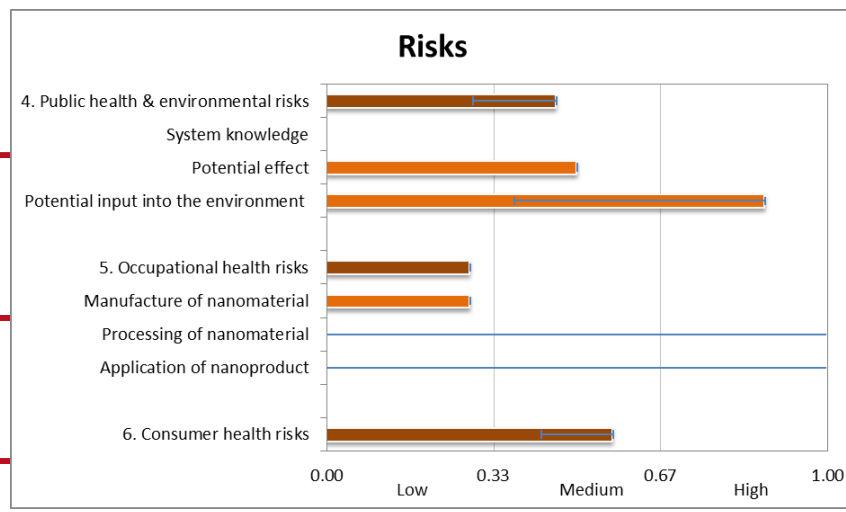
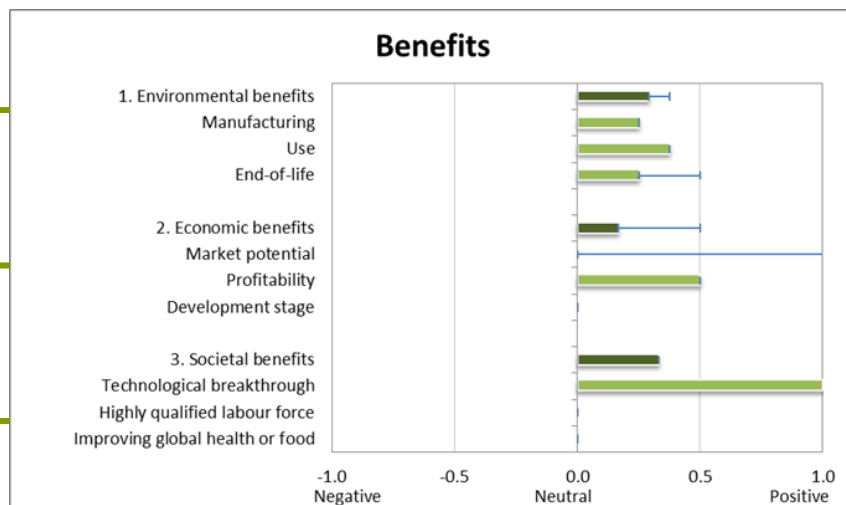
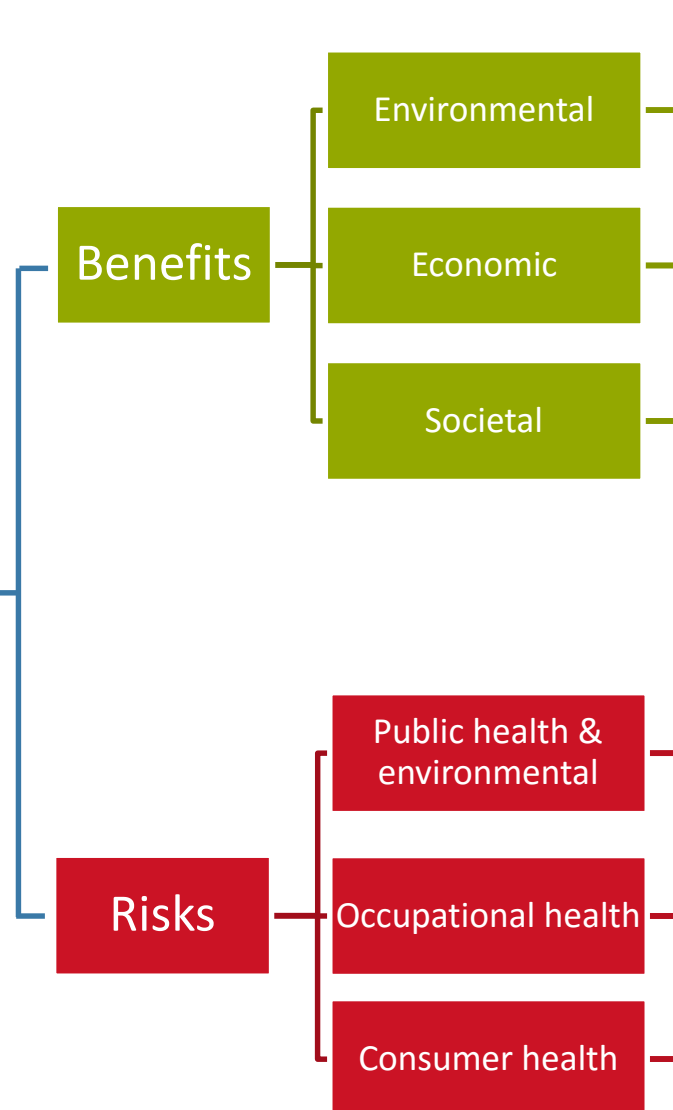
6. Consumer health risks of nano

7. Decision support

Precautionary Matrix

Stoffenmanager Nano

NanoRiskCat



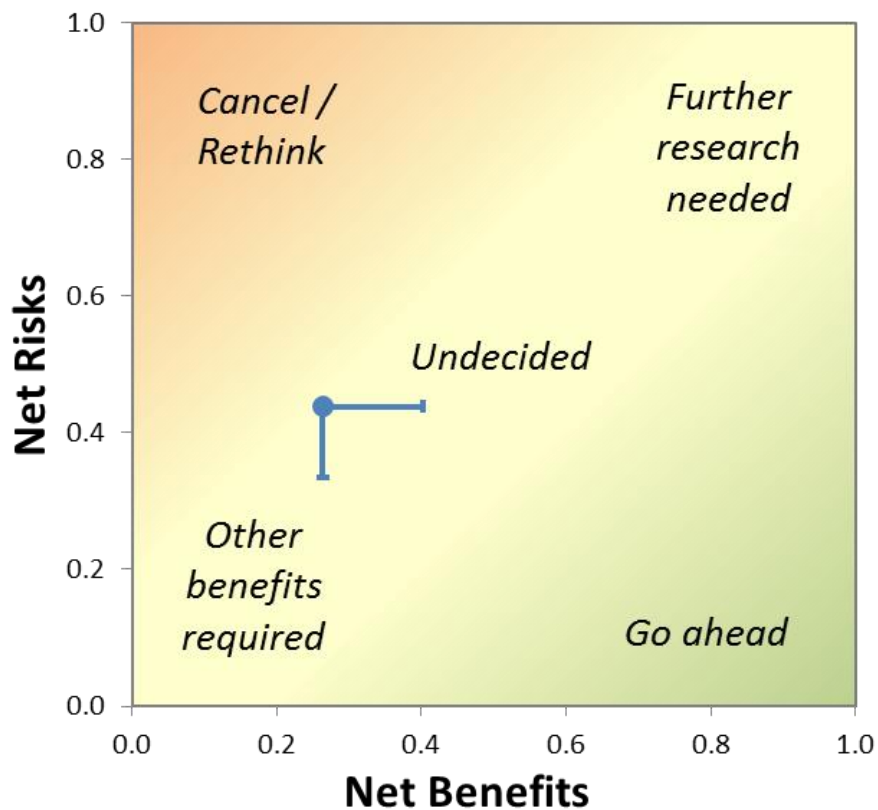




## Weighed results

Example: scratch and corrosion resistant nano silica coating

*The product seems to have no high risks*





The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 315494 (LICARA).



# Stoffenmanager

Working safely with hazardous substances



## Stoffenmanager Nano 1.0

eNanomapper workshop

Basel, February 2016

Wouter Fransman

wouter.fransman@tno.nl



Ministerie van Sociale Zaken en  
Werkgelegenheid



Arbo Unie



# Stoffenmanager Nano 1.0

- ▶ Exposure measurements are complex and therefore expensive and time-consuming
  - Control banding / Risk banding: first Tier for qualitative risk assessment => Work in progress...
- ▶ Assists producers, formulators and end users to prioritize health risks of working with MNO
  - Hazard x Exposure = Risk
- ▶ Applicability domain:
  - Only inhalation exposure
  - All types of MNO and all processes with MNO
- ▶ Education (PIMEX, good practices), community portal
- ▶ Result: Freely available IT-tool for prioritizing nano-specific risks



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## The Stoffenmanager Nano Module

### Welcome to the Stoffenmanager Nano

This module allows you to qualitatively assess occupational health risks from inhalation exposure to Manufactured Nano Objects (MNO). Risk Management Measures may be selected or included in the Action Plan.

For more information on exposure to nanoparticles or control measures click here for:

- [Factsheets good practices;](#)
- [PIMEX-movies exposure to nanoparticles](#)

You can use the Safety Data Sheets (SDS) and / or product information sheets of your products to determine whether your company is working with nanoparticles. We refer to the [background page](#) for an overview of common work situations in which the presence of MNO is likely.

If after consulting the data/information sheets, there is no clear indication of the presence of MNO, but you suspect that your product does contain MNO, please contact your supplier. It is still possible to use Stoffenmanager Nano

Stoffenmanager Nano applies to MNO that meet all of the following criteria:

### Log in



E-mail:

Password:

Log in

Remain logged in

[New account](#) | [Forgot password?](#)



### Latest news



07 June 2011

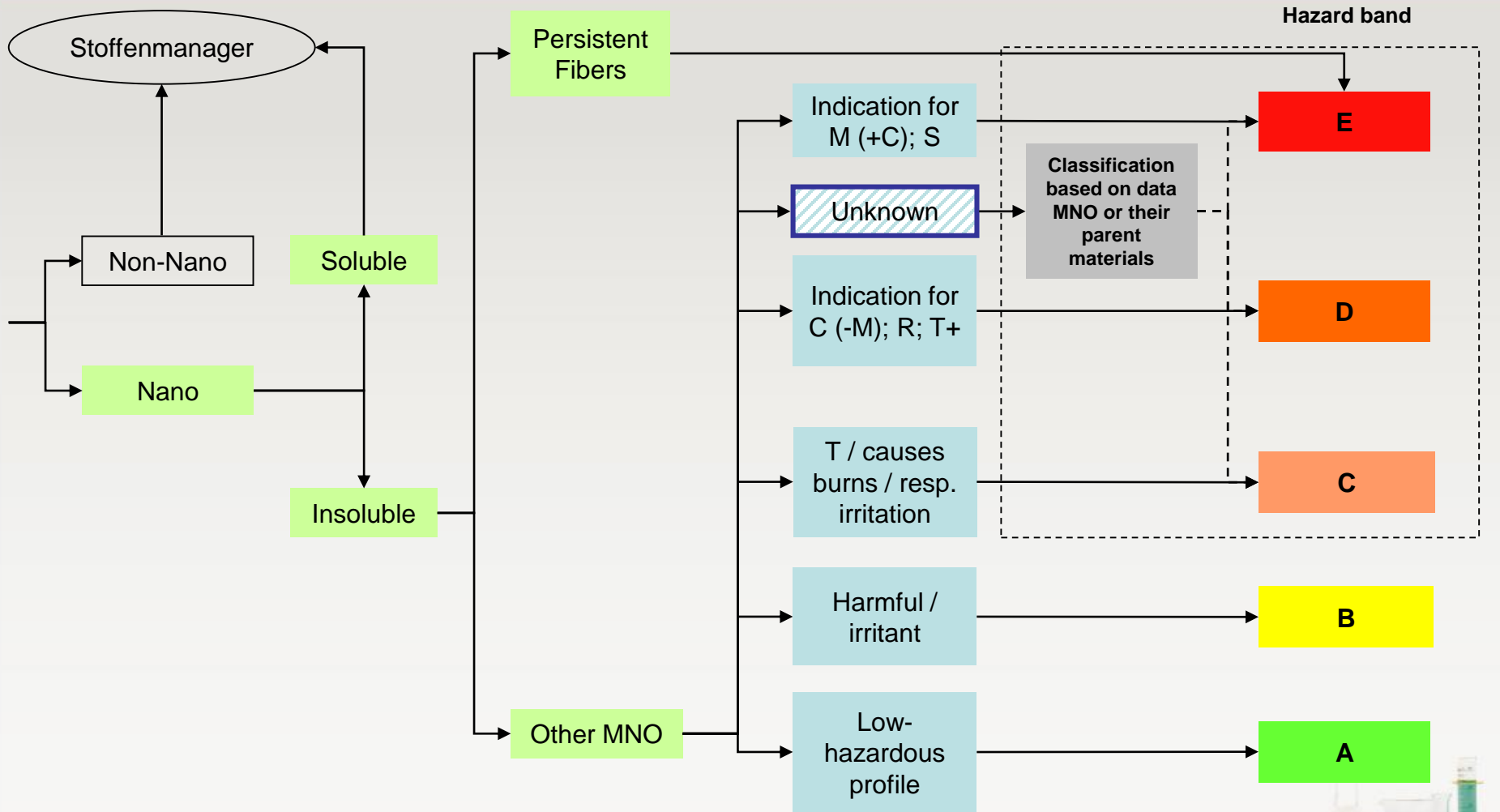
[Stoffenmanager International Implementation Workshop: 4th October ...](#)

07 June 2011

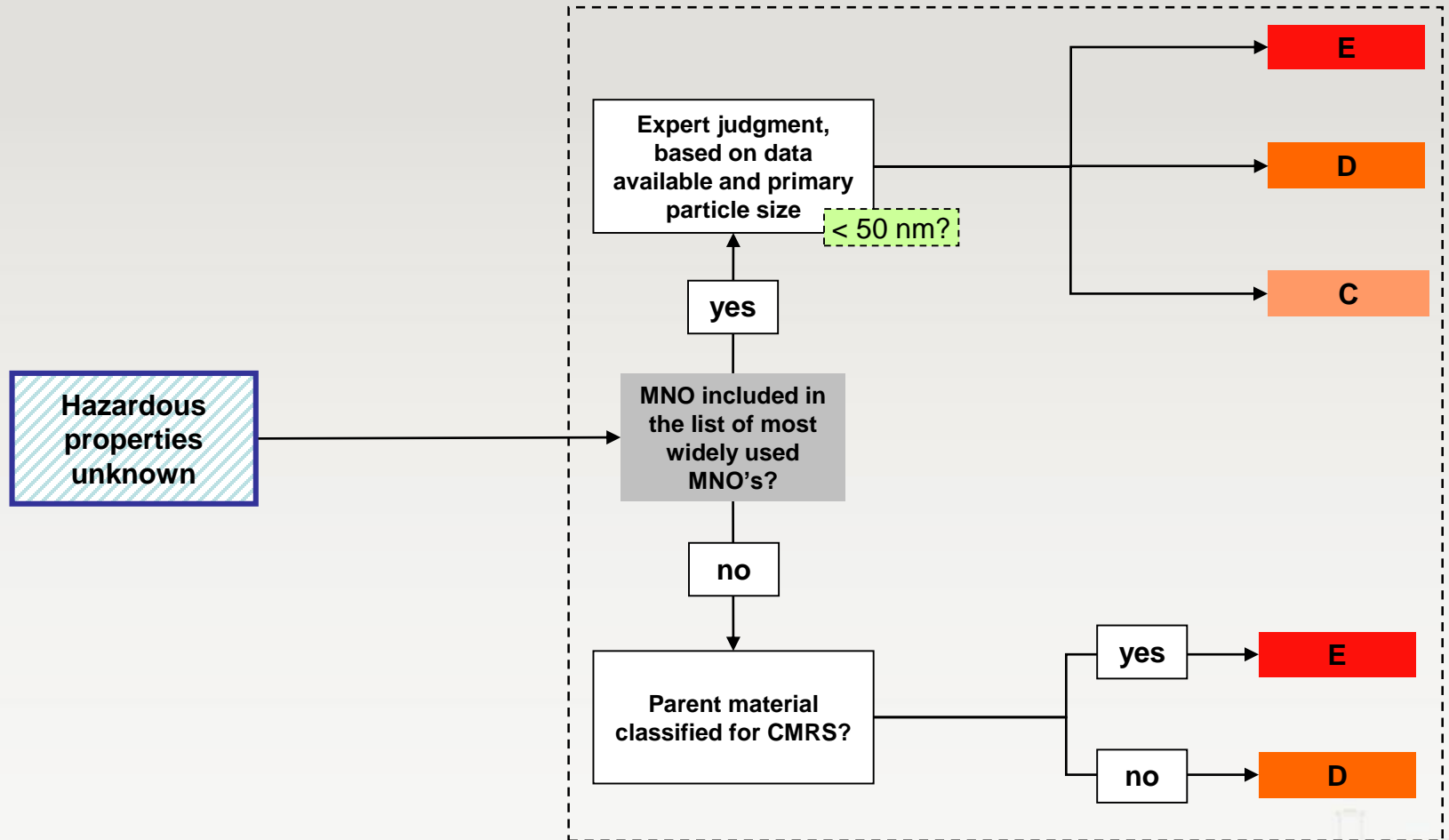
[Multilingual Stoffenmanager ...](#)

[More news >](#)

# Stoffenmanager Nano 1.0: Hazard banding



# Stoffenmanager Nano 1.0: Hazard banding





# Stoffenmanager Nano 1.0: Exposure banding

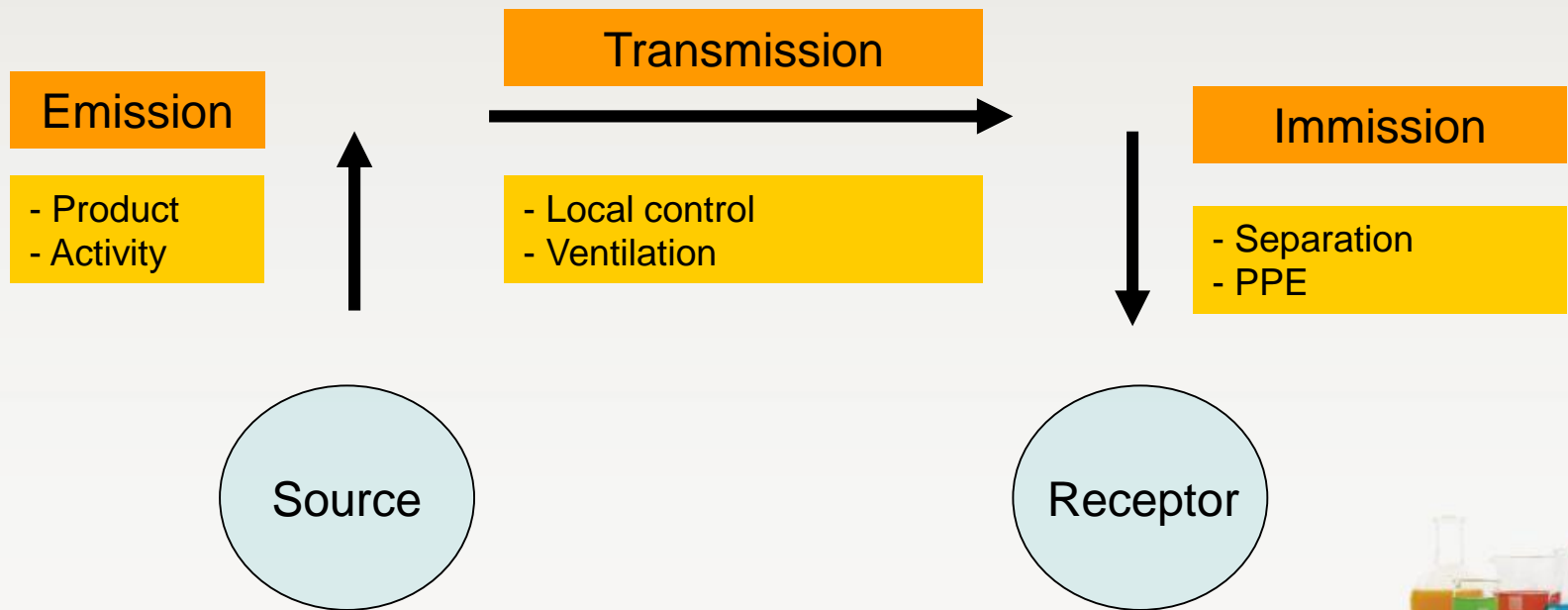
Source domains (Schneider et al., in press)

1. Point or fugitive emission during the production phase prior to harvesting the bulk material
2. Handling and transfer of bulk powdered MNO
3. Dispersion of (solid or liquid) intermediates or ready-to-use MNO-containing products
4. Activities resulting in fracturing and abrasion of MNO-containing end products





# Stoffenmanager Nano 1.0: Exposure banding



# Stoffenmanager Nano 1.0: Risk banding

Hazard band \ Exposure band	A	B	C	D	E
1	3	3	3	2	1
2	3	3	2	2	1
3	3	2	2	1	1
4	2	1	1	1	1



# Future plans

- ▶ Empirical data collection
  - Measurements at the workplace
  - Experiments under controlled conditions
  - Harmonizing measurement strategies
  - Database development (NECID)
- ▶ Expert elicitation
  - Develop nano specific activity emission potential multipliers
  - Extend to other parameters in the model
- ▶ Use any source of information that comes publicly available in the near future

Towards a quantitative risk assessment !





# An introduction to NECID

eNanomapper workshop, Basel, February 2016

The screenshot shows the NECID software interface. On the left, the text "Nano Exposure & Contextual Information Database" is displayed vertically. On the right, a ribbon menu contains the following options: Measurement, Protocol (PDF), Timeline, Data Exchange, Export (Excel), and Basic data Update. Below the ribbon, a text box provides instructions for each option:

- By clicking on "Measurement" and you will open the NECID data entering module.
- By clicking on "Protocol" you can upload you re a pdf protocol file of the selected measurement series will be created.
- By clicking on "Data exchange" you can create a database exchange file to copy one or more measurement series to an other system.
- By clicking on "Export" a dialog for the creation of an Excel file for a selected measurement series will open.
- By clicking on "Basic database update" you can update the basic data tables on your local NECID version. Your stored measurement series will not be affected.

Outmost left of the ribbon you find a tab "Extra" where you can check if an update is needed, by choosing "Check Update".  
By doing so you will also see which version you actually are using.  
You either will find in the tab a help function and the option to switch off the introduction that normally will pop up after opening the database by clicking on "Measurement".

Logos for IFA (Institut für Arbeitsschutz der Bundesagentur für Arbeit) and perosh are visible at the bottom of the interface.



## NECID - Background

- › Developed by



- › Actively supported by 8 institutes + external partners



- › Aim: Harmonized collection of nano exposure data to enable sharing of data and provide a sustainable source of information for research, risk management and the development of occupational exposure benchmark levels/limits.



## Get started with NECID

**N**ano  
**E**xposure &  
**C**ontextual  
**I**nformation  
**D**atabase

- Measurement
- Protocol (PDF)
- Timeline
- Data Exchange
- Export (Excel)
- Basic data Update

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IFA  
Institut für Arbeitsschutz der  
Technischen Universität München

perosh



# Measurement – General information

The screenshot shows a software interface for 'Measurement series'. The interface is divided into several sections:

- Left sidebar:** A navigation menu with options: Measurement series, Activity, Premises, Material, Sample information, and Import raw data. This menu is circled in red.
- Top right:** A toolbar with icons for file operations and a 'Linkage of activity relationship' section. This area is circled in red.
- Main form area:** Contains various input fields and dropdown menus for 'Measurements ID', 'Study ID', 'Internal-code', 'Measurement strategy', 'ENM of interest for this set of measurements', 'Measurement campaign', 'Date campaign began', 'Date campaign ended', 'Information for measurement', and 'Instruction for use of data'. This entire form area is circled in red.
- Table:** A table titled 'List of measurement series' with columns: Measurements ID, Study ID, Internal-code, ENM of interest for this set of measurements, and Date of transfer. One row is highlighted in blue and circled in red.

Measurements ID	Study ID	Internal-code	ENM of interest for this set of measurements	Date of transfer
10601	TNO study 1	1	Fullerenes (C60)	12-8-2014

At the bottom left, there is a 'Quit' button. At the bottom right, the date 'dinsdag 25 november 2014' is displayed.



# Measurement – Activity

Program Extra

Activity Premises

Measurement series

- Activity
- Premises
- Material
- Sample information
- Import raw data

Activity ID: 0

Description

Activity kind  ENM  No nano activity

Description

Time start hh/mm/ss Time stop hh/mm/ss Activity duration hh/mm/ss

Total activity duration in shift hours

Use of ENM

Classification

Activity code

Physical state

Work and process

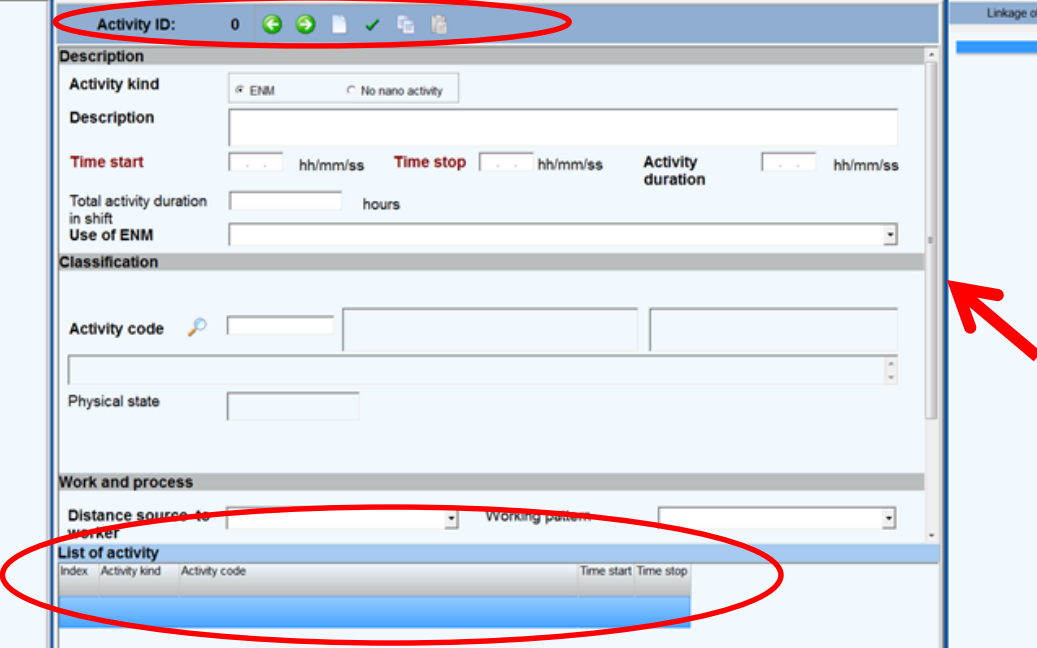
Distance source to worker Working pattern

List of activity

Index	Activity kind	Activity code	Time start	Time stop

Quit

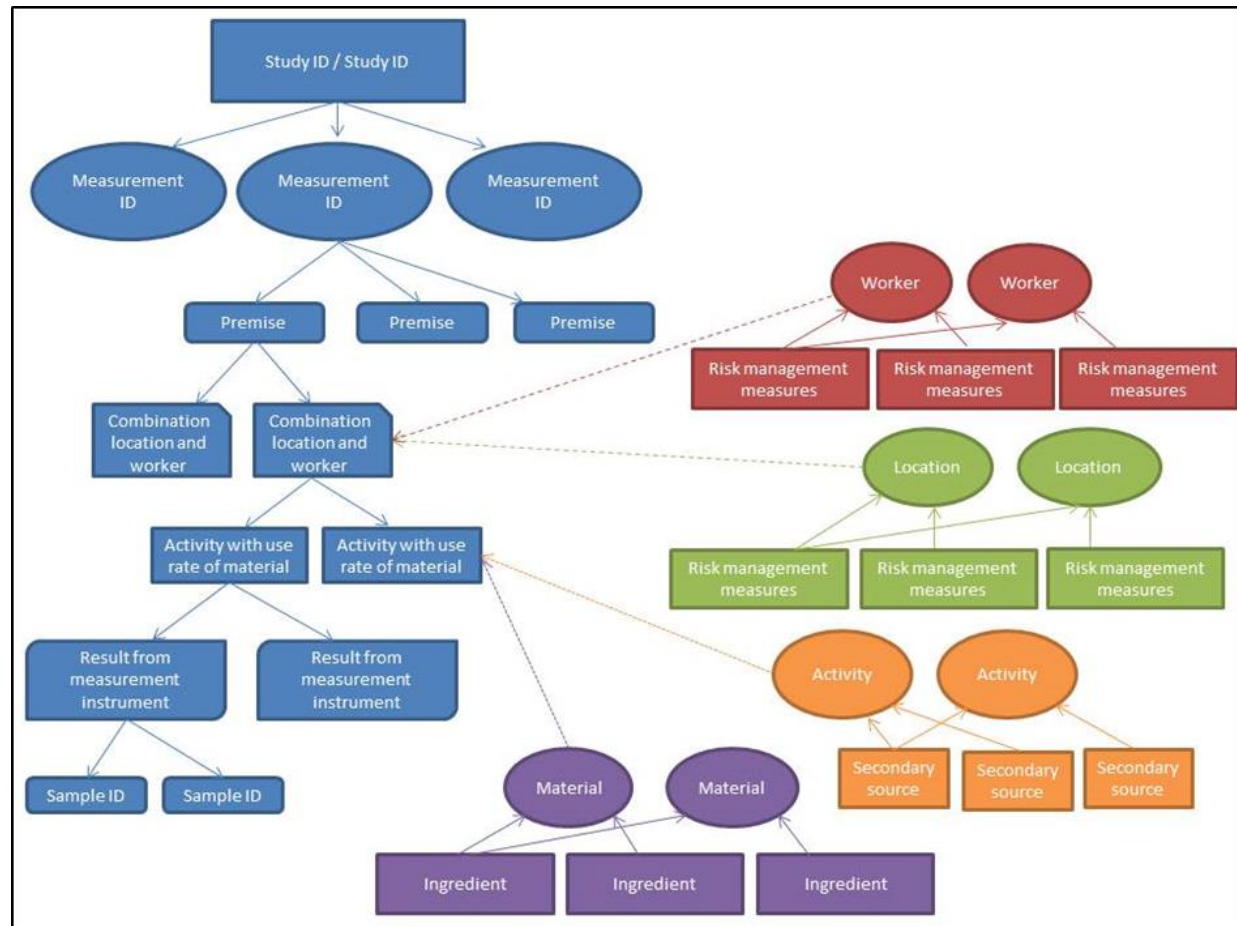
Linkage of activity relationship







# Measurement- information to include



› **THANK YOU FOR YOUR ATTENTION**

Wouter Fransman [wouter.fransman@tno.nl](mailto:wouter.fransman@tno.nl)

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