



**From nanosafety research to operational tools for the nanotechnology industry: the EU projects NanoMILE, NanoFASE, NanoReg2, NanoSolutions, Sun, CaLIBRAte**

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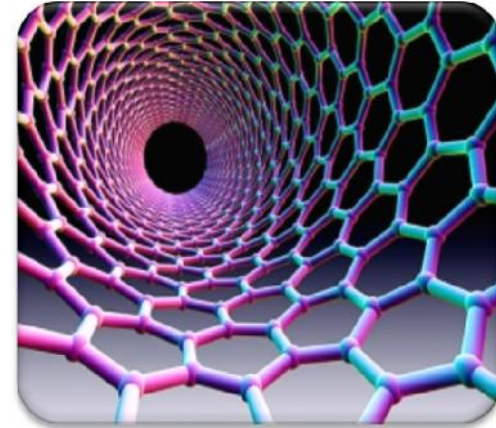
Workshop **Nanosafety: From research to implementation of Risk Management and Safe Innovation in the nanotechnology industry**

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# Introduction: NanoSafety research & Industry

Since 2002 (FP6):  
~ 50 EC research projects  
~ **150 M€ EC funding**  
Hundreds of research teams



Goals: Understand, **Support innovation & competitiveness**, serve society

→ **What comes out of it for the nano-industry\*?**  
Now? Later when?  
How to **remain efficiently updated** ?  
How to **influence**?

Here: **insight**

1. Overview of impacts
2. Projects: outputs
3. Perspectives / you

\* *Producers of nanos or of nano-containing products*

# Overview of impacts for nano-industry – All projects





For core business	On context	On tools
<ul style="list-style-type: none"> <li>- Safer nanos / Products</li> <li>- Safer sites (emissions)</li> <li>- Demonstration of safety</li> </ul>	<ul style="list-style-type: none"> <li>- Stabilized regulation (REACH, GHS, ...)</li> <li>- Public confidence on impact of new nanos</li> <li>➔ <b>Sustainable innovation &amp; economic development</b></li> </ul>	<ul style="list-style-type: none"> <li>- Testing protocols &amp; equipment</li> <li>- OSH rules</li> <li>+ Protocols for synthesis of nanos</li> </ul>

## Ex. of key exploitable outputs:



2013 –2017, 13 M€, 28 partners (2 US) : Understanding mechanisms of interactions of nanos with living systems and the environment (aging, tox, ecotox)

Exploitable output	Examples	Stage
<b>Protocols</b> for aging/ tox/ecotox	<ul style="list-style-type: none"> <li>• Maternal transfer in fish and isopods (new)</li> <li>• High Throughput <b>screening assays</b></li> <li>• Clothe in washing machine and effluents</li> </ul>	  <b>R&amp;D</b>
<b>Advanced equipment</b> for characterization / testing	<ul style="list-style-type: none"> <li>• nano-titrator (Malvern)</li> <li>• Exposure station at the air/liquid interface (Vitrocell)</li> </ul>	<b>R&amp;D / demo</b>
<b>Integrated datasets</b> on characteriz°, tox, ecotox	<ul style="list-style-type: none"> <li>• <b>Interconnectable database</b> for future <b>data mining</b></li> <li>• Comparison <b>to models</b></li> </ul>	<b>R&amp;D</b>
<b>Model: QSAR/QPAR</b>	<ul style="list-style-type: none"> <li>• Software</li> <li>• User-friendly simplified version <b>online</b></li> </ul>	<b>R&amp;D to market</b>
<b>Grouping / classification Risk Assessment Safe design</b>	<ul style="list-style-type: none"> <li>• Ranking of existing nanos</li> <li>• <b>Guidance</b></li> <li>• Decision tool for cost-benefit analysis</li> </ul>	<b>R&amp;D / demo</b>

## Ex. of Tools and services developed in



[nanomile.eu-vri.eu/home.aspx?lan=230&tab=2481&pag=1475](http://nanomile.eu-vri.eu/home.aspx?lan=230&tab=2481&pag=1475)



### Automated exposure station at the air/liquid interface

- Exposes lung cells to nanoparticles in air
- Simulates human exposure through **inhalation**
  
- Long term goal: **replace experiments on animals**



## Ex. of key exploitable outputs:



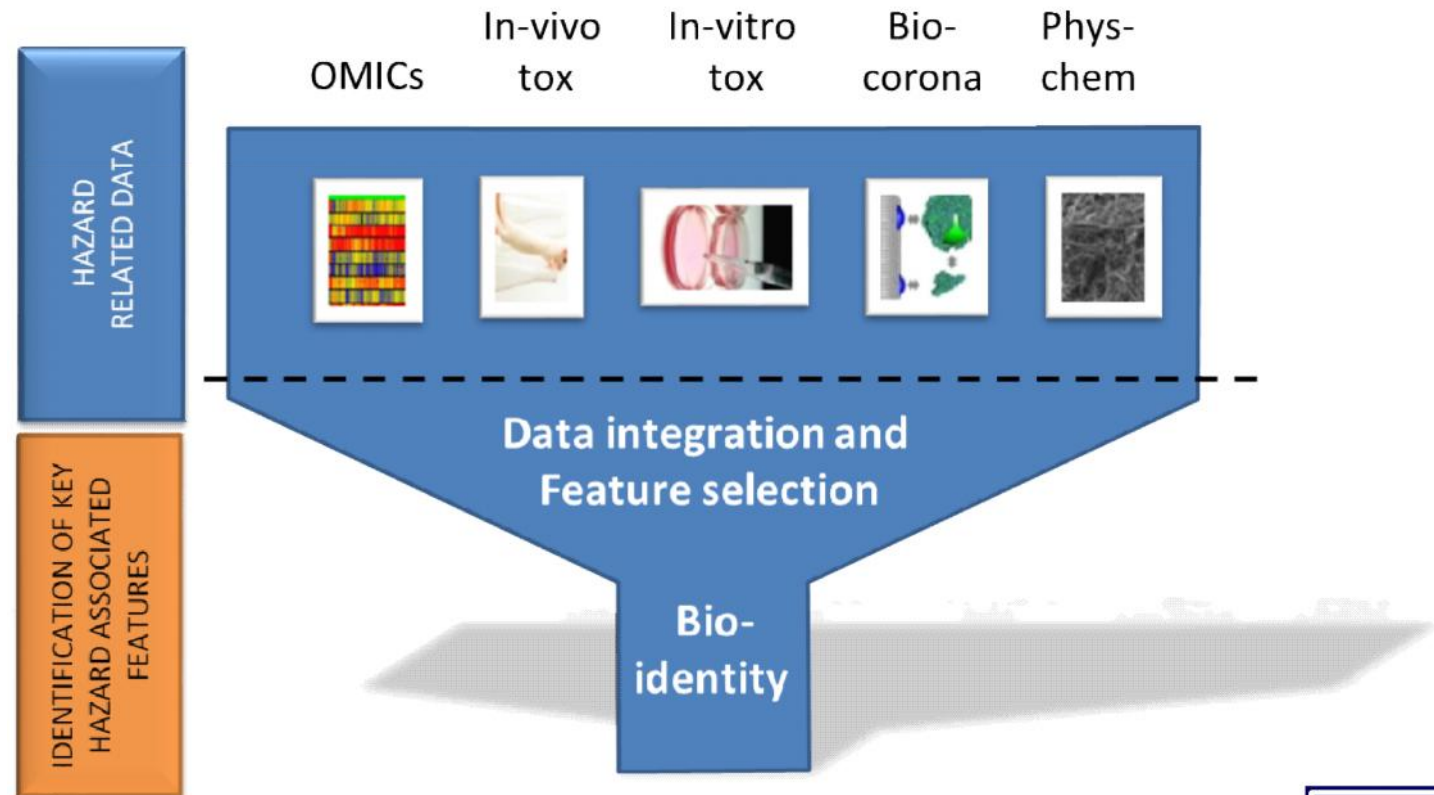
2013 –2017, 13,8 M€, 36 partners : Determine the "biological identity" of nanos and provide a means to develop a safety classification of nanos based on an understanding of their interactions with living organisms

Exploitable results	Description	Stage
<b>Nanosafety Classifier</b>	See next slide	R&D / demo
<b>Software for Life Cycle Assessment (LCA)</b>	Software and data on human and ecotoxicological properties	R&D / demo
<b>Screening platforms</b>	'High-throughput' technique: <ul style="list-style-type: none"><li>• huge numbers of tests at once</li></ul>	R&D/ demo

**NanoSafety Classifier**

Computational tool :

- predicts health and environmental impacts
- based on characteristics and behaviour





## Ex. of key exploitable outputs:



2015 –2019, 11,3 M€, 41 partners (7 non EU) : Nanomaterial fate and speciation in the environment

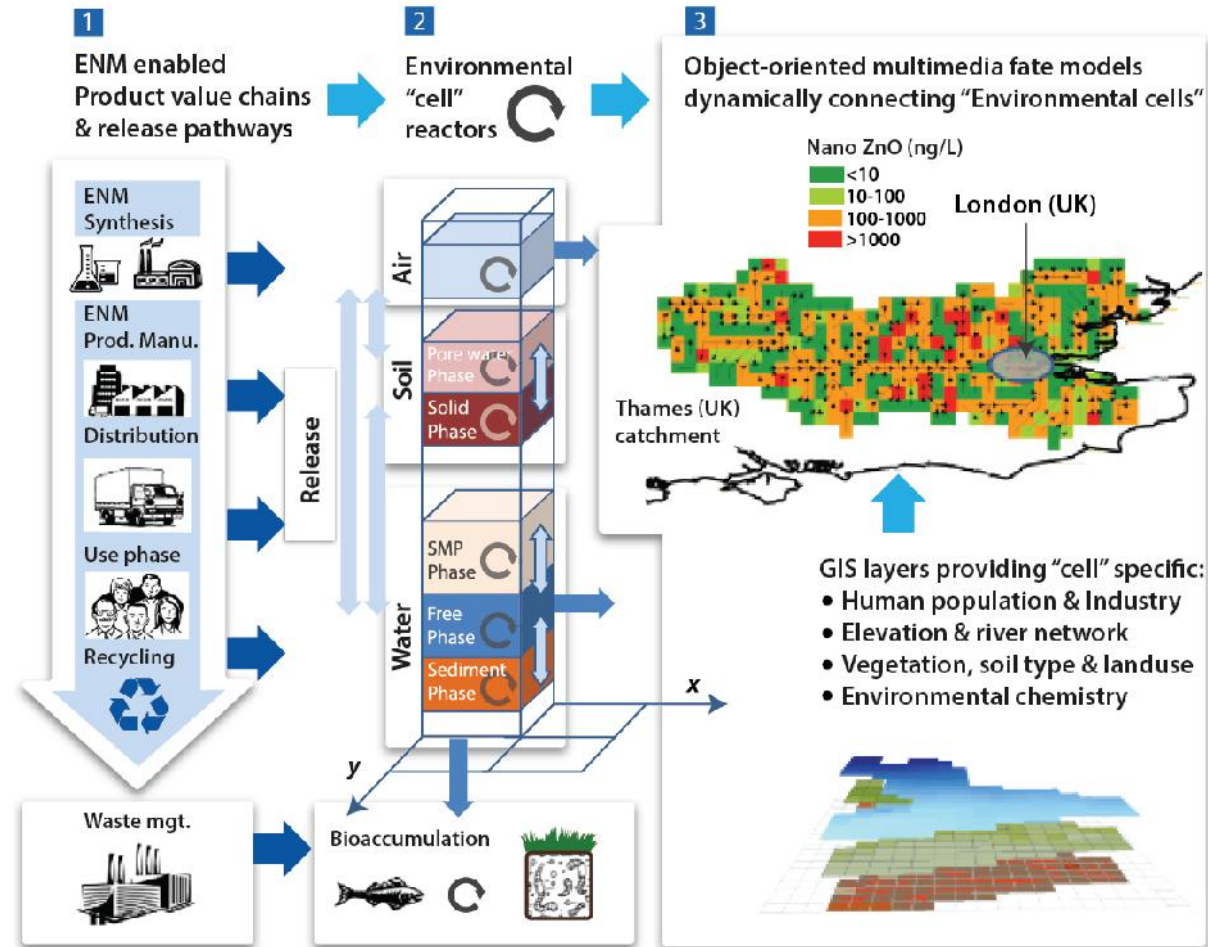
Exploitable output	Examples	Stage
<b>Models</b>	<ul style="list-style-type: none"> <li>Operationalised version of <b>SimpleBox4Nano</b></li> <li>Individual processes: waste streams, air, soil, water/ sediment..</li> </ul>	<b>Demo / market</b> (EUSES, REACH)
<b>Protocols</b>	<ul style="list-style-type: none"> <li>Dissolution, attachment, aggregation, leachate</li> <li>Quantification of nanos and their transformation in environmental samples</li> </ul>	<b>R&amp;D to market</b>
<b>Data</b>	<ul style="list-style-type: none"> <li><b>Pathway analysis</b> for a range products &amp; industrial sectors</li> <li><b>Emission and release:</b> several industrial sectors</li> <li><b>Form</b> of nanos in environmental media</li> </ul>	<b>Demo / market</b>
<b>Risk Assessment Safe design</b>	<ul style="list-style-type: none"> <li>Approach to <b>group nanos</b> for fate assessment, in order to <b>reduce quantity of individual product assessments</b></li> </ul>	<b>R&amp;D / demo</b>



# Ex. of Tools and services developed







**“Clickable” exposure assessment framework**

[www.nanofase.eu](http://www.nanofase.eu)



## Ex. of key exploitable outputs: Others

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Project	Duration	Exploitable output	Stage
 	2011-2015	Nano-protocols for characterization, tox, ecotox	Demo to market
	2013 -2016	Recommendations of nano-adaptations of <b>OECD Guidelines for the Testing of Chemicals</b>	Demo to market
	2013-2017	Software System for <b>integrated Risk Assessment and Management</b>	Demo / market
	2015-2018	<b>Safe by Design</b> principles based on regulatory driven tools and processes	Demo / market
	2016-2019	<b>Risk governance</b> framework for assessment and management of risks	R&D / demo

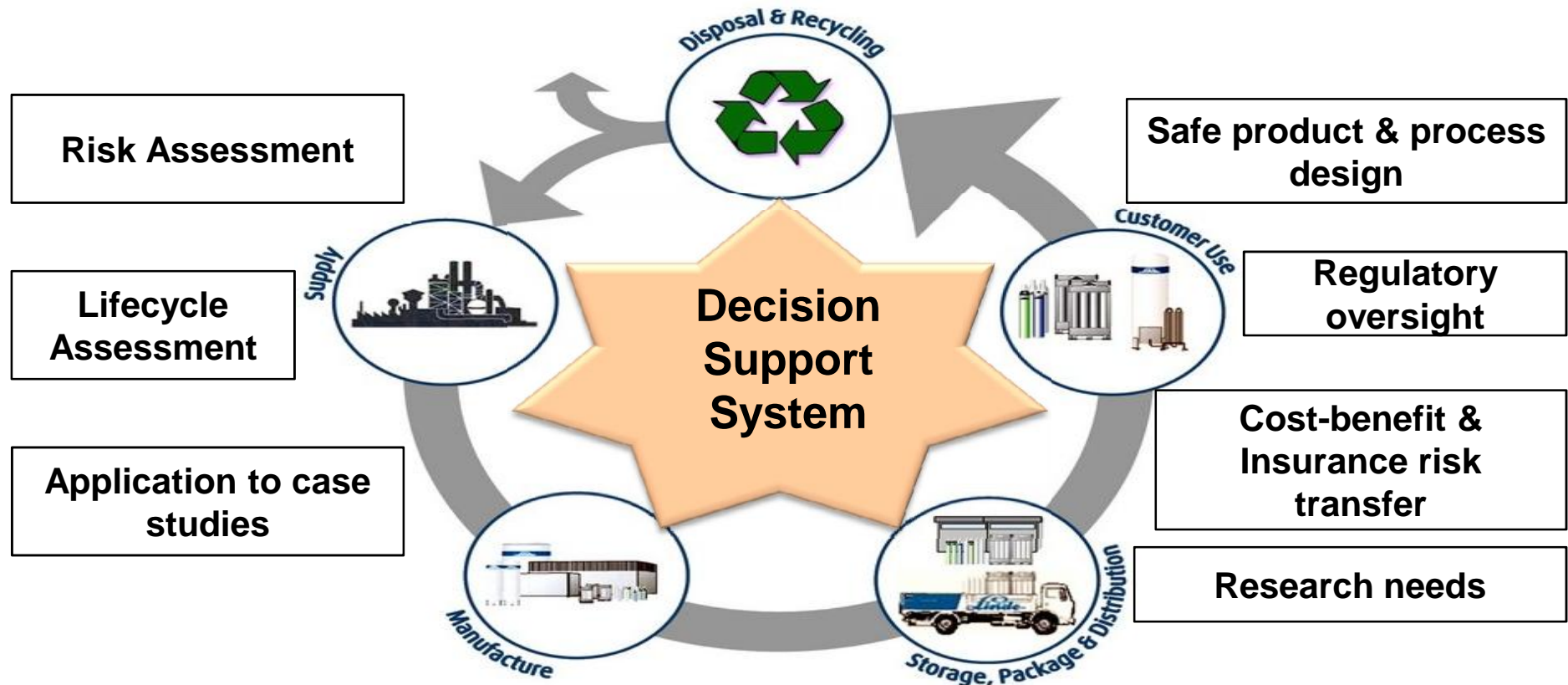
# Ex. of Tools and services developed in



Sustainable Nanotechnologies Project

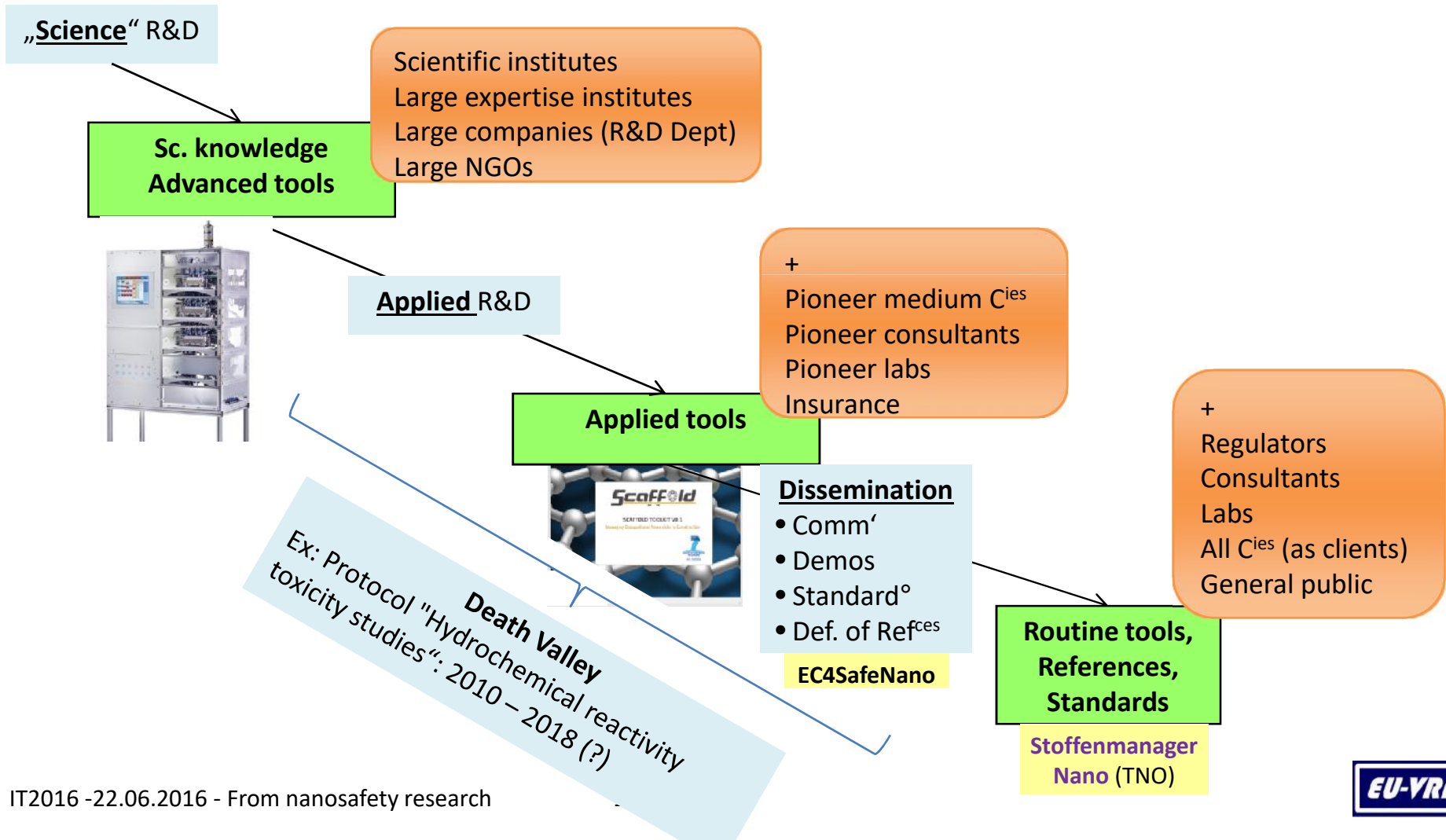
## SUN Decision Support System

Software System for Risk Assessment and Management of Manufactured Nanomaterials



# Different stages, different users

Research → Market



## So, for you now...

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**NanoSafety  
Cluster**



### Remain informed:

- NanoSafety Cluster: [www.nanosafetycluster.eu](http://www.nanosafetycluster.eu)
  - Newsletter (register!)
  - Compendium of projects: 8 p/project, yearly
- + Platform „NanoFutures“: [www.nanofutures.info](http://www.nanofutures.info)
- + Project websites [e.g. **find these slides** on [www.nanomile.eu](http://www.nanomile.eu), [www.nanofase.eu](http://www.nanofase.eu),...]

### Integrate knowledge & tools in your approach/tools/policy:

- Mechanisms, data, risk assessment, risk management, safety-by-design...
- Internally or through service providers

**Participate to R&D projects:** Partner, Advisory board, Stakeholder group

**Define a future European Centre for nanosafety expertise** - EC4SafeNano

# Acknowledgement

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