



nanonextnl

innovating with micro and nanotechnology

NanoNextNL : a success formula for
societally relevant innovation with
public-private partnerships in
technology

Léon Gielgens
Programme Director NanoNextNL

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NanoNextNL Programme

Public-Private Partnership (PPP):

- 250 million Euro
- 13 universities, 8 medical centres, 12 knowledge institutes, and 110 industrial partners



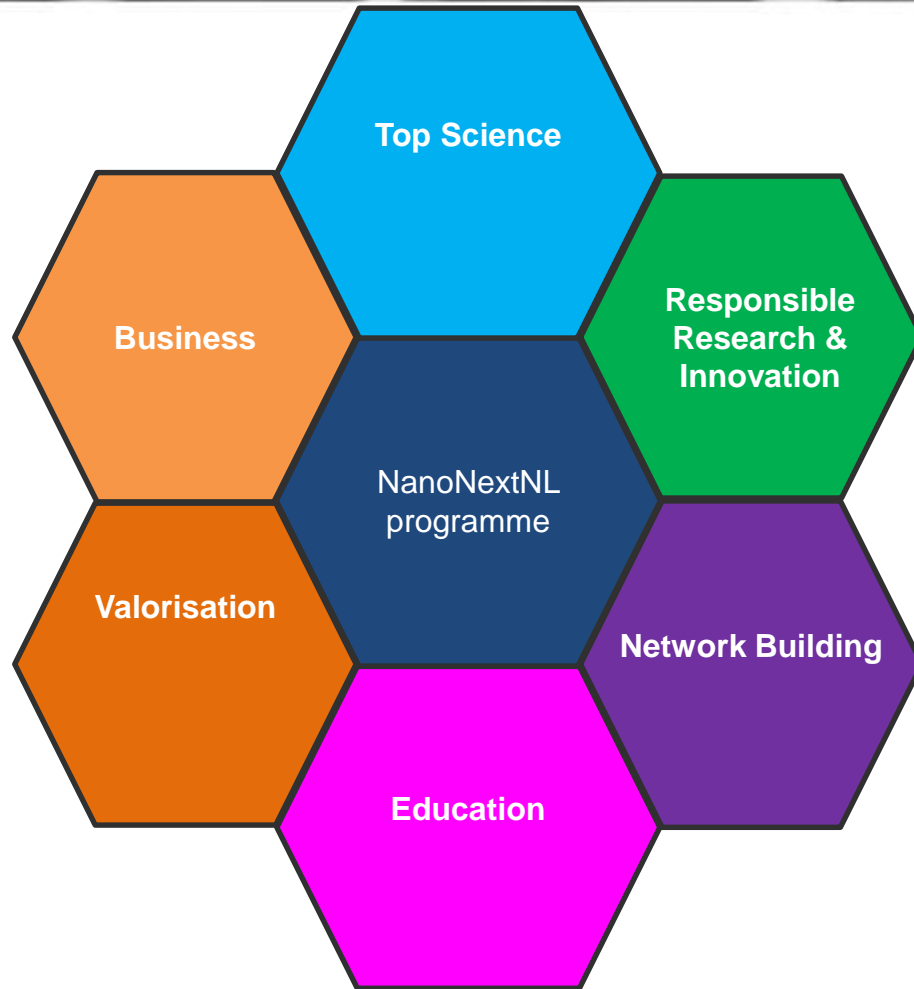
Collaboration in and beyond Themes

Societal
Needs
Generic
Themes

	1. Risk Analysis and Technology Assessment (RATA)	2. Energy	3. Nano-medicine	4. Clean water	5. Food
6. Beyond Moore					
7. Nano materials					
8. Bio-nano					
9. Nano fabrication					
10. Sensors and actuators					

Collaboration
beyond themes

Overarching theme

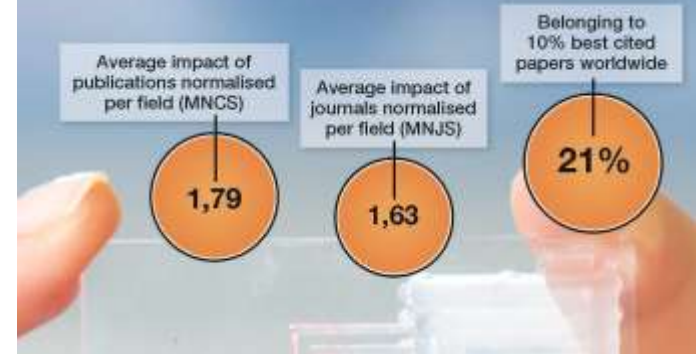


Top Science

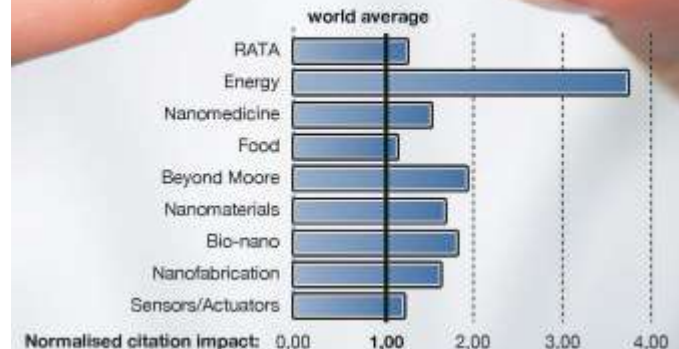
- A simultaneous focus on application and top science is very well possible: publications have a high impact factor
- Analysed publications
 - 2010-2015 (734) (March 2017)
- Status March 2017:
 - >1250 publications
 - Average impact publications: 1,79
 - Average impact journals: 1,63
 - Belonging to top10%: 21%
 - 21% publications with industry
 - >130 theses completed

Citation impact of NanoNextNL publications

- Over 1250 published (status March 2017)
- Over 150 published in high impact journals, impact factor >10
- 734 analysed (published in 2010-2015)
- 21% of the publications concern collaboration with industry

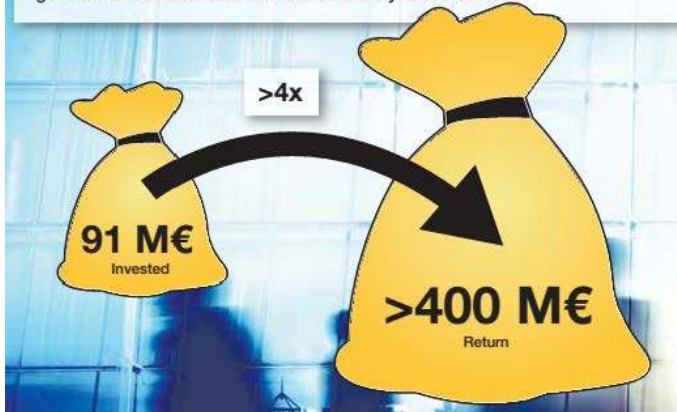


Citation impact of publications from NanoNextNL themes



Return-on-investment

If the expectations on the return-on-investment are extrapolated, the 91 M€ invested in industrial NanoNextNL research (subsidy + matching) will generate a business value of >400 M€ in the years to come:



Innovation:

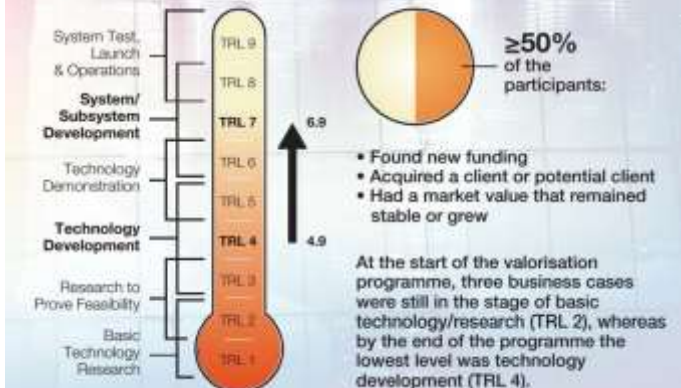
- > 4 x return-on-investment
- Cumulative ROI is 400 M€
- Additional ROI expected from growth of start-ups
- Joint patents might be complicated due to conflicts of interest
- NanoNextNL has contributed to the survival of several SMEs

Valorisation Programme:

- Business support (23 cases) was initiated based on International Advisory Council review in 2013
- TRL increased from 4.9 to 6.9
- Advice: start business case development directly at the start of the programme

Results valorisation programme

Participants in the NanoNextNL valorisation programme state that the average Technology Readiness Level rose from technology development (TRL 4.9) to system development (TRL 6.9).



Product Innovations of Industrial Participants



“A single finger prick of blood suffices for the diagnosis of heart infarcts, psychological disorders or brain damage” Matthias Irmsher, Philips



“Production of nanoparticles using raw materials”
Peter Nieuwland, FutureChemistry

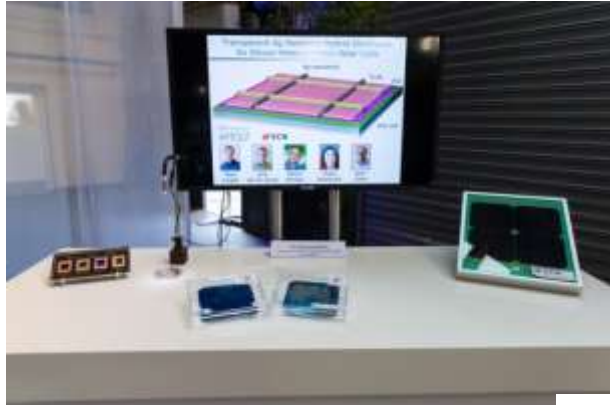


“Tailor-made spheres provide a stable and transparent colour to drinks and food”
Krassimir Velikov, Unilever



“New ideas for innovative microscopy products are now further developed”
Frank de Jong, FEI

Demonstrators, Patents and Start-ups



- 86 demonstrators
- 127 unique patents
- 18 start-ups



Risk Analysis and Technology Assessment

Responsible research and innovation

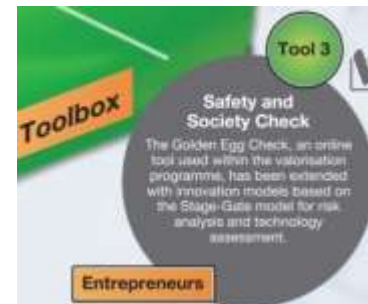
- RATA is integrated in business plans and in several NanoNextNL research programmes.
- Safe-by-Design as developed within RATA is used as a selling point by start-ups
- Start-ups indicated that the RATA programme increased RATA-awareness, identified unique selling points, and resulted in certification
- Experience gained is shared within Europe and appreciated as the Dutch approach
- Advice: RATA should be fully incorporated in future research programmes
- Lesson learned: Researchers tend to prioritize research over RATA
- Lesson learned: Active support by supervisors is essential

Safe-by-Design

RATA results:

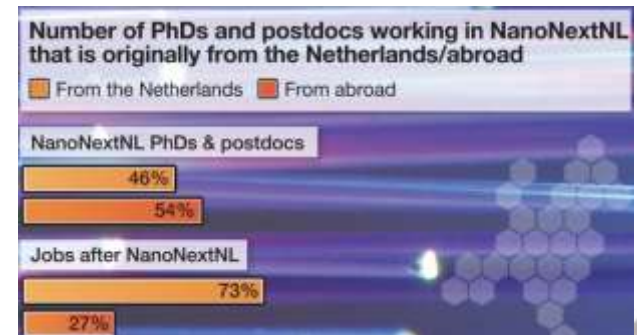
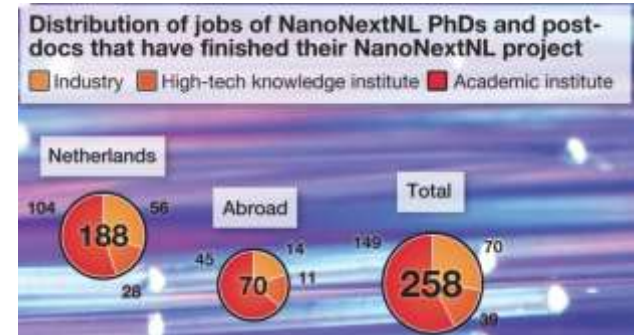
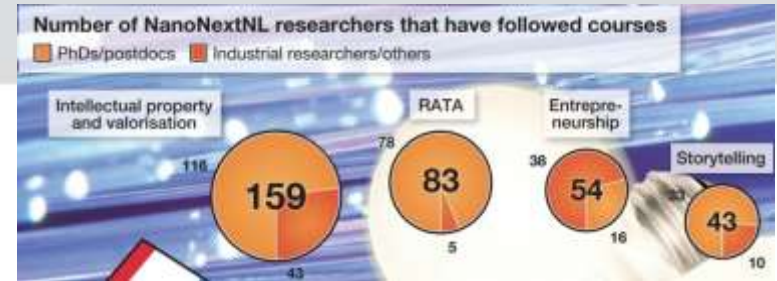
Safe-by-Design tools available for application in science and industry:

- 1) On-line technology evaluation tools
- 2) Risk analysis is integrated in Lean-business canvas
- 3) Risk analysis is incorporated in the Golden Egg Check
- 4) Societal incubator: workshop with representatives from business, science, and civil society (under construction)



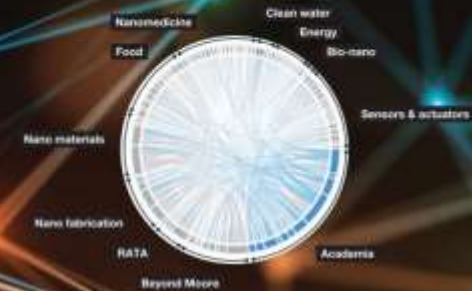
Education

- Tailored courses developed:
 - Intellectual Property
 - Entrepreneurship
 - Story-telling
 - Risk Analysis and Technology Assessment
- The developed education portfolio is invaluable to future research and technology programmes that involve nanotechnology
- Overall NanoNextNL has led to nett influx of personnel to the Netherlands
- Lesson learned: Offering entrepreneurship course at the start of the programme will maximise conversion rate of research ideas to business
- Lesson learned: Support by supervisors is important to maximize course attendance



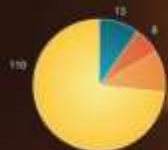
NanoNextNL has built a unique and vibrant nano/microtechnology ecosystem at a scale that is unique in the Netherlands and beyond

435 multidisciplinary connections
between academic and industrial partners



Number of partners

Universities Medical centres
Knowledge institutes Industrial partners



Impression Annual NanoCity Meetings



New PPP-Standard

- Integrate top science, responsible research and innovation, business development and education
- Foster and stimulate unique multi- and interdisciplinary network formation and collaboration
- Stimulate and support young investigators with business development and establishment of start-ups
- Application of innovation based on Safe-by-Design
- Organize innovative network meetings such as NanoCity

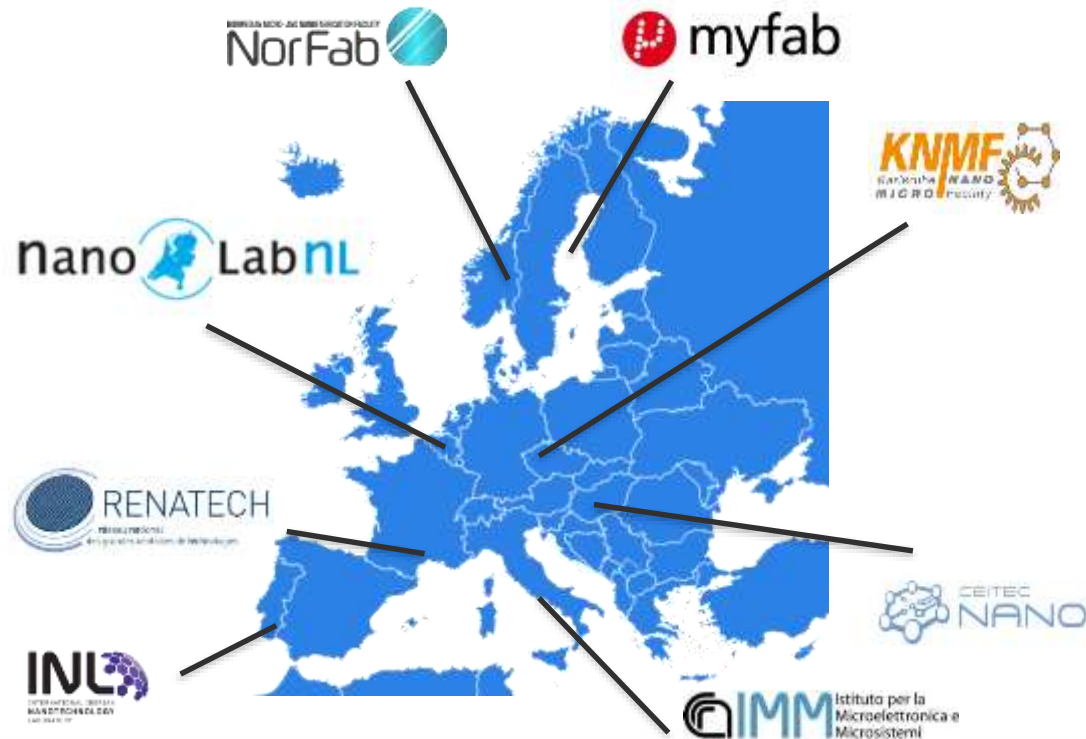
Factors for Success

- Excellent communication
 - Efficient use of assets
 - Strong community
 - Use of standards (Dutch Safe by Design approach)
 - Large impact per Euro invested
- Leading infrastructure established
 - Top science and knowledge
 - Shared High Tech facilities:
NanoLabNL (co-founder of EuroNanoLab)



- **Conclusion:**

The Netherlands has established a successful PPP-standard



EuroNanoLab is an initiative to establish a **large scale distributed nanofabrication research infrastructure**

- Providing (open-) access to public and private users
- Facilitating international and public-private research projects
- Accelerating innovation by sharing process competences and capabilities
- Set-up European standards in cleanroom procedures

Lessons Learned

- Involve industry with recruitment of researchers
- Involve industry and academia in each project
- Start jointly
 - Kick-off meeting for programme as whole
 - Challenge:
(industry more flexible workforce; academia needs to recruit)
- Support of supervisors essential for course attendance and RATA
- Commence with entrepreneurship training at start of programme
- Science and business success is indicator of PPP performance

Future Requirements

- Continued investments required to maintain ecosystem with:
 - Top science combined with valorisation
 - Integration of RATA
 - Valorisation support
 - Network opportunities
- Focus for the near future

Conscious decision for societally relevant themes:

- Health
- Energy
- Food
- High-tech manufacturing



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