

# observatoryNANO - supporting informed decisions on nanotechnology developments

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## About the IoN

- UK based, established 1997
- Membership organisation  
- over 25,000 members worldwide
- Information, analysis and education
- Support to business and policy makers
- Events - conferences, workshops, technology transfer
- EU projects



NANO-TV, ENRHES



A global database of over 65,000 nanotechnologists  
A website that receives > 1.5m hits p.m.



## observatoryNANO

- Funded by the European Commission from 2008-12 under Framework Programme 7.
- 16 partners from 10 European States.
- Purpose - to provide the EC and other policy and decision makers with reliable information regarding the development of nanotechnology and its potential impacts on society.

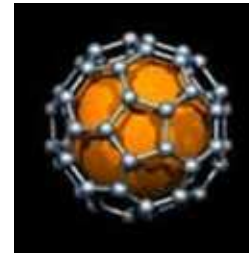




Aerospace, Automotive,  
& Transport



Agrifood



Chemistry &  
Materials



Construction



Energy

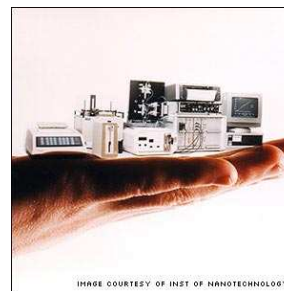
10 broad technology/market sectors are being analysed  
- each presented as a number of subsectors



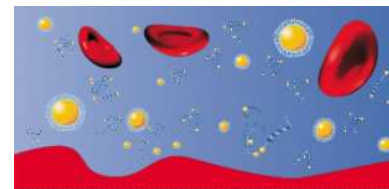
Textiles



Security



ICT



Health, Medicine,  
& Nanobio



Environment

Journal publications, patents, reports ...  
- Everything from basic research to market applications

**Desk research**



**Interim reports**



Feeds into other WPs

1

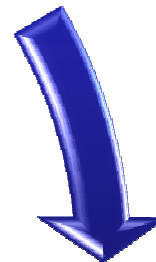
6

Publication of peer-reviewed, concise reports on the project website

**Publication**



**Annual Activity Cycle**



Interviews, review, questionnaires, roundtables, and workshops

**Expert engagement**

12

**Symposium**



Overview of annual analysis and findings. Mixing of academia, industry, business, NGOs, policy and decision makers.

Other WPs feed in



## ST analysis

- 1.State of R&D
- 2.Additional demand for research
- 3.Applications and perspectives
- 4.Current situation within the EU

## Economic analysis

- 1.nanotech impact
- 2.drivers and barriers
- 3.sector segmentation and applications
- 4.possible future products and time range
- 5.application and selected company profiles

### Supported by:

1. Patent analysis (in collaboration with EPO)
2. Publication analysis
3. Public and private funding analysis

## 61 ST sub-sector reports from 10 technology sectors...

### **Aerospace, Automotive & Transport-**

Technologies to produce bulk nanostructured metals; Technologies to produce polymer nanocomposites; Technologies to produce and apply tribological nano-coatings

### **Agrifood-**

Agricultural production; Food processing and functional food; Food packaging and distribution

### **Chemistry & Materials-**

Carbon based nanomaterials; Nanocomposites; Nanostructured metals and alloys; Nano-polymers; Nano-ceramics; Nano-fabrication technologies

### **Construction-**

Cement based materials; Coatings; Living comfort and building safety; Sustainability and environment; Civil- and underground construction

### **Energy-**

Photovoltaic; Thermoelectricity; Fossil fuel; Energy harvesting; Nuclear; Renewable energies; Fuel cells; Hydrogen production and storage; Batteries and supercapacitors

### **Environment-**

Air purification; Wastewater purification; Drinking water treatment; Groundwater remediation; Soil remediation

### **Health, Medicine & Nanobio-**

Cosmetics; Diagnostics; Novel bionanostructures; Implants, surgery and coatings; Therapeutics; Regenerative medicine

### **Information & Communication-**

Integrated circuits; Memory; Displays; Manufacturing; Photonics; Beyond CMOS

### **Security-**

Chemical Weapons and Industrial Toxins Detection; Biological Threat Agent Detection; Radiological-Nuclear Weapon Detection; Explosives Detection; Narcotics Detection; Neutralising CBRNE effect; Decontamination; Forensics; Personnel Protection; Equipment and Infrastructure Protection; Condition Monitoring of civilian zones; Anti-counterfeiting; Authentication; Positioning and Localisation

### **Textiles-**

Nanostructures; Fibre production; Finishing treatments; Textile products

## 35 economic sub-sector reports from 10 technology sectors...

### **Aerospace, Automotive & Transport-**

Structural parts/airframe; External panels/surfaces; Powertrain; Engine (ICE)/turbines

### **Agrifood-**

Nanocomposite packaging; Coatings for packaging; Edible coatings; Biodegradable nanocomposites for packaging;  
Delivery systems for nutraceuticals

### **Chemistry & Materials-**

Nanomagnetic materials; Carbon nanotubes; Nanodiamond; Intrinsic conducting polymers

### **Construction-**

Cement based materials; Construction ceramics; Paints; Windows; Insulation systems/materials

### **Energy-**

Photovoltaic; Fossil fuel

### **Environment-**

Water treatment; Soil remediation

### **Health, Medicine & Nanobio-**

Bone replacement materials; Dental nanomaterials; in vivo imaging; Drug delivery

### **Information & Communication-**

Memory; Displays; Materials

### **Security-**

Detection

### **Textiles-**

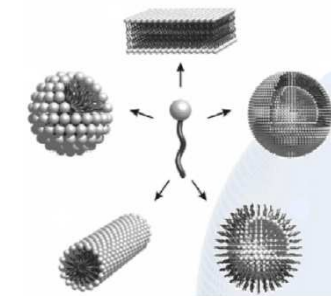
Water repellent/self-cleaning; Moisture absorption/wicking; Anti-static; Anti-bacteria; Filtration and UV protection

an example...

# Agrifood

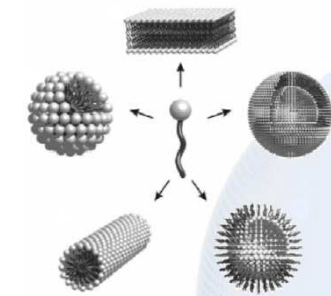
Largest manufacturing sector in Europe.

Area	Examples
Agricultural production	new delivery systems (e.g. BASF, Proctor and Gamble, Henkel, Dow Chemical, Syngenta)
Food processing	coatings and filters (e.g. Aquamarijn Micro Filtration bv, ItN Nanovation, NanoGate)
Food processing	nutriceuticals (e.g. Salvona Technologies Inc, AquaNova, BASF)
Food packaging	improved barrier properties, sensor technologies (e.g. Bayer, Honeywell, DuPont, Timestrip plc)



## Issues and additional demands for research:

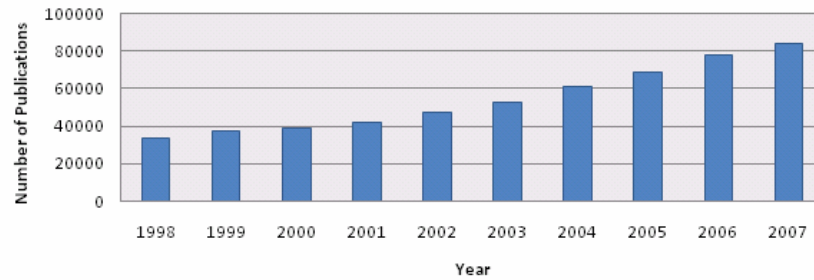
Area	Issue/additional demand for research
Precision agriculture	more robust sensor technologies
Food processing QC	microfluidic devices incorporating nanotechnology for real-time monitoring of food processing
Nanostructured foods	lab to industry (particularly nano-emulsions)
Nanostructured foods	targeting to different parts of the GIT
Nanostructured foods	public acceptance (e.g. BASF's CoQ10)
Nanostructured foods	safety- EFSA report this year advocates more research into exposure and toxicity
Biopolymer nanocomposites	improving mechanical strength and water permeability



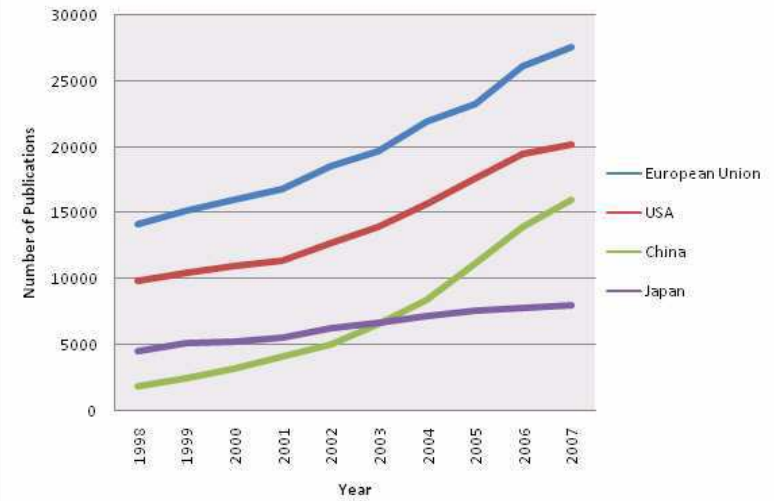
and cost !

# Publications & Patents

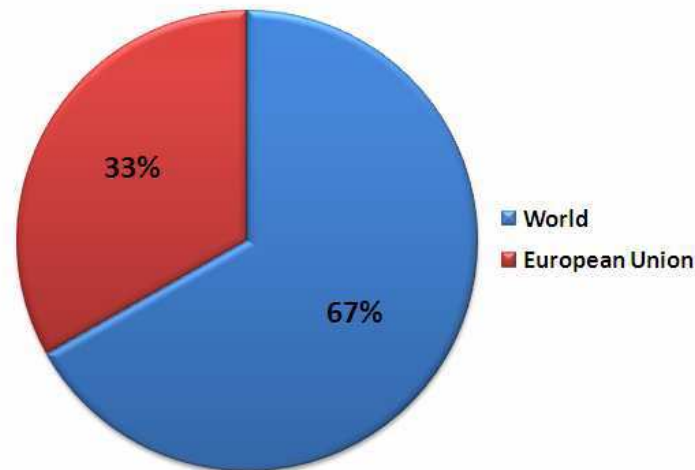
**Figure 1. WOS Nano Publications by Year for the World**



**Figure 2. WOS Publication Activity by Region by Year**



**Figure 3. Share of Nano Publications 1998-2007: European Union vs. World**



## Most prolific institutions (150)

## ...and private organisations (80)

2007		1998	
North America		North America	
USA	44	USA	54
Canada	4	Canada	3
Mexico	1		
<b>Regional Sum</b>	<b>49</b>	<b>Regional Sum</b>	<b>57</b>

Europe		Europe	
UK	7	Germany	19
Germany	6	UK	8
France	5	France	7
Italy	4	Italy	6
Spain	3	Switzerland	3
Sweden	3	Russia	3
Switzerland	2	Spain	3
Russia	2	Sweden	3
Netherlands	1	Netherlands	2
Czech Republic	1	Czech Republic	1
Poland	1	Poland	1
Belgium	1	Belgium	1
Ukraine	1	Ukraine	1
Bulgaria	1	Hungary	1
Finland	1		
<b>Regional Sum</b>	<b>39</b>	<b>Regional Sum</b>	<b>59</b>

Asia		Asia	
China	23	Japan	14
Japan	13	China	7
South Korea	7	South Korea	2
Taiwan, China	6	Taiwan, China	2
India	3	Singapore	1
Singapore	2	India	1
Hong Kong, China	2	Hong Kong, China	1
<b>Regional Sum</b>	<b>56</b>	<b>Regional Sum</b>	<b>28</b>

Rest of the World		Rest of the World	
Israel	2	Israel	4
Australia	2	Australia	1
Brazil	2	Brazil	1
<b>Regional Sum</b>	<b>6</b>	<b>Regional Sum</b>	<b>6</b>

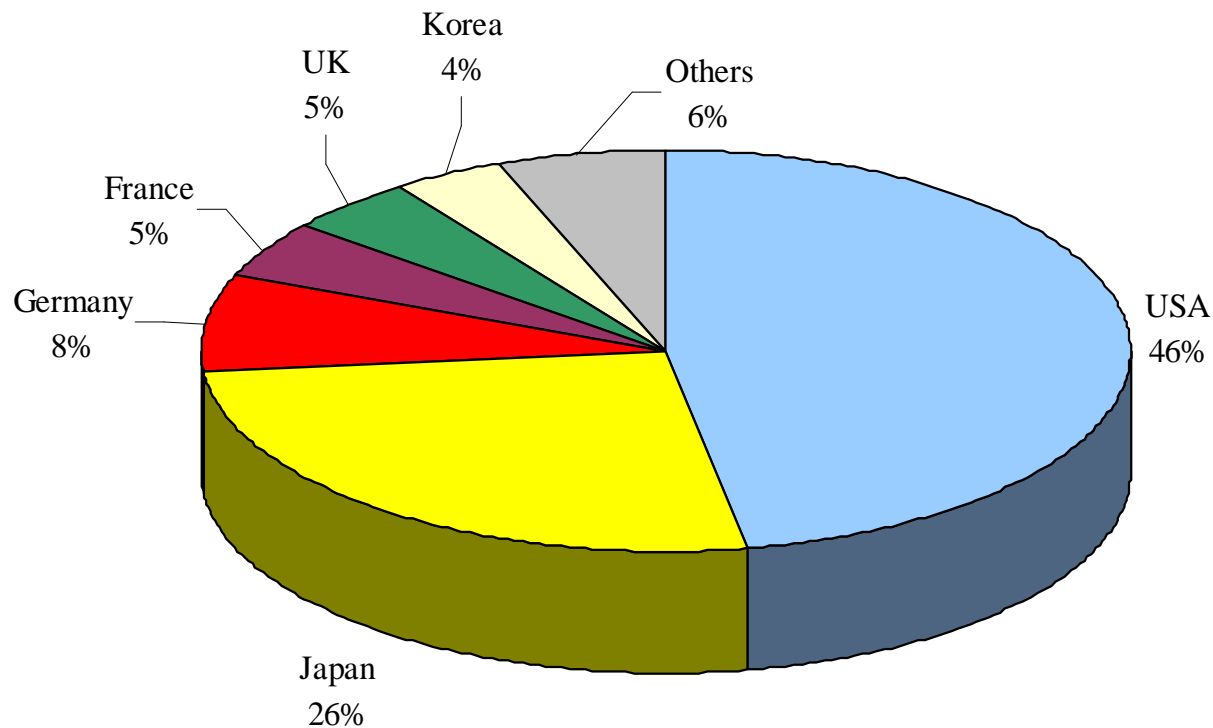
USA	33
Japan	29
Germany	9
South Korea	3
Switzerland	2
UK	1
Taiwan, China	1
Singapore	1
New Zealand	1

## Institutions (by Citation Index)

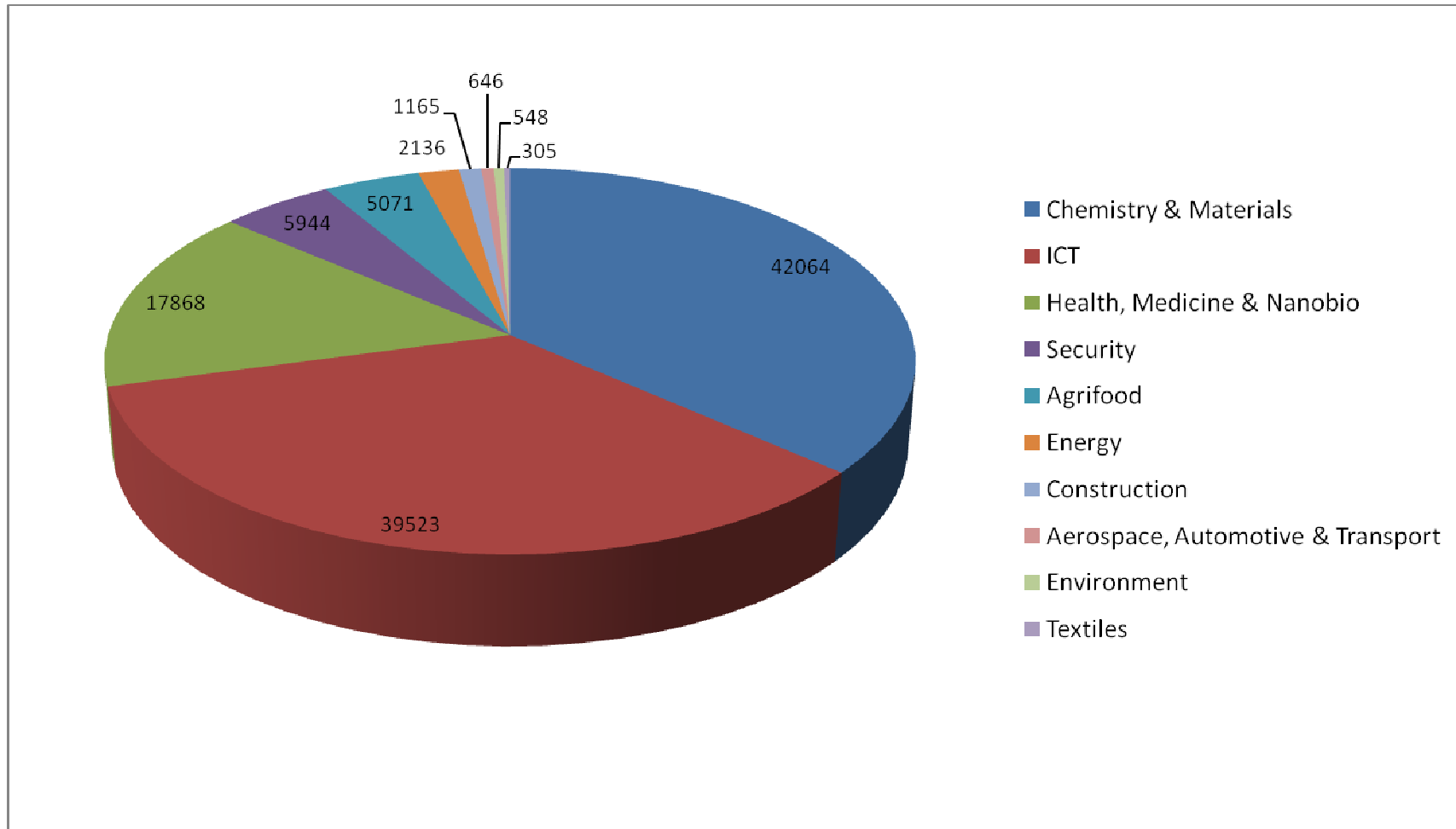
Rank	Institution	Country	Citation Score	Rank by Number of Publications in 2006
1	Georgia Inst Technol	USA	3.663	37
2	Caltech	USA	3.491	77
3	Harvard Univ	USA	3.441	26
4	Columbia Univ	USA	3.417	92
5	Rice Univ	USA	3.410	107
6	Univ Calif Berkeley	USA	3.391	20
7	Univ Calif Santa Barbara	USA	3.245	43
8	Stanford Univ	USA	3.214	40
9	MIT	USA	3.126	19
10	Northwestern Univ	USA	3.086	45
11	Delft Univ Technol	Netherlands	3.057	126
12	Univ Calif Los Angeles	USA	3.052	59
13	Univ Washington	USA	3.044	70
14	Penn State Univ	USA	2.768	41
15	Lawrence Livermore Natl Lab	USA	2.754	121
16	Univ Massachusetts	USA	2.722	98
17	Univ Penn	USA	2.718	79
18	ETH	Switzerland	2.705	50
19	Eindhoven Univ Technol	Netherlands	2.668	120
20	Arizona State Univ	USA	2.641	86
21	Ecole Polytech Fed Lausanne	Switzerland	2.584	64
22	Princeton Univ	USA	2.548	94
23	Cornell Univ	USA	2.546	55
24	Univ Erlangen Nurnberg	Germany	2.544	101
25	Japan Sci & Technol Agcy	Japan	2.456	3
26	Univ Manchester	UK	2.442	95
27	Univ Michigan	USA	2.420	33
28	Pacific NW Natl Lab	USA	2.409	147
29	Univ Munich	Germany	2.401	113
30	Univ Sydney	Australia	2.394	117
31	Univ N Carolina	USA	2.393	90
32	Univ Minnesota	USA	2.391	44
33	Hong Kong Univ Sci & Technol	Hong Kong, China	2.391	109
34	Univ Calif Davis	USA	2.387	65
35	Univ Tennessee	USA	2.383	111
36	Univ Cambridge	UK	2.349	22
37	John Hopkins Univ	USA	2.338	88
38	Univ Texas	USA	2.322	15
39	Duke Univ	USA	2.318	144
40	Imperial Coll London Sci Technol & Med	UK	2.314	73

## Patent analysis - PATSTAT

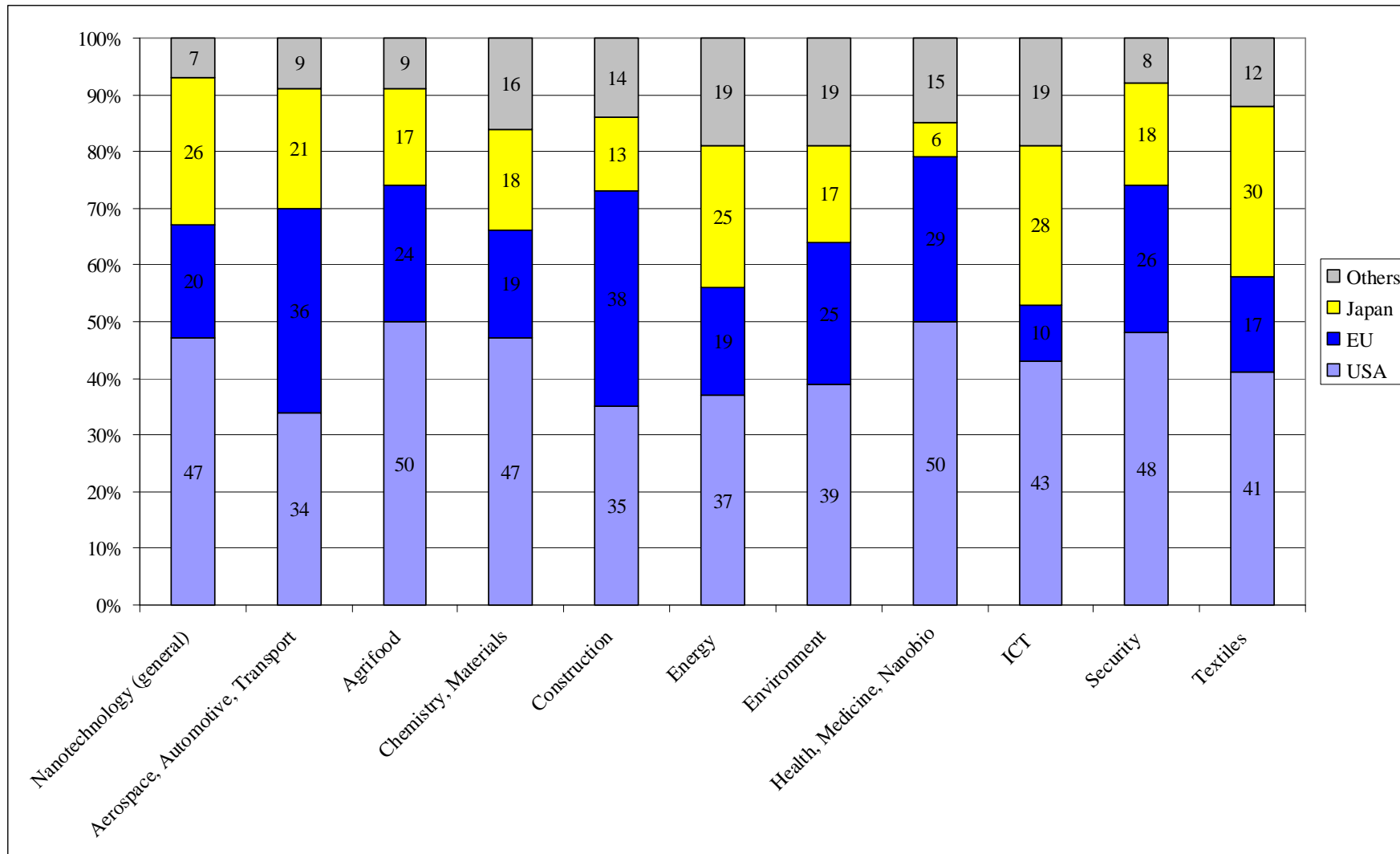
patent applications (countries); 132021 in total (since 1972)



- >132,000 nano patents
- more than 10,000 p.a.
- semiconductors largest (> 30,000)
- keyword sets- patents per sector



Number of patents per technology sector



Country shares (in %) of patent applications for nanotechnology

# Public & Private Funding

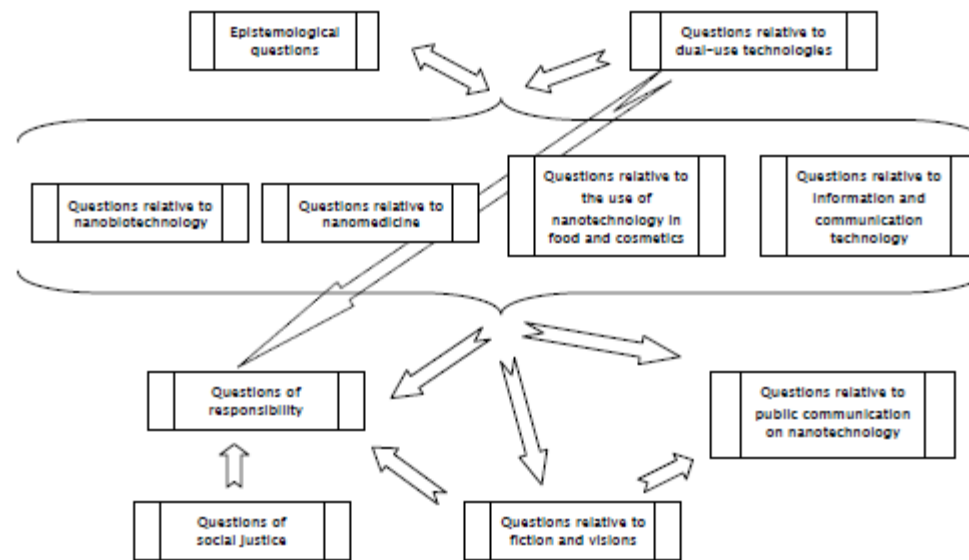
- Public funding remains high, PPPs now evident
- Decreased VC fund raising during 2007-08
- EU attracts small percentage of global VC
- However, encouraging signs that companies are still receiving investment and are able to produce exits (e.g. Oxford Nanopore, ~ €16.3m, Nanoco- AIM)

# ELSA, EHS & Standards

review global activities & assess ST analyses for new issues

## Societal and ethical implications

- report on individual and collective responsibility:
  - developments in governance (including codes of conduct),
  - risk issues and the precautionary principle,
  - divide between developed and developing countries.
- quarterly interviews with opinion leaders
- ethics toolkit



Ethical and societal questions related to nanotechnology.

## Environment, health and safety (EHS) issues

Baseline document- seminal research in EHS

- toxicology
- ecotoxicology
- exposure assessment
- risk assessment and management
- occupational hygiene
- fate and behaviour

Liaisons with other projects and organisations

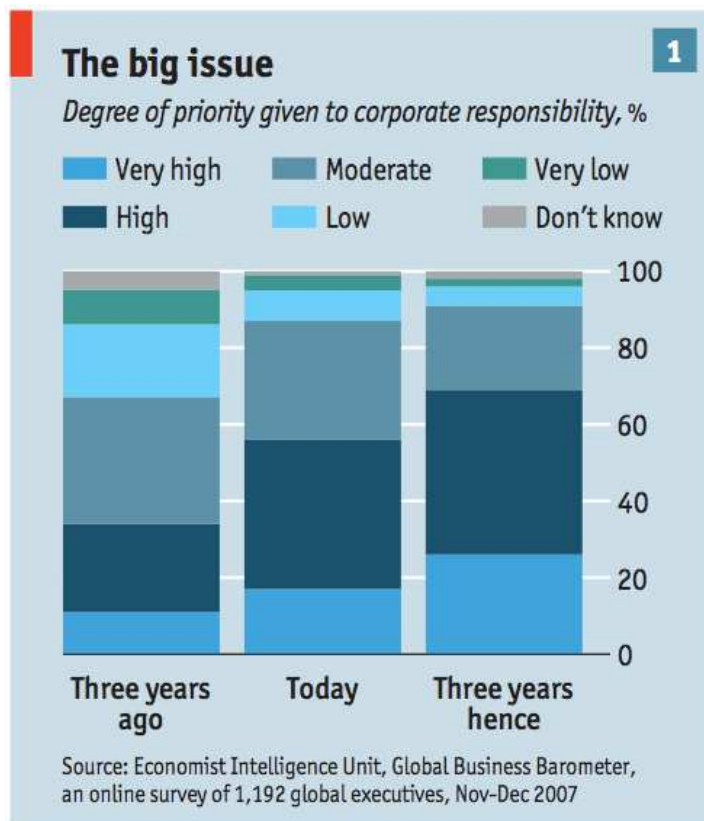
## Developments in regulations and standards

Annual report:

1. Regulating Nanotechnology
2. Legislation/Hard Regulation
  - EU, Member States, USA, Australia, Canada, Japan
3. Self-regulation
  - EC Code of Conduct, EPA-NSMP, DEFRA-VRS, others
4. Standards for Nanotechnologies
  - ISO TC229, CEN, OECD
5. Annex- list of main organisations

## Communication

- to the wider community
- and for business - corporate social responsibility (CSR)



## NanoMeter

Assessing Opportunities and Risks of Nanotech Applications

- Social benefits
- Impact on health & environment
- Resource requirements
- Privacy issues
- The overall user benefits
- Aspects of product stewardship



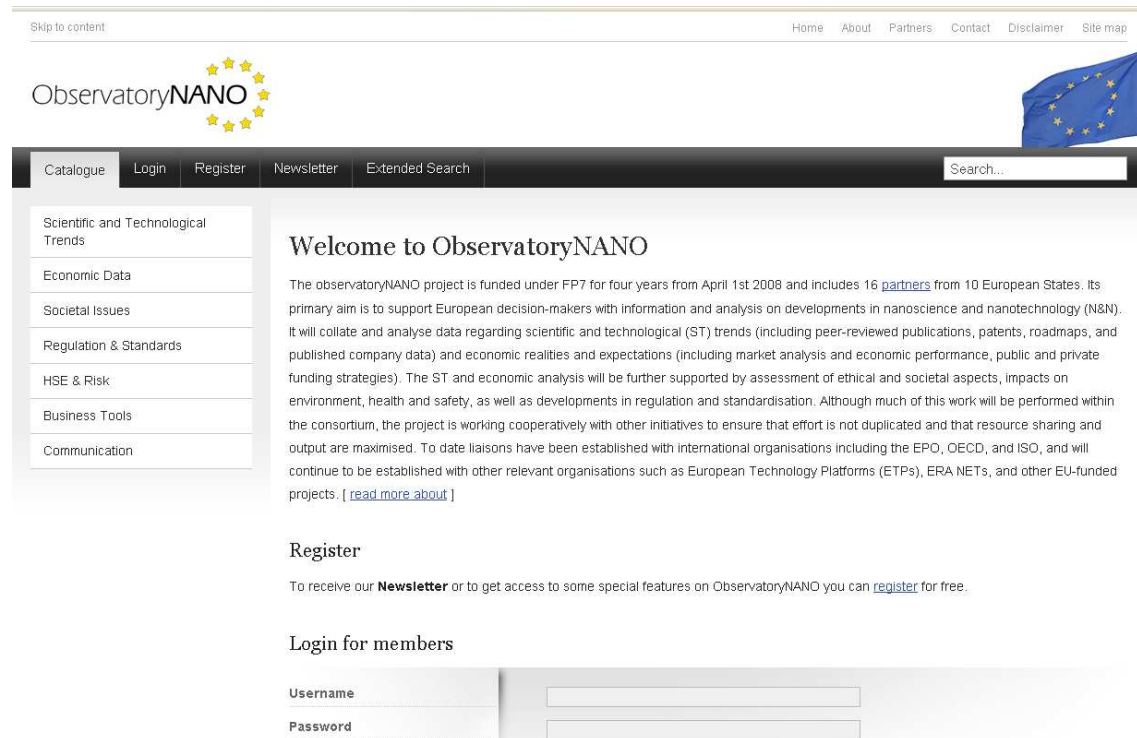
- evaluates existing knowledge
- helps identify gaps
- supports risk assessment
- supports sharing of perceptions and knowledge

## Other activities

- review of other observatory-like initiatives
- established an external advisory board
- established a community of interested experts

## How to find out more (and get involved!):

- All reports freely accessible and linked by keywords
- Register to get updates and newsletters
- Participate in the expert dialogue, e.g. topic orientated workshops
- Let us know about your developments



The screenshot shows the ObservatoryNANO website interface. At the top, there is a navigation bar with links for Home, About, Partners, Contact, Disclaimer, and Site map. Below this is the ObservatoryNANO logo and a European Union flag. A dark navigation bar contains links for Catalogue, Login, Register, Newsletter, and Extended Search, along with a search input field. The main content area features a sidebar with categories: Scientific and Technological Trends, Economic Data, Societal Issues, Regulation & Standards, HSE & Risk, Business Tools, and Communication. The main text area is titled "Welcome to ObservatoryNANO" and contains a detailed paragraph about the project's funding, goals, and activities. Below the welcome message are sections for "Register" and "Login for members", each with a corresponding form.

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Observatory**NANO**

Catalogue Login Register Newsletter Extended Search Search...

Scientific and Technological Trends

Economic Data

Societal Issues

Regulation & Standards

HSE & Risk

Business Tools

Communication

### Welcome to ObservatoryNANO

The observatoryNANO project is funded under FP7 for four years from April 1st 2008 and includes 16 [partners](#) from 10 European States. Its primary aim is to support European decision-makers with information and analysis on developments in nanoscience and nanotechnology (N&N). It will collate and analyse data regarding scientific and technological (ST) trends (including peer-reviewed publications, patents, roadmaps, and published company data) and economic realities and expectations (including market analysis and economic performance, public and private funding strategies). The ST and economic analysis will be further supported by assessment of ethical and societal aspects, impacts on environment, health and safety, as well as developments in regulation and standardisation. Although much of this work will be performed within the consortium, the project is working cooperatively with other initiatives to ensure that effort is not duplicated and that resource sharing and output are maximised. To date liaisons have been established with international organisations including the EPO, OECD, and ISO, and will continue to be established with other relevant organisations such as European Technology Platforms (ETPs), ERA NETs, and other EU-funded projects. [ [read more about](#) ]

### Register

To receive our **Newsletter** or to get access to some special features on ObservatoryNANO you can [register](#) for free.

### Login for members

Username

Password

## Partners:

Institute of Nanotechnology	IoN	UK
VDI Technologiezentrum GmbH	VDI-TZ	DE
Commissariat à l'énergie atomique	CEA	FR
Institute of Occupational Medicine	IOM	UK
Malsch TechnoValuation	MTV	NL
triple innova	triple innova	DE
Spinverse	Spinverse	FI
Bax & Willems Consulting Venturing	B&W	ES
Dutch National Institute for Public Health and the Environment	RIVM	NL
Technical University of Darmstadt	TUD	DE
AIRI/Nanotec IT	AIRI	IT
Nano and Micro Technology Consulting	NMTC	DE
Swiss Federal Laboratories for Materials Testing and Research	EMPA	CH
Centre for Bioethics and Nanoethics, Aarhus	AU	DK
MERIT, Universiteit Maastricht	MERIT	NL
Technology Centre AS	TCASCR	CZ



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