



EUROPEAN  
COMMISSION

Community Research

# The EU 7th Framework Programme for Research, Technological Development and Demonstration

**Heico Frima**

European Commission

Directorate-General for Research

Programme Officer

Unit "Nano- and Converging  
Sciences and Technologies"

E-mail: [heico.frima@ec.europa.eu](mailto:heico.frima@ec.europa.eu)



**6th ESA Roundtable on Micro & Nanotechnologies for  
Space Applications**

**Noordwijk, 9 October 2007**

Disclaimer: Note that this presentation is not legally binding and does not represent any commitment on behalf of the European Commission

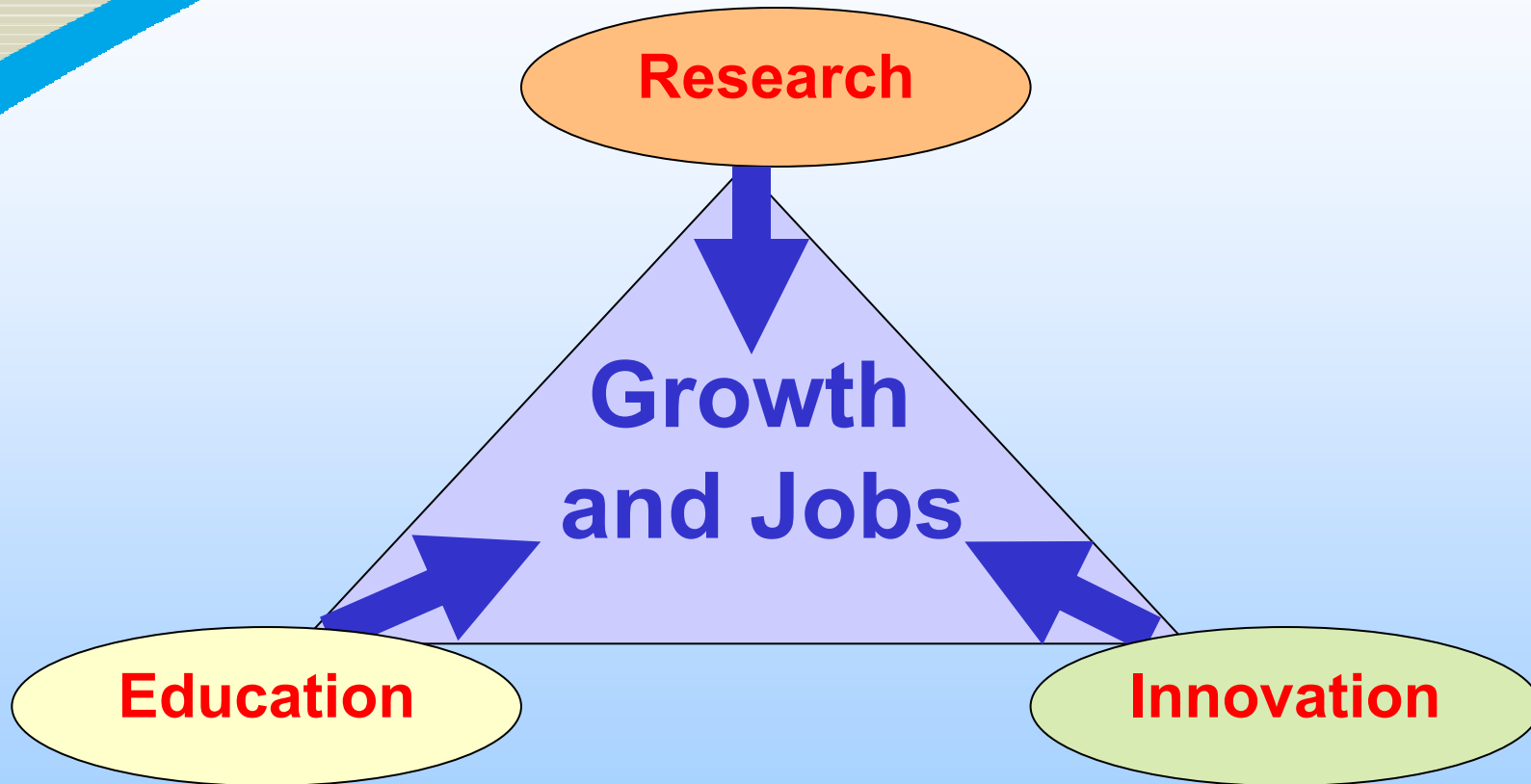




EUROPEAN  
COMMISSION

Community Research

# Lisbon strategy



S&T contributes to the **Lisbon** objectives: economic **growth**, **employment** creation, **environmental** protection, **social** challenges: fight **poverty**, improve human **health** and **quality** of life (GSM, remote working, safe roads, etc.)

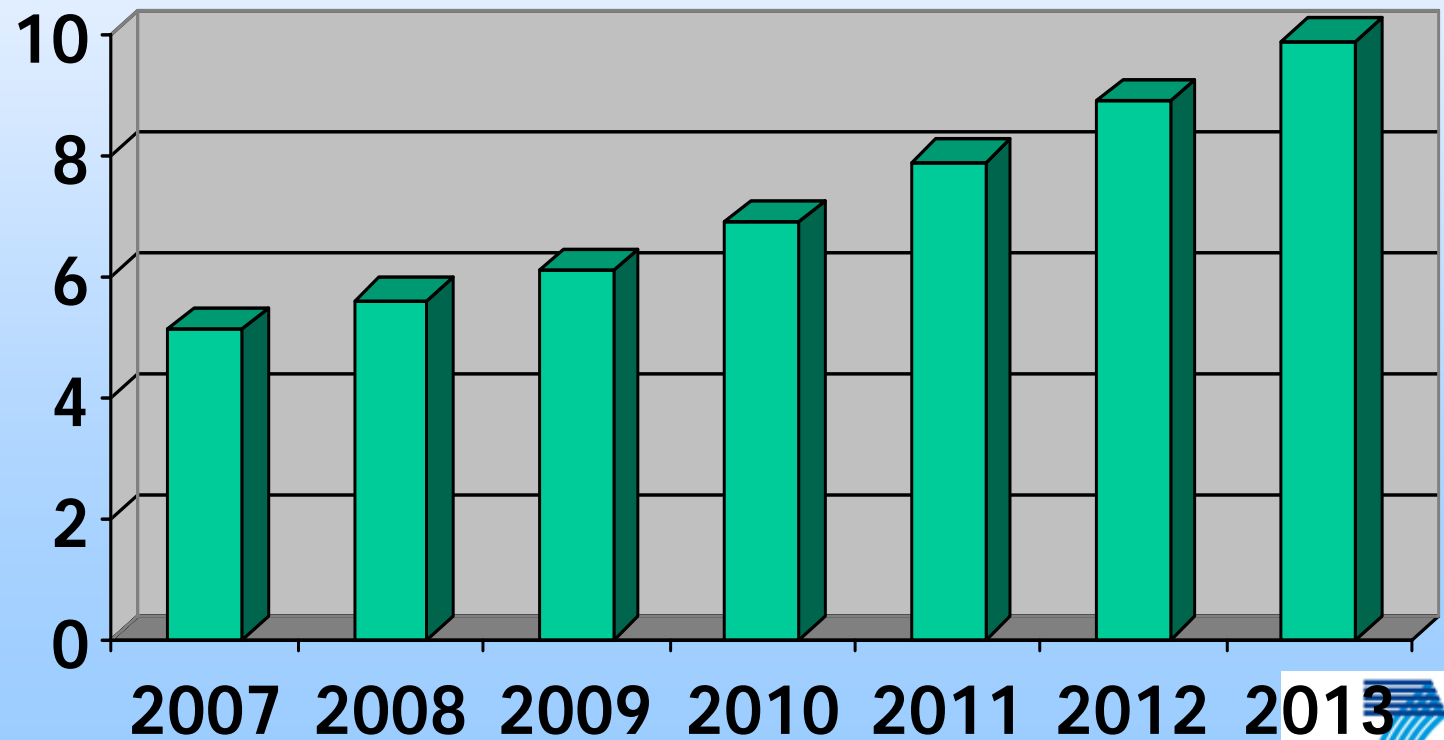


EUROPEAN  
COMMISSION

Community Research

# Framework Programme 7 : Budget: 50,5 Billion Euro

Billion Euro





EUROPEAN  
COMMISSION

Community Research

# Framework Programme 7 consists of four programmes

***Cooperation* – Collaborative research**

***Ideas* – Frontier Research**

***People* – Human Potential**

***Capacities* – Research Capacity**

+

**JRC (non-nuclear, nuclear) and Euratom**

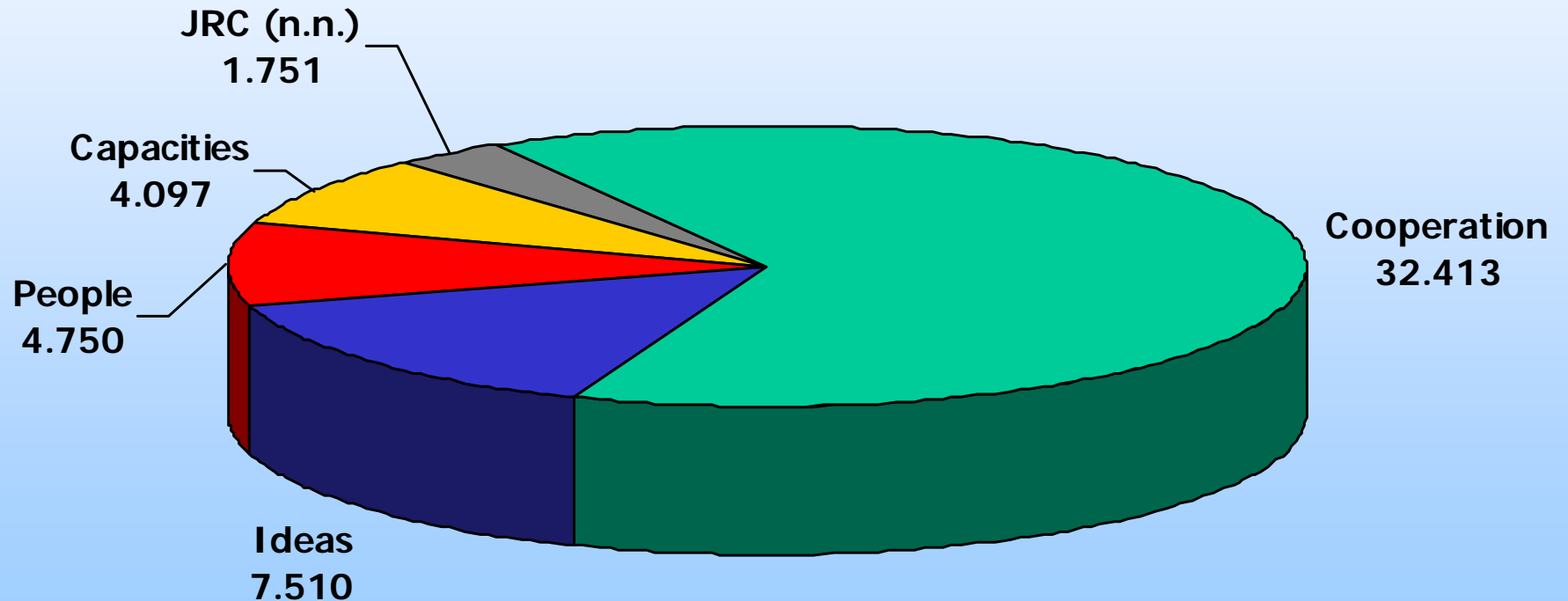


EUROPEAN  
COMMISSION

Community Research

# FP7 budget

(in billion €, total 50.521)





EUROPEAN  
COMMISSION

# ***Cooperation* – Collaborative research**

Support will be implemented across all themes through

**Collaborative research**  
(Collaborative projects; Networks of Excellence; Coordination/support actions)

**Coordination of non-EU research programmes**  
(= national programmes)  
(ERA-NET; ERA-NET+; Article 169)

**International Cooperation**

**Joint Technology Initiatives**



EUROPEAN  
COMMISSION

Community Research

# FP7 – SP Cooperation

## 10 Themes

(€ million)

1. Health	6 100
2. Food, agriculture and fisheries, and biotechnology	1 935
3. Information and communication technologies	9 050
4. Nanotechnologies, materials and production	3 475
5. Energy	2 350
6. Environment	1 890
7. Transport	4 160
8. Socioeconomic research	623
9. Space	1 430
10. Security	1 400
Total	32 413

\* Not including non-nuclear activities of the Joint Research Centre: €1 751 million



EUROPEAN  
COMMISSION

Community Research

# Emerging Nanopatterning Methods

## NaPa

- **FP6 Integrated Project, NMP Priority**
- **Project started March 1, 2004**
- **Coordinator: VTT Information Technology**
- **30 Partners (35 groups) from 14 countries**
- **10 Universities, 11 research institutes, 9 industry**
- **Duration 48 months, Volume 31 M€, EC grant 16 M€**

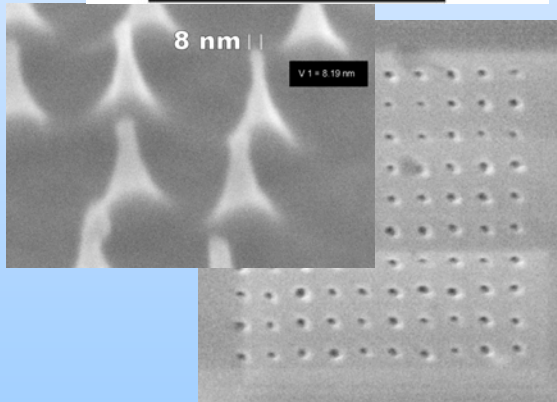
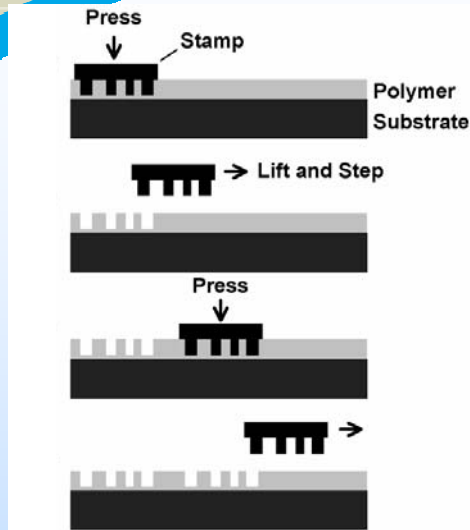




EUROPEAN  
COMMISSION

Community Research

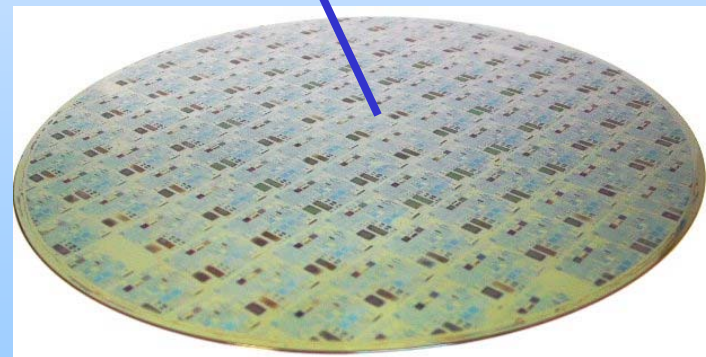
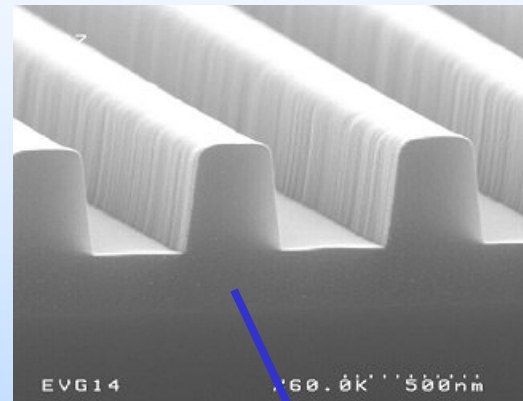
# Nanoimprinting lithography



## Step&Stamp

T. Haatainen et al., VTT

## NIL on 200 mm wafer



C. Gourgon et al., CNRS

## NIL variants





EUROPEAN  
COMMISSION

Community Research

# NaPa European dimension



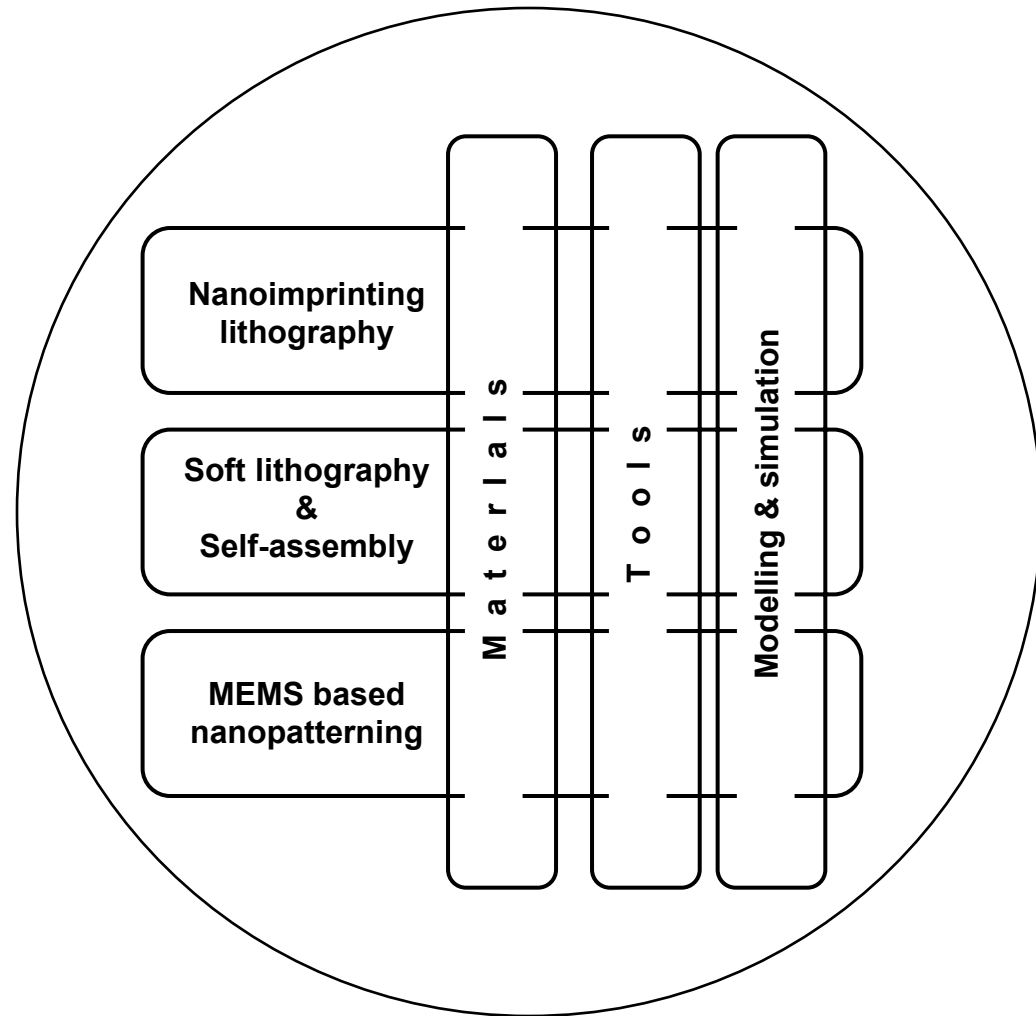


EUROPEAN  
COMMISSION

Community Research

# Structure of the project

- **6 Subprojects**
- **20 Workpackages**
- **> 100 Tasks**





EUROPEAN  
COMMISSION

Community Research

### 3. Information and Communication Technologies

**ICT Technology Pillars**

Integration of Technologies

Applications Research

**Future and Emerging Technologies**



EUROPEAN  
COMMISSION

Community Research

## ICT Technology Pillars

- **Nano-electronics, photonics & integrated micro/nano-systems**
- **Ubiquitous and unlimited capacity communication networks**
- **Embedded systems, computing and control**
- **Software, Grids, security and dependability**
- **Knowledge, cognitive and learning systems**
- **Simulation, visualisation, interaction and mixed realities**
- **New perspectives emerging in ICT drawing on other science and technology disciplines**



EUROPEAN

Communi

## 4. Nanosciences, Nanotechnologies, Materials and new Production Technologies – NMP

- Industrial production and manufacturing remain central in wealth generation in Europe.
- Growing interdependence between
  - Competitive service-based economy
  - Competitive industry-based economy (1 job in manufacturing → 2 jobs in service)



EUROPEAN  
COMMISSION

Community Research

# Contribute to Industrial Transformation

- In the globalised economy, EU industry must focus upon **creating products with more added-value especially by** moving from:
  - **Individual to system competitiveness**
  - **Resource-based to knowledge-based economies**
  - **Macro → micro → nano**
  - **Mono-disciplinarity → interdisciplinarity → convergence**



Community Research

**Outline of the FINAL DRAFT Work Programme for NMP – Sept. 26, 2007**

**45 topics**

	LA rge e Large scale cooperative projects	SME SME-focused cooperative projects	SM al Small or medium scale cooperative projects	Othe Coordination & Support Actions (CSA) ERA Net ERA Net Plus		
<b>NANO (9)</b>	2		4	3		
<b>MATERIALS (13)</b>	2		9	1		1
<b>PRODUCTION (8)</b>	3	2	2	1		
<b>INTEGRATION (15)</b>	6	3		3	3	
<b>Totals (45)</b>	<b>13</b>	<b>5</b>	<b>15</b>	<b>8</b>	<b>3</b>	<b>1</b>





EUROPEAN  
COMMISSION

Community Research

# Draft WP 2008 - NMP

## Activity 4.1: Nano S&T

### 4.1.1: Nanosciences and converging sciences

- Converging S&T (nano, bio, info, cogni) - SSFRP
- Support to outreach and communication in nanotechnology – CSA
- Examining capacity building in nano-biotechnology - CSA



EUROPEAN  
COMMISSION

Community Research

# Draft WP – NMP

## Activity 4.1: Nano S&T

### 4.1.2: Nanotechnologies & converging technologies

- Pilot lines to introduce nanotech-based processes into the value chain of existing industries – LSIP
- Nanotechnology for water treatment – (Joint Call with Theme Environment) - SSFRP
- Development of technologies for the controlled combustion of nano-particles - SSFRP
- Study about best practices for IPR... - CSA



EUROPEAN  
COMMISSION

Community Research

# Draft WP - NMP

## Activity 4.1: Nano S&T

### 4.1.3: Health, Safety and Environment Impacts

- Validation, adaptation and/or development of risk assessment methodology for engineered nanoparticles - LSIP
- Impact of engineered nanoparticles on health and the environment – SSFRP



EUROPEAN  
COMMISSION

Community Research

# Draft WP - NMP

## Activity 4.2: Materials

### 4.2.1: Mastering nano-scale complexity in materials

- Nanostructured membrane materials - SSFRP
- Processing and upscaling of nanostructured materials - SSFRP



EUROPEAN  
COMMISSION

Community Research

# Draft WP - NMP

## Activity 4.2: Materials

### 4.2.2: Knowledge-based smart materials with tailored properties

- Compound semiconductors for electronics and photonics - LSIP
- Nanostructured metamaterials - SSFRP



EUROPEAN  
COMMISSION

Community Research

# Draft WP - NMP

## Activity 4.2: Materials

### 4.2.3: Novel biomaterials and bioinspired materials

- Advanced implants and bioactive materials for critical organs – SSFRP



EUROPEAN  
COMMISSION

Community Research

# Draft WP - NMP

## Activity 4.2: Materials

### 4.2.4 Advances in chemical technologies and materials processing

- Inorganic-Organic Hybrid Materials - LSIP
- Radical advances in the processing of multifunctional films and tapes - SSFRP



EUROPEAN  
COMMISSION

Community Research

# Draft WP - NMP

## Activity 4.2: Materials

### 4.2.5 Using engineering to develop high performance knowledge-based materials

- Functionally graded materials - SSFRP
- Modelling of interfaces for high performance materials design - SSFRP





EUROPEAN  
COMMISSION

Community Research

# Draft WP - NMP

## Activity 4.2: Materials

### 4.2.6 Coordinated activities and international cooperation

- Materials for energy applications (Joint Call with Theme 5 / Energy) - SSFRP
- Computational materials science (Coordinated call with India) – SSFRP
- Coordinated actions with Materials researchers in major world regions – CSA
- ERA-NET+ on Materials Research



EUROPEAN  
COMMISSION

Community Research

# Draft WP - NMP

## Activity 4.3: New Production

### 4.3.5: Exploitation of the convergence of technologies

- Volume production process chains for high throughput micro-manufacturing – SME-TP



EUROPEAN  
COMMISSION

Community Research

# Draft WP - NMP

## Activity 4.4: Integration

- Development of nanotechnology-based systems for diagnosis and/or therapy for diabetes, musculo-skeletal or inflammatory diseases - LSIP
- Catalysts and sustainable processes to produce liquid fuels from coal and natural gas - LSIP
- Nanotechnology-enabled applications for integrated, cost-effective volume production– LSIP
- Expanding the limits of advanced materials processing applications through a new generation of high brilliance lasers – LSIP



EUROPEAN  
COMMISSION

Community Research

# Draft WP - NMP

## Activity 4.4:

### Integration

- ERA-NET on Nanomedicine
- ERA-NET on implementing micro- and nanomanufacturing technologies with Member States industry



EUROPEAN  
COMMISSION

Community Research

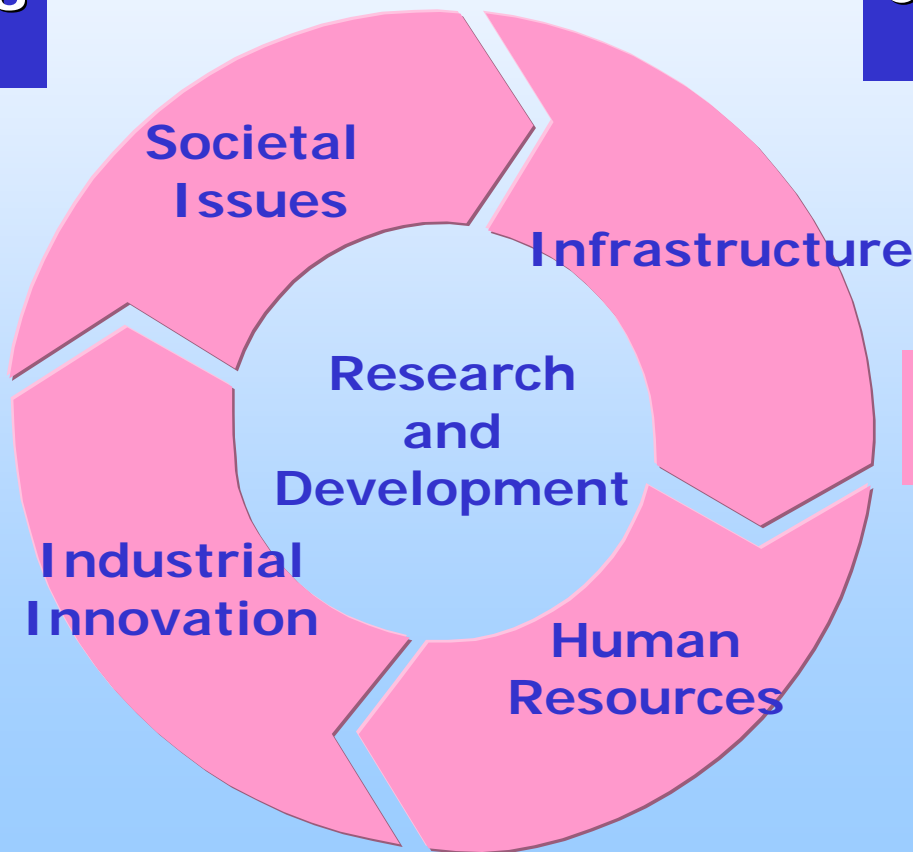
# European policy: integrated, safe and responsible

Two Communications from the European Commission:  
**Towards a European strategy for nanotechnology**  
and the **Action Plan**

**COM(2004) 338  
of 12.5.2004**

**COM(2005) 243  
of 7.6.2005**

**Health, safety,  
environmental  
and consumer  
protection**



**International  
Co-operation**

<http://cordis.europa.eu.int/nanotechnology/actionplan.htm>



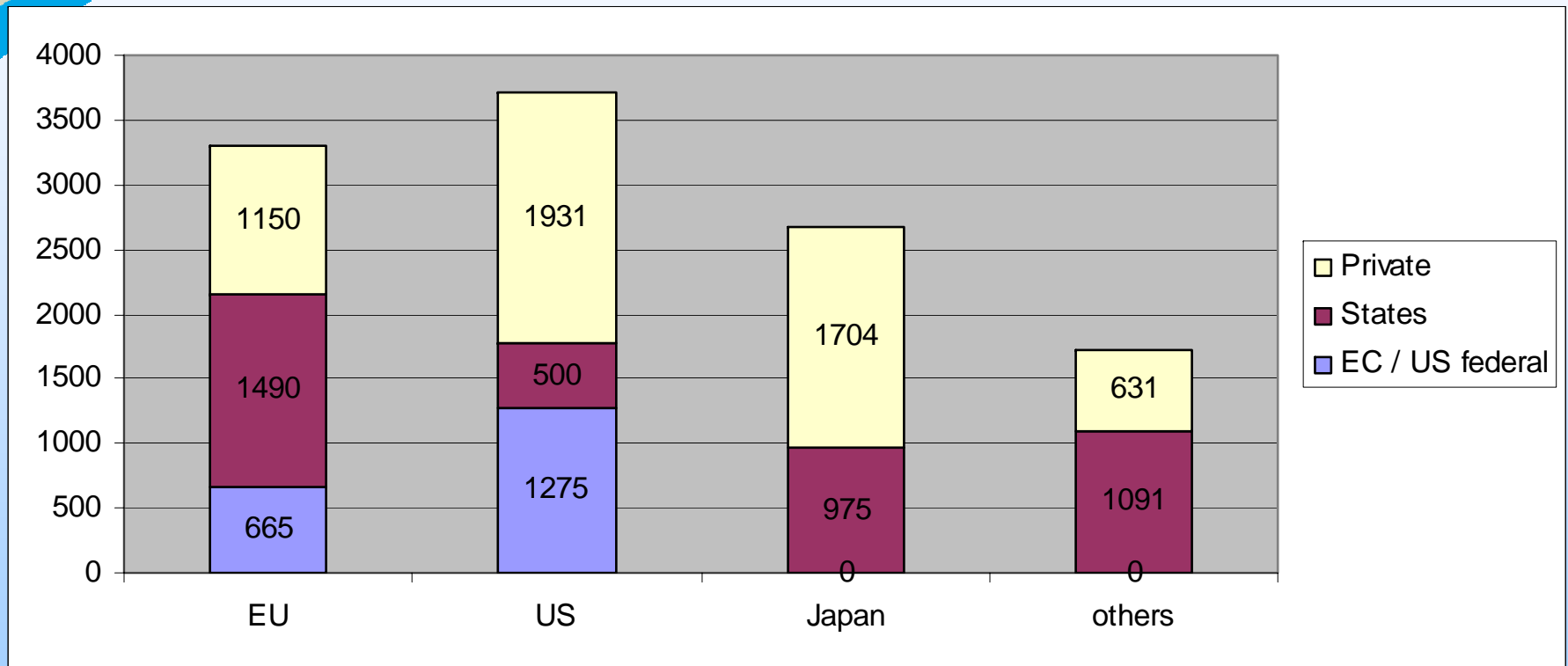


EUROPEAN COMMISSION

Community Research

# Nanotechnology R&D in the World

Global figures for 2006 in M\$ (1€ ~ 1.25\$)



**2004**  
**~8 Billion \$**

**2005**  
**~10.5 Billion \$**

**2006**  
**~11.5 Billion \$**

Source: European Commission & Lux Research





EUROPEAN  
COMMISSION

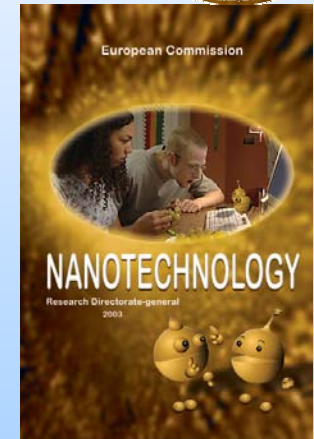
Community Research

# For information, e.g. :

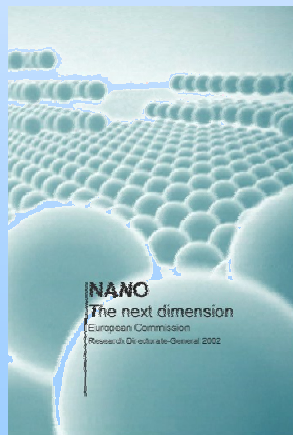
Brochure:  
"Nanotechnology:  
Innovation for  
tomorrow's world" soon  
in 24 languages



Film (for  
younger people):  
"Nanotechnology"  
in 20 languages



Slides for  
children in  
many  
languages



Film:  
"Nano: The next dimension"

All can be seen or obtained via  
[www.cordis.lu/nanotechnology/src/pressroom.htm](http://www.cordis.lu/nanotechnology/src/pressroom.htm)

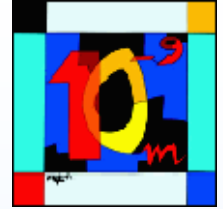




EUROPEAN  
COMMISSION

Community Research

# References



**FP7 & Calls:** [http://cordis.europa.eu/fp7/home\\_en.html](http://cordis.europa.eu/fp7/home_en.html)

**Nanotechnology homepages:**

[http://ec.europa.eu/nanotechnology/index\\_en.html](http://ec.europa.eu/nanotechnology/index_en.html)

<http://cordis.europa.eu/nanotechnology/>

**Nanosciences and Nanotechnologies: *policy***

<http://cordis.europa.eu/nanotechnology/actionplan.htm>

**More on nanotechnology:**







Community Res

# “Ideas” – European Research Council (ERC)

- To support investigator-driven frontier research over all areas of research
- By individual teams
- Excellence as sole criterion
- Autonomous scientific governance
- Simple, user-friendly delivery
- Team Leader (“Principal Investigator”) assembles his/her research group; freedom to choose the research topic. Individual teams to consist of researchers without “artificial” administrative constraints; thus members may be drawn from one or several legal entities, from within or across national boundaries, **including 3rd countries**



Community Re

# People – Human Potential

## Initial training of researchers

Marie Curie Networks and fellowships

## Life-long training and career development

## Industry-academia path ways and partnerships

## International dimension

## Specific actions - Excellence awards



EUROPEAN  
COMMISSION

Community Research

# Nanotechnology: potentially ubiquitous

Medicine  
and  
Health

Information  
Technology

Energy  
Production  
/ Storage

Materials  
Science

Food, Water  
and the  
Environment

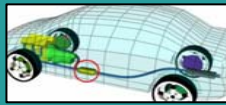
Instruments



Drug  
delivery



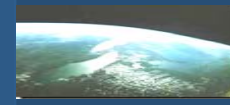
GMR Hard  
Disk



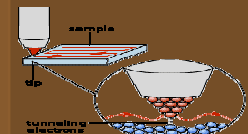
Hydrogen  
Fuel Cells



Lightweight  
and strong



Remediation  
methods



Tunneling  
microscopy

- to serve citizens and satisfy their needs
- to support industrial competitiveness
- to exploit science and technology advances

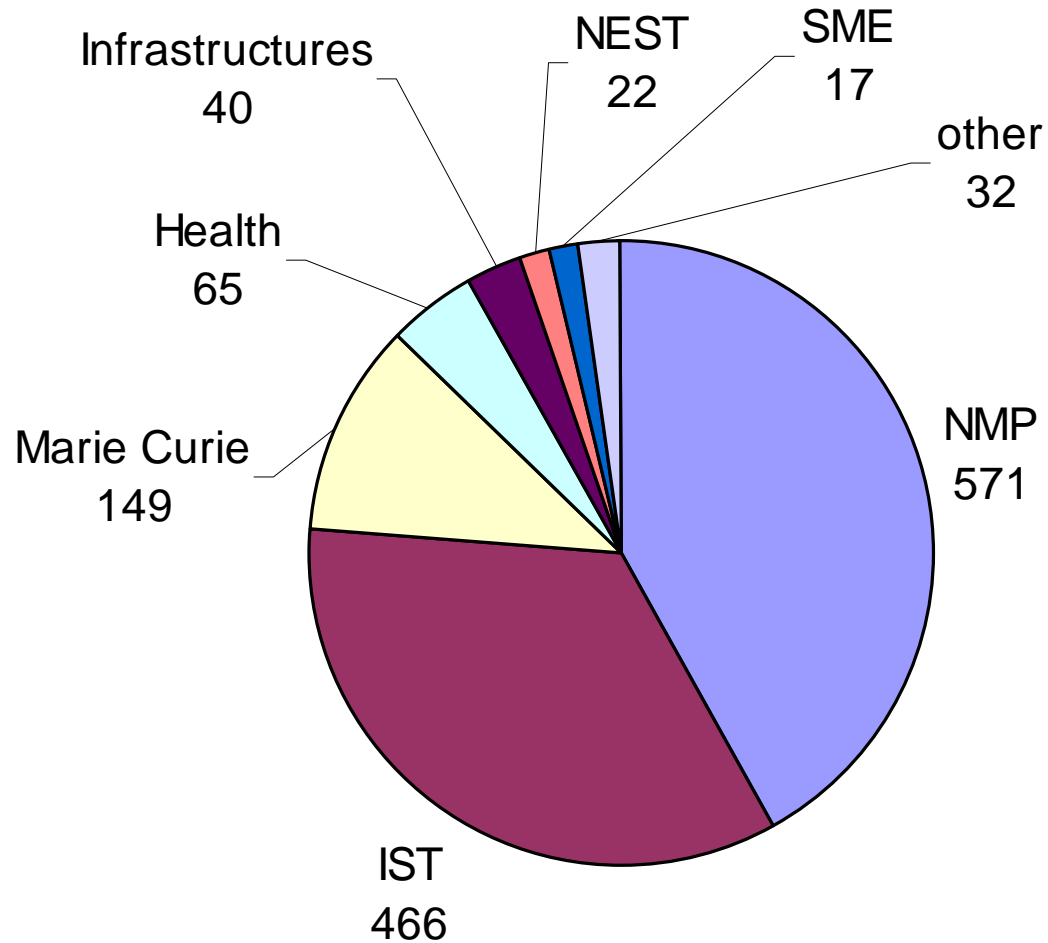


EUROPEAN  
COMMISSION

Community Research

# Nanotechnology R&D in FP6

About 1.4 billion€ in more than 550 projects



EC funding by FP6 programme, M€





Community

# Capacities – research capacities

1. Research Infrastructures
2. Research for and by SMEs
3. Regions of Knowledge
4. Research Potential
5. Coherent development of research policies
6. Specific activities of International Cooperation
7. Science in Society



EUROPEAN  
COMMISSION

Community Research

# FP7 “People” – International dimension - Fellowships

## Main features

### For European researchers:

- Outgoing fellowships with mandatory return
- Return/reintegration of European researchers abroad

### For 3<sup>rd</sup> country researchers

- Host-Driven actions for 3<sup>rd</sup> country researchers
- Incoming individual fellowships
- Schemes for neighbouring countries and those with S&T agreement (e.g. Russia, Ukraine)
- Scientific “diaspora” of Europeans abroad and foreigners in Europe



EUROPEAN  
COMMISSION

Community Research

# Draft WP 2008 - NMP

## Activity 4.1: Nano S&T

**4.1.1: Nanosciences and converging sciences**

**4.1.2: Nanotechnologies and converging technologies**

**4.1.3: Health, Safety and Environmental Impacts**



EUROPEAN  
COMMISSION

Community Research

# Draft WP - NMP

## Activity 4.3: New Production

- 4.3.1: Development and validation of new industrial models and strategies**
- 4.3.2: Adaptive production systems**
- 4.3.3: Networked production**
- 4.3.4: Rapid transfer and integration of new technologies into the design and operation of manufacturing processes**
- 4.3.5: Exploitation of the convergence of technologies**





EUROPEAN  
COMMISSION

Community Research

# Draft WP - NMP

## Activity 4.3: New Production

### 4.3.1: Development and validation of new industrial models and strategies

- Transformation strategies for SMEs in turbulent global market environments – SME-TP



EUROPEAN  
COMMISSION

Community Research

# Draft WP - NMP

## Activity 4.3: New Production

### 4.3.2 Adaptive production systems

- Implementation of process intensification strategies in industrial scale - LSIP
- Self learning production systems - SSFRP
- Support for inter-regional manufacturing communities following IMS strategy update - CSA



EUROPEAN  
COMMISSION

Community Research

# Draft WP - NMP

## Activity 4.3: New Production

### 4.3.3 Networked production

- Supply chain integration and real time decision making in non-hierarchical manufacturing networks - SSFRP



EUROPEAN  
COMMISSION

Community Research

# Draft WP - NMP

## Activity 4.2: Materials

**4.2.1: Mastering nano-scale complexity in materials**

**4.2.2: Knowledge-based smart materials with tailored properties**

**4.2.3: Novel biomaterials and bioinspired materials**

**4.2.4: Advances in chemical technologies and materials processing**

**4.2.5: Using engineering to develop high performance materials**

**4.2.6: Coordinated activities and Int. Cooperation**



EUROPEAN  
COMMISSION

Community Research

# Draft WP - NMP

## Activity 4.4: Integration

- Innovative concepts and processes for strategic mineral supply and for new high added value mineral-based products - LSIP
- Sustainable new products and markets through bio-production of green forest-based chemicals and materials – LSIP
- Integration of new technologies and materials for differentiated consumer-centred product capability SME-TP
- Smart materials for applications in the sectors of construction and of machinery and production equipment – SME-TP
- Reducing the risk of injury in complex systems through advanced personal protective equipment – SME-TP



EUROPEAN  
COMMISSION

Community Research

# Draft WP - NMP

## Activity 4.3: New Production

### 4.3.4 Rapid transfer and integration of new technologies into the design and operation of manufacturing processes

- Rapid design and virtual prototyping of factories - LSIP
- Industrialisation through new integrated construction processes - LSIP