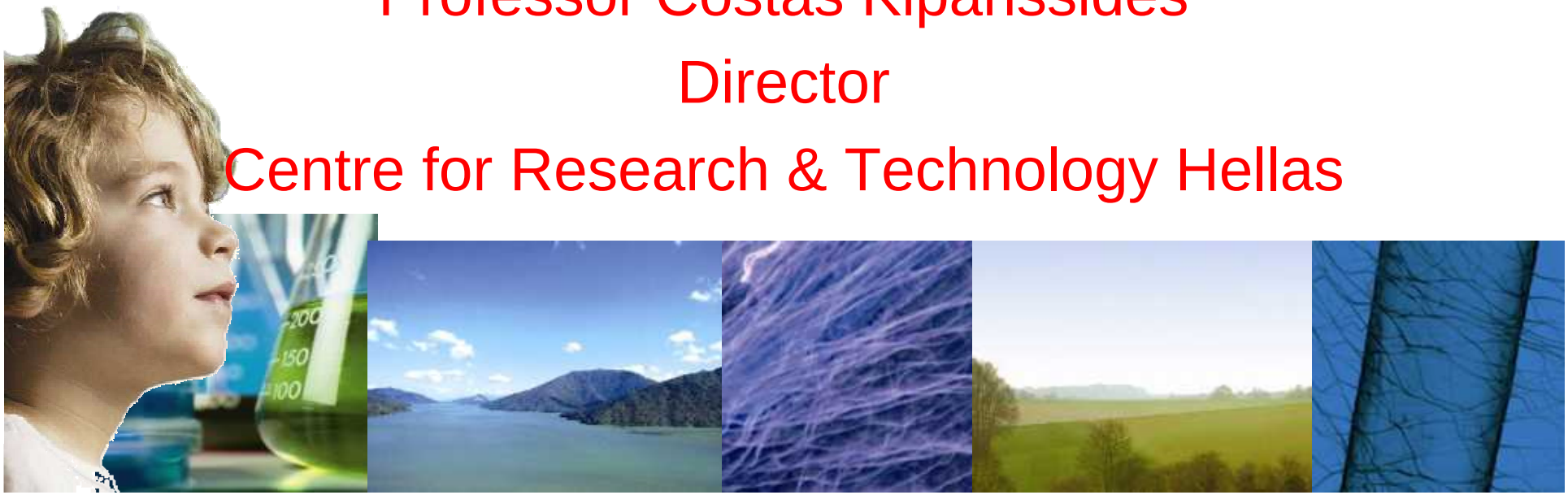
GREEK INNOVATION AND DEVELOPMENT PLATFORMS

Professor Costas Kiparissides

Director

Centre for Research & Technology Hellas



Content

- Innovation and Entrepreneurship Policies
- Categories of R&D Activities
- From Ideas to Products and Services
- Research and Technology Platforms
- Factors for a Successful Platform
- Greek Innovation and Technology Initiatives
- Concluding Remarks

Humanity's top ten problems for next 50 years

- *Energy*
- *Water*
- *Food*
- *Diseases*
- *Environment*
- *Poverty*
- *Terrorism & War*
- *Education*
- *Democracy*
- *Population*

Prof. R.E. Smalley, "Our Energy Challenge", Columbia University, NYC, 23 September 2003

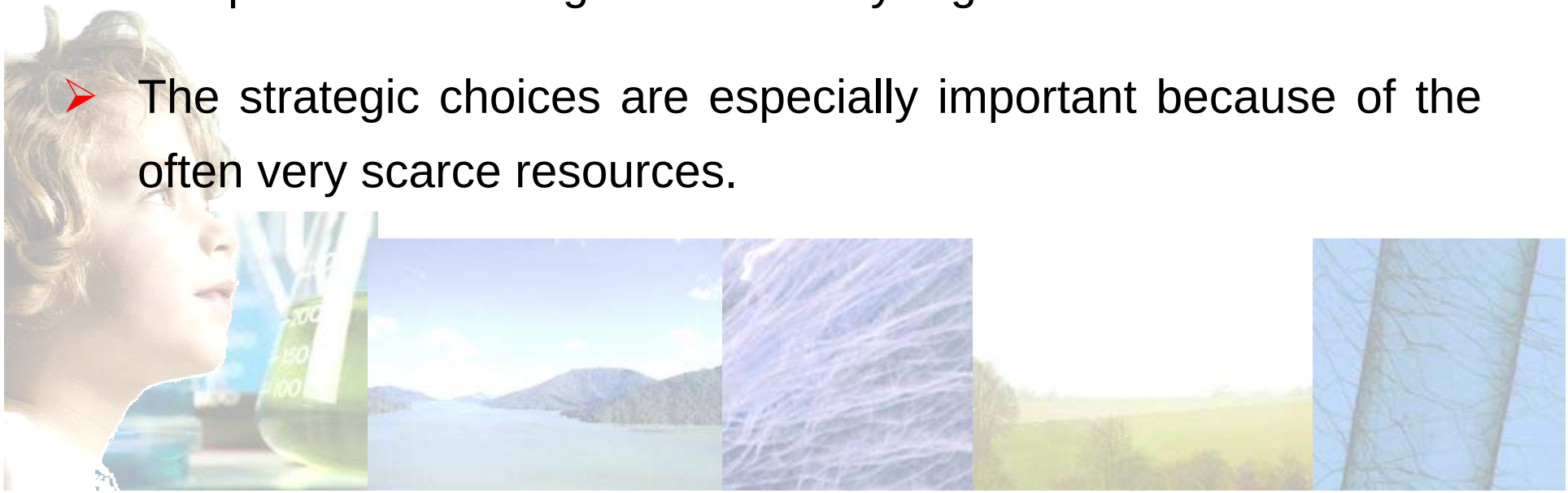
The World Population

2003	**6.5**	**billion**
2050	**8-10**	**billion**

Innovation and Entrepreneurship Policies

- Nations and Regions have to plan and implement their innovation and entrepreneurship policies in a world of ever increasing competition. The correct policy decisions, aiming towards a sustainable future, are essential in achieving a competitive advantage for a country/region.

- The strategic choices are especially important because of the often very scarce resources.



Definition of Innovation

- Innovation is an elusive concept and it is therefore difficult to define it. First of all, it is important to distinguish between "innovation" and "invention", which are very often confused. An invention is defined as 'an idea, a sketch or model for a new improved device, product, process or system', whereas innovation is achieved '…only with the first commercial transaction involving the new product, process, system or device…'. (Freeman, 1982)
- The definition proposed by OECD is *"innovation consists of all those scientific, technical, commercial and financial steps necessary for the successful development and marketing of new or improved manufactured products, the commercial use of new or improved processes or equipment or an introduction of a new approach to a social service. R&D is only one of these steps".*

Categories of Innovation

- Innovation can be classified to three categories:

  ✓ *Product innovation*: A newly marketed product, equipment or service with its main characteristics changed or an existing or new product whose technical characteristics have been enhanced or upgraded.

  ✓ *Process innovation:* Gopalakrishnan and Damanpour (1997) refer to the taking up of new or significantly better production methods. Process innovation for SMEs in local areas, seems to require mostly internal knowledge, accumulated by the firm, but with some technological proximity to suppliers and customers (Capello, 1999).

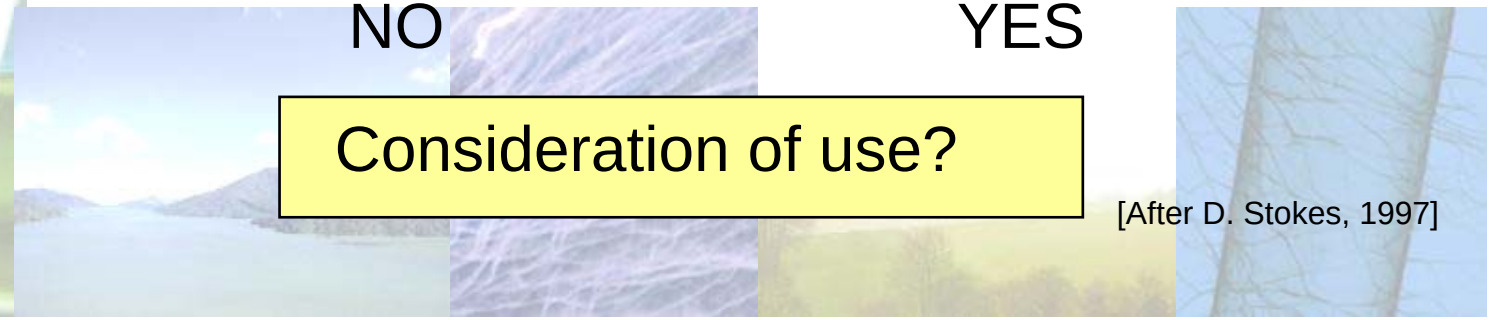
  ✓ *Organizational innovation:* Of equal importance to the creation of new products and processes is the introduction of new approaches to managing or organizing the firm (Littunen, 2000). Organizational innovation creates new knowledge and information

Entrepreneurship and Innovation

- Entrepreneurship has been recognized as a micro driver of innovation and economic growth (Wennekers and Thurik 1999; Audretsch and Thurik 2001; Acs 2006; Audretsch et al. 2006).
- Entrepreneurship and innovation are fuzzy concepts that have been given multiple meanings.
- Schumpeter distinguishes four roles in the process of innovation:
  - ✓ *the inventor, who invents a new idea*
  - ✓ *the entrepreneur who commercializes this new idea*
  - ✓ *the capitalist, who provides the financial resources to the entrepreneur (and bears the risk of the innovation project)*
  - ✓ *the manager, who takes care of the routine day-to-day corporate management*

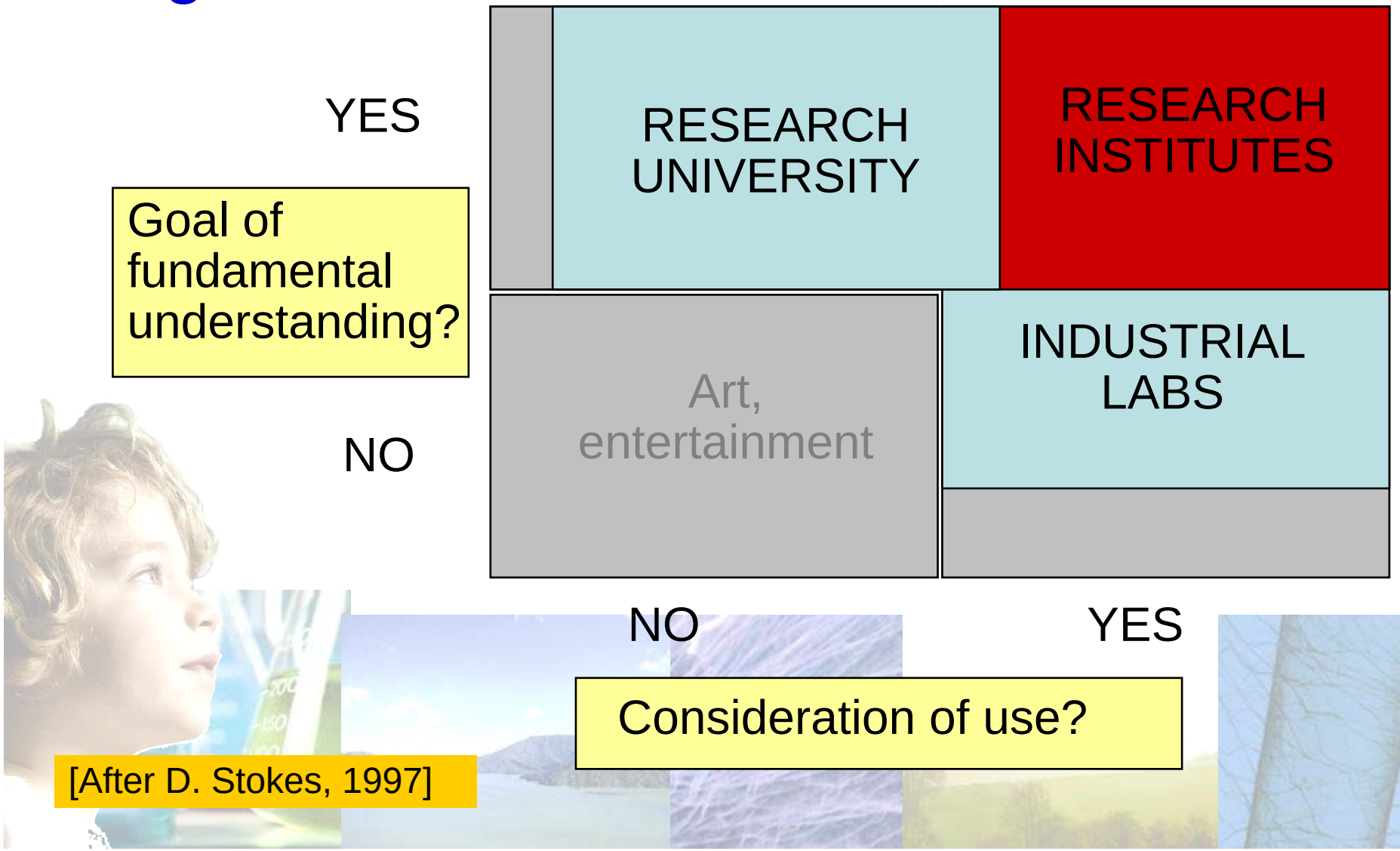
Categories of R&D activities

Goal of fundamental understanding?	Consideration of use?	
	NO	YES
YES	Pure Basic (Bohr)	Use-inspired (Pasteur)
NO	Art, entertainment	Pure Applied (Edison)



[After D. Stokes, 1997]

Categories of R&D activities



[After D. Stokes, 1997]

Strategies for promoting new research opportunities beyond disciplinary borders *in a large R&D agency*

Innovation and multidisciplinarity

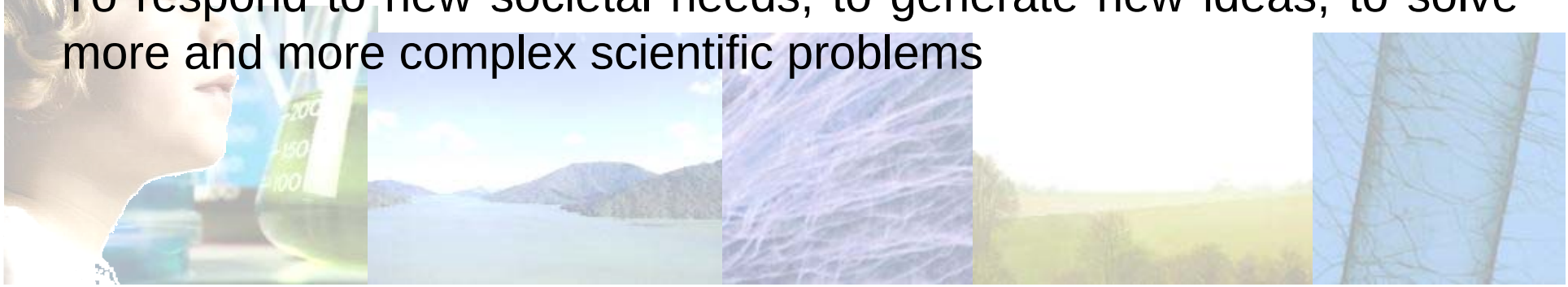
- ✓ *Generating new ideas : innovation from basic research*
- ✓ *From new ideas to products or services*
- ✓ *Innovation and technology transfer policies*

Generating new ideas :
Innovation from basic research

Creating the conditions for creativity in research

- *Associating complementary skills*
- *Implementing projects at risk*
- *Recruiting young researchers*
- *Developing European and international cooperation*

To respond to new societal needs, to generate new ideas, to solve more and more complex scientific problems



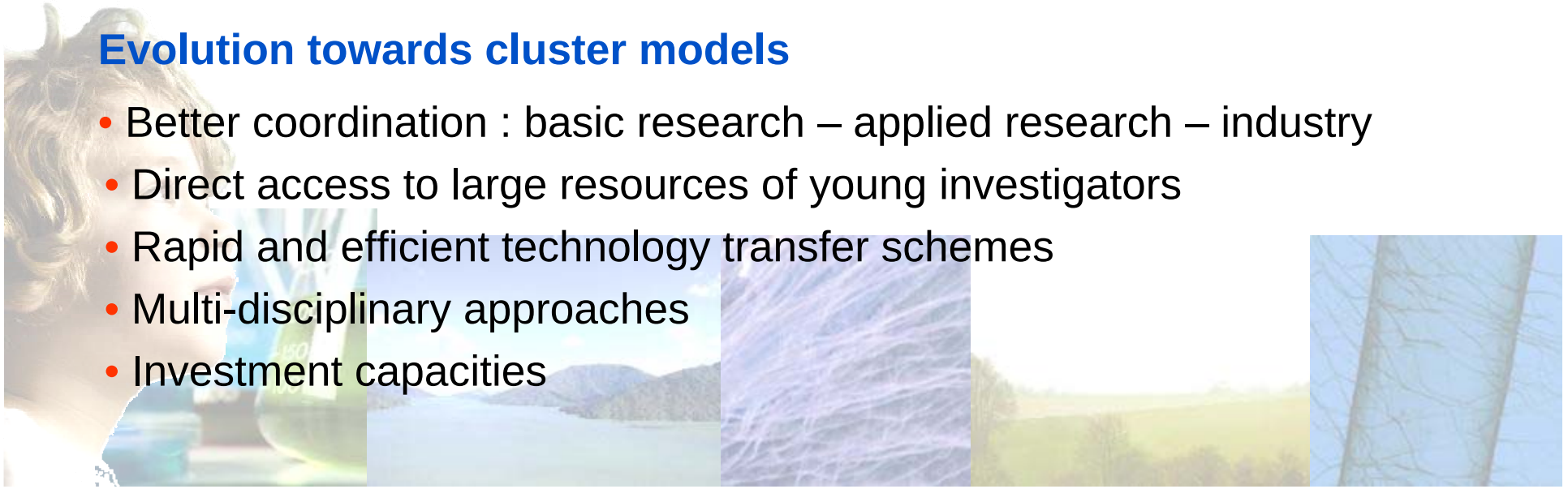
Various R&D models exist in the world

R&D models today

- Central laboratories of large companies
- Consortia of industries
- Public laboratories
- Research networks (virtual) *(European research projects, ..)*
- Universities

Evolution towards cluster models

- Better coordination : basic research – applied research – industry
- Direct access to large resources of young investigators
- Rapid and efficient technology transfer schemes
- Multi-disciplinary approaches
- Investment capacities



Reseach and Development Platforms

- A national/regional innovation technology and development platform is a concept understood as an industry or expertise led "initiative" presenting the business potential of the actors working for the platform.
- The actors of an innovation technology and development platform are the firms, science and technology research centers, education organizations, public authorities, etc. contributing to the defined development platform.

Requirements for a Platform System

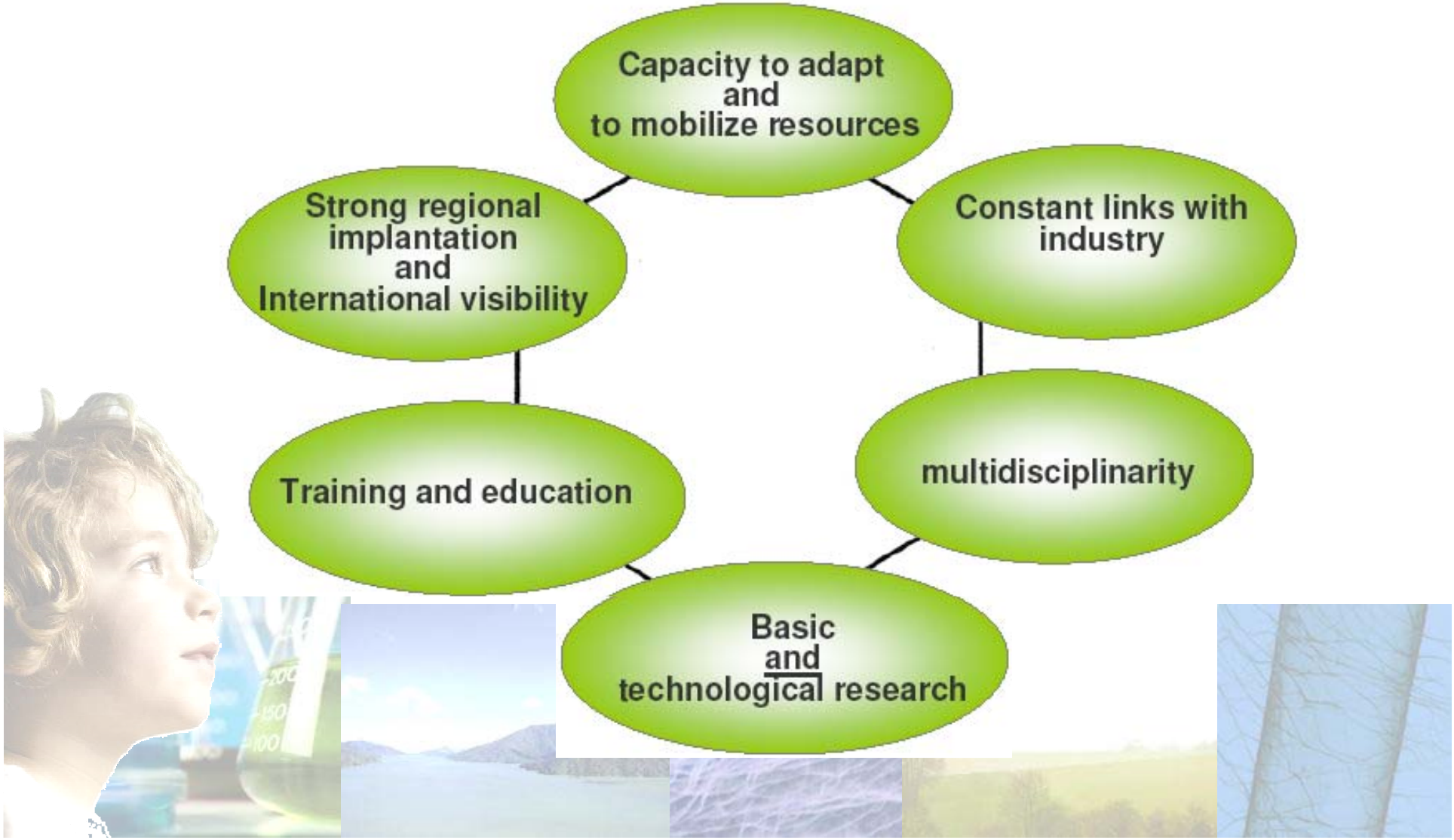
A number of criteria need to be considered when assessing the establishment of a national/regional development platform system. They are:

- ✓ *the growth potential of the industry,*
- ✓ *the quantity, quality and structure of the industry,*
- ✓ *internationalization of the industry,*
- ✓ *the innovative capability of the industry,*
- ✓ *the ability of the management in the industry,*
- ✓ *the quantity of the research conducted in the country/region,*
- ✓ *the quantity and quality of education given in the country/region and*
- ✓ *the ability of the available technology transfer organizations.*

Methodology of Regional Development Platform Analysis

- The analysis method consists of seven phases:
  - ✓ *Benchmarking through the assessment of regional innovation system theories*
  - ✓ *Background study of the industries and areas of expertise in the region*
  - ✓ *Expert panel*
  - ✓ *Assessment of future technological scenarios*
  - ✓ *Analysis of statistical and empirical information*
  - ✓ *Definition of the form of the regional innovation system*
  - ✓ *Search of core processes of the regional innovation system.*

Factors of Success



Greek Innovation & Science Initiatives

- For the development of the Greek Technology & Science Initiatives, twelve groups of experts prepared respective position papers on twelve selected fields relevant to the Greek Economy by taking into account the following parameters:

  - ✓ ***Present world-wide state-of-the-art in the field***
  - ✓ ***R&D map of Greek activities in the field***
  - ✓ ***Relevance of the field to the Greek Economy***
  - ✓ ***Proposed areas of future R&D priorities***
  - ✓ ***Linkage of the Greek R&D activities to similar EU initiatives***
  - ✓ ***Long-term prospects for Greece and implications***
  - ✓ ***Proposed implementation tools of an initiative***

Greek Technology & Science Initiatives (GSTI)	Research themes in FP7 and other European Programmes	European Technology Platforms
Life Sciences	Health	• European technology platform for global animal health • Innovative medicines for Europe
Biotechnology, Food, Agriculture and Fisheries	Food, agriculture and biotechnology	• Plants for the future • Food European technology platform "Food for life"
Information and Communication Technologies (ICT)	Information & communication technologies	• The mobile and wireless communications technology platform • European initiative on NETWORKED and ELECTRONIC MEDIA • Networked European software and services initiative • The European robotics platform • The photonics technology platform • Embedded systems
Nanoscience, Nanotechnologies, Materials and Technological Initiatives	Nanosciences, nanotechnologies, materials and new production technologies	• European nanoelectronics initiative advisory council • Nanomedicine – nanotechnologies for medical applications • Technology platform on sustainable chemistry • The European steel technology platform • The European technology platform for the future of textile and clothing • Platform on future manufacturing technologies • The European construction technology platform • European technology platform for advanced engineering materials and technologies • European technology platform on industrial safety
Energy	Energy	• The European hydrogen and fuel cell technology platform • The European technology platform on photovoltaics • Technology Platform for Zero Emission Fossil Fuel Power Plants • Technology Platform on Biofuels • Wind Energy Technology Platform • Smart Grids Technology Platform

Environment and Climate Change	Environment (including climate change)	• Water supply and sanitation technology platform • Forest based sector technology platform
Transport	Transport (including aeronautics)	• European road transport research advisory council • European rail research advisory council • WATERBORNE technology platform • Advisory council for aeronautics research in Europe
Social sciences	Socio-economic sciences and the humanities	
Technologies for the understanding, preservation and management of Cultural Heritage		
Security	Security	
Space	Space	• The European space technology platform • The integral Satcom initiative
Lifelong Learning	Lifelong Learning Program Digital libraries and content (ICT)	• In lifelong learning four sectoral "subprogrammes" exist instead of ETP's • Most ETP's have already included in their action plan activities related to education & training

Society needs translate into application domains

Health	‘The Doctor in your Pocket’ Real-Time Diagnostics Bio-Chips / Body-Sensors
Mobility / Transport	100% Safety on the Road Integrated Transport Systems Prevention of Pollution
Security	Personal Emergency Systems Protection against Crime and Terrorism Secure Home Environment
Communications	Seamless Wired / Wireless Access Mobile Services without Compromise Protection of Privacy
Education / Entertainment	Learning Anywhere, Anytime Content with Best Quality (e.g. HDTV) Content Protection

Sensing Applications

Health:

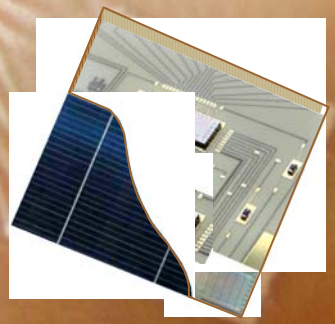
- Blood pressure
- Temperature
- ECG
- Glucose
- Toxins
- UV dose
- Drug dispensing

Safety:

- Shock, …

Comfort:

- Perspiration, …

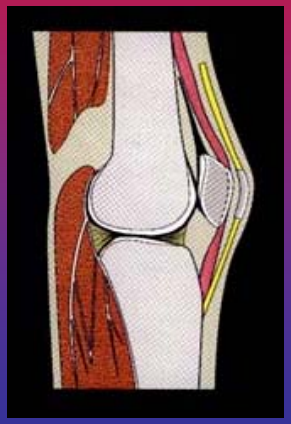


CERTH THE CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

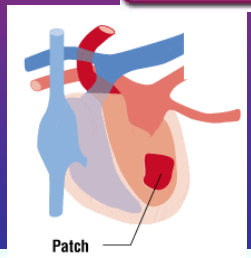
Regenerative Medicine

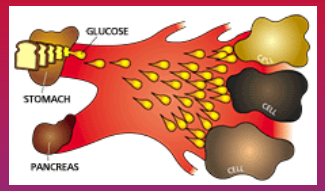
The design, specification and fabrication of cells, biomaterials, or biomolecules to restore or modify the biological function of tissues.

Cartilage repair



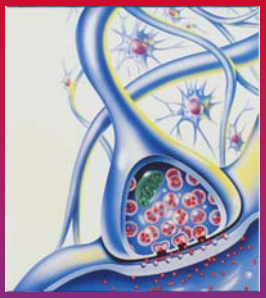
“Patches” Heart/Lung





TE Vaccines Diabetes/Cancer

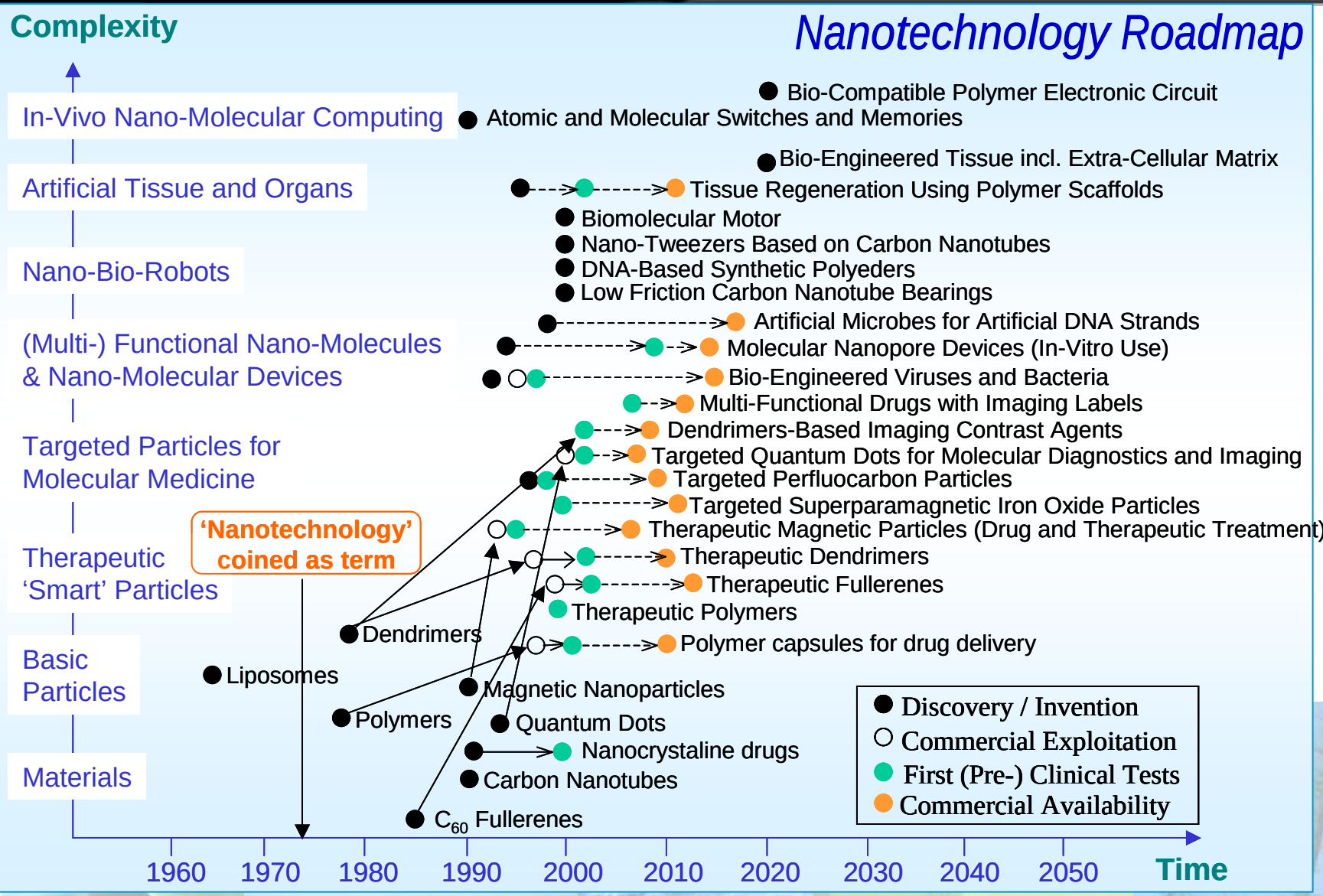
Parkinson’s Disease Cure



Nerve regeneration for spinal & limb repair

2005 **2010** **2015** **2020**

Nanotechnology Roadmap



Nanotechnologies in the Energy Industry

Energy sources

Regenerative

Photovoltaics: nano-optimized cells (polymeric, dye, quantum dot, thin film, multiple junction), antireflective coatings

Wind Energy: nano-composites for lighter and stronger rotor blades, wear and corrosion protection nano.coatings for bearings and power trains etc.

Geothermal: nano-coatings and –composites for wear resistant drilling equipment

Hydro-/Tidal Power: nano-coatings for corrosion protection

Biomass energy: yield optimization by nano-based precision farming (nanosensors, controlled release and storage of pesticides and nutrients)

Fossil Fuels

wear and corrosion protection of oil and gas drilling equipment, nanoparticles for improved oil yields

Nuclear

nano-composites for radiation shielding and protection (persona equipment, container etc.), long term option for nuclear fusion reactors

Energy change

Gas turbines

heat and corrosion protection of turbine blades (e.g. ceramic or intermetallic nano-coatings) for more efficient turbine power plants

Thermoelectrics

nanostructured compounds (interface design, nanorods) for efficient thermoelectrical power generation e.g. usage of waste heat in automobiles or body heat for personal electronics (long term)

Fuel Cells

nano-optimized membranes and electrodes for efficient fuel cells (PEM) for applications in automobiles/mobile electronics

Hydrogen Generation

nano-catalysts and new processes for more efficient hydrogen generation (e.g. photoelectrical, elektrolysis, biophotonic)

Combustion Engines

wear and corrosion protection of engine components (nano-composites/-coatings, nano-particles as fuel additive, etc.)

Electrical Motors

nano-composites for superconducting components in electro motors (e.g. in ship engines)

Energy distribution

Power Transmission

High-Voltage transmission nanofillers for electrical isolation systems, Soft magnetic nano-materials for efficient current transformation

Super conductors: Optimized high temperature SC's based on nanoscale interface design for loss-less power transmission

CNT power lines: super conducting cables based on carbon nanotubes (long term)

Wireless power transmission Power transmission by laser, microwaves or electromagnetic resonance based on nano-optimized components (long term)

Smart Grids

Nanosensors (e.g. magneto-resistive) for intelligent and flexible grid management capable of managing highly decentralised power feeds

Heat Transfer

Efficient heat in- and outflow based on nano-optimized heat exchangers and conductors (e.g. based on CNT-composites) in industries and buildings

Energy storage

Electrical Energy

Batteries: Optimized Li-ion-batteries by nanostructured electrodes and flexible, ceramic separator-foils, application in mobile electronics, automobile, flexible load management in power grids (mid term)

Supercapacitors: nanomaterials for electrodes (carbon-aerogels, CNT, metall(-oxides) and elektrolytes for higher energy densities

Chemical Energy

Hydrogen: nanoporous materials (organometals, metal hydrides) for application in micro fuel cells for mobile electronics or in automobiles (long term)

Fuel reforming/refining: nano-catalysts for optimized fuel production (oil refining, desulphurization, coal liquefaction)

Fuel tanks: gas tight fuel tanks based on nano-composites for reduction of hydrocarbon emissions

Thermal Energy

Phase change materials: encapsulated PCM for air conditioning of buildings

Adsorptive storage: nanoporous materials (e.g. zeolites) for reversible heat storage in buildings and heating nets

Energy usage

Thermal Insulation

Nanoporous foams and gels (aerogels, polymer foams) for thermal insulation of buildings or in industrial processes

Air Conditioning

Intelligent management of light and heat flux in buildings by electromchromic windows, micro mirror arrays or IR-reflectors

Lightweight Construction

Light weight construction materials using nano-composites (carbon nanotubes, metal-matrix-composites, nano-coated light metals, ultra performance concrete, polymer-composites)

Industrial Processes

Substitution of energy intensive processes based on nanotech process innovations (e.g. nano-catalysts, self-assembling processes etc.)

Lighting

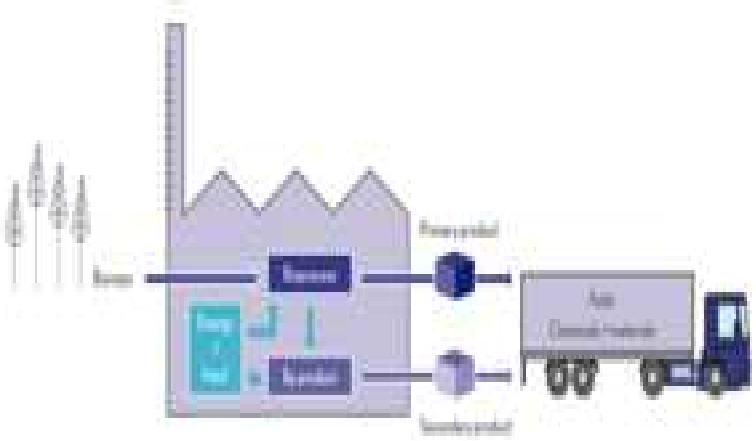
Energy efficient lighting systems (e.g. LED, OLED)

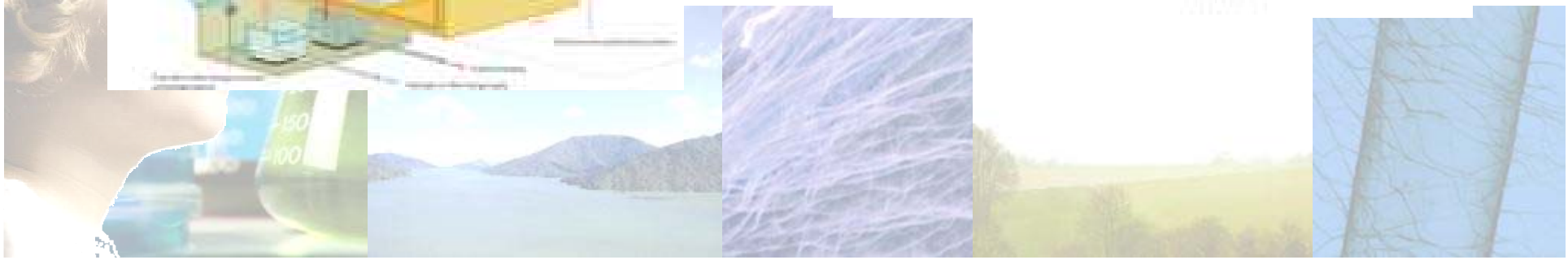
Visionary projects

- Two visionary project ideas:

The Smart Energy Home

Integrated Biorefinery





Implementation Tools and Conclusions

- Sustained and well-planned funding programs for research and technology .
- Promotion of networking between Research Centers, Universities and Industries as well as with European organizations.
- Development of infrastructures.
- Competitive and attractive programs for the repatriation of Greek scientists and the recruitment of foreign researchers.
- Training and post-graduate programs.
- Support permanent dissemination schemes for technology and know-how transfer of RTD results to the Greek industry.


135
C.E.R.I.T.H.