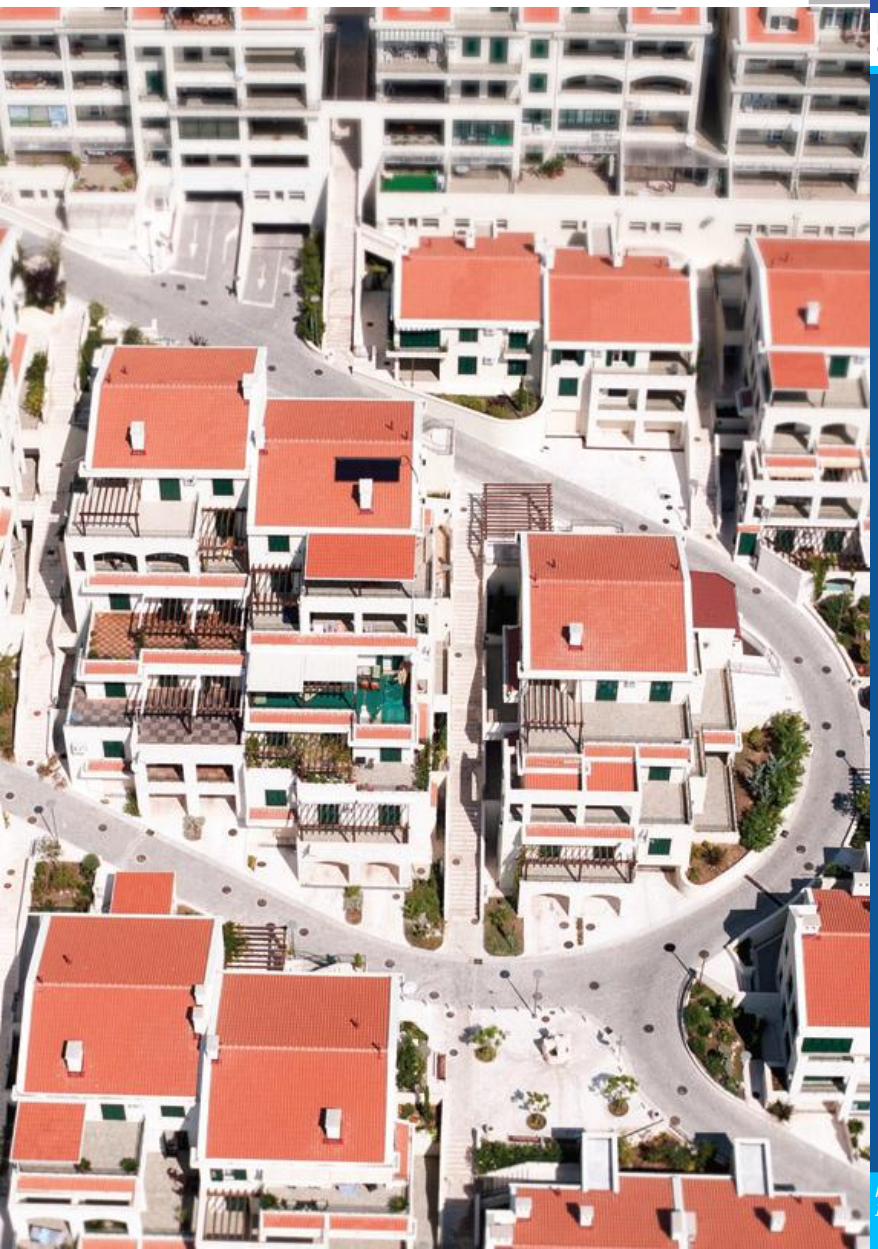

European Commission

Lo sviluppo di nuovi materiali come soluzioni per costruzioni e città intelligenti

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Roma, 11 VII 2012

Research and Innovation

Innovation from Materials

Some 70 percent of all technical innovations

hinge directly or indirectly on the properties

of the materials they use.

Material innovations can be used in practically all technology sectors and branches of industry.

Material innovations have the potential to reduce environmental pollution, save energy, conserve resources, make mobility less dangerous and improve the quality of our life.

Source: ACATECH, 2009,
http://www.research-in-germany.de/dachportal/en/downloads/download-files/9554/high-tech-strategy-2006-112-pages-.pdf

Impact of Advanced Material Technology

Impact of advanced material technology on ICT, Energy & Biotechnology (% growth attributable to advanced materials)

	1970	*1980*	*1990*	*2000*	*2010*	2020	2030
ICT	***15***	***25***	***40***	***55***	***65***	**75**	**85**
Energy	***10***	***15***	***30***	***45***	***55***	**65**	**70**
Biotechnology	***5***	***10***	***20***	***30***	***45***	**55**	**65**

Advanced materials have an earlier & greater impact in ICT (incl. electronics), followed by Energy (incl. construction) and Biotechnology (incl. health)

Source: Sanford M. Moskowitz, « The Advanced Materials Revolution », John Wiley & Sons Inc, 2009

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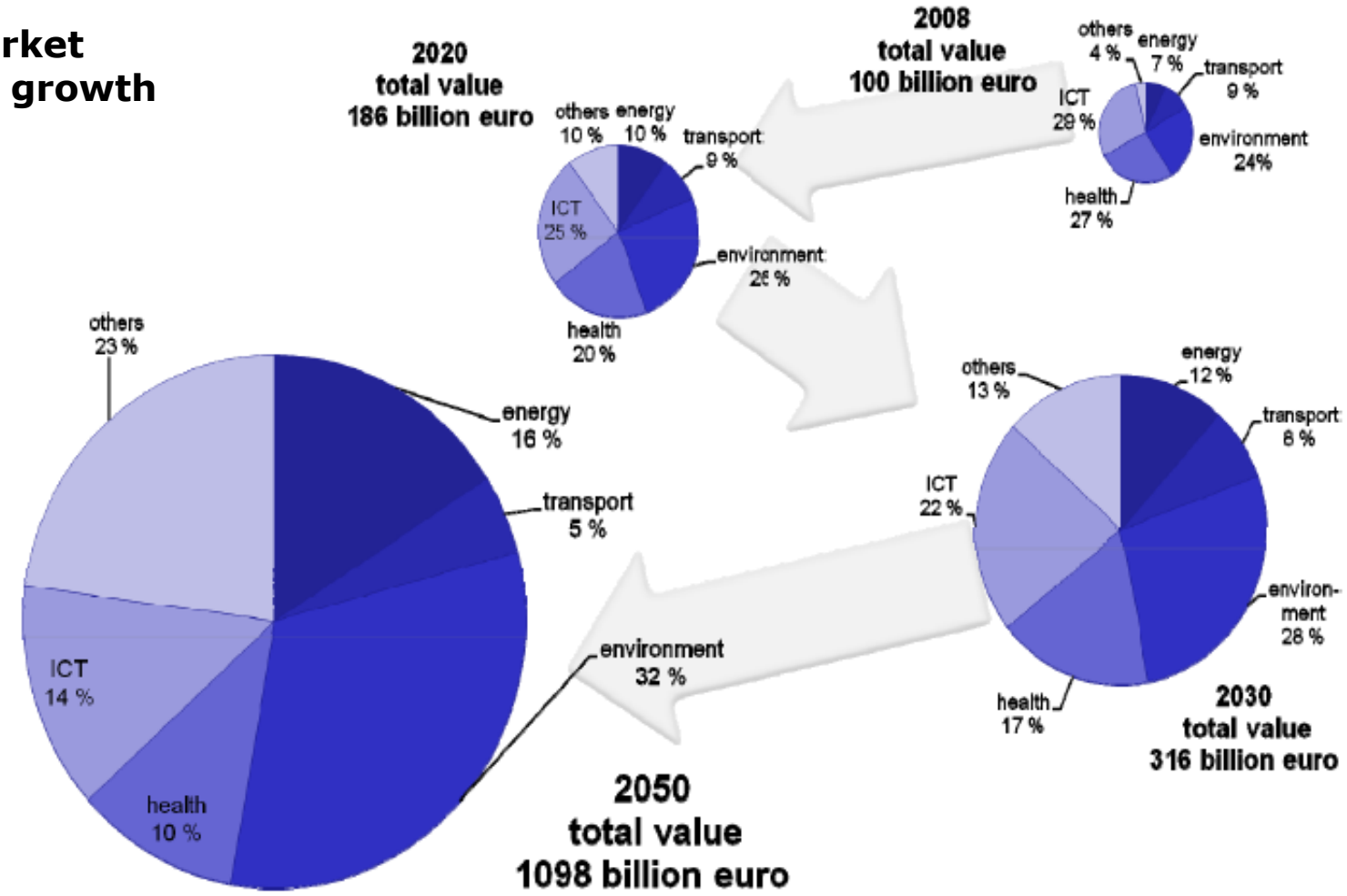
Market growth



European Commission

Some European initiatives related to energy efficiency in buildings

Recast of the Energy Performance of Buildings Directive (2010)

Action Plan "20/20/20" (2007)

Energy End Use Efficiency and Energy Services Directive (2006) with the National Energy Efficiency Action Plans (2006 – 2011)

Energy Efficiency Plan (March 2011)

European Strategic Energy Technology Plan and its roadmap on "Energy efficient materials for buildings" (2011)

Public Private Partnership on Energy Efficient Buildings (2009) with specific calls on Materials (2011, 2012, 2013)

Major trends for materials in buildings

***Energy savings**: reduced embodied energy & carbon footprint, lighter weight, improved glazing & windows, improved insulation…*

Energy storage & harvesting

***Multifunctionality** (less materials, reduced maintenance or improved performance): differential properties for different tasks, self cleaning, anti graffiti, self healing, sensors, IT technologies…*

***Sustainability**: LCA, reuse, recyclability (CEN/TC 350)…*

Durability

Prefabrication

Sources: European Commission, Work Programmes Themes « NMP Materials » and « ENERGY », Policy Research « Energy-EfficientBuildings PPP», 2010, SET Plan 2011

Major needs for building materials

Structural elements & envelope

	Reduced embodied energy	Use phase
Cement concrete	Alternative blends Increase use of waste streams Low or negative carbon cements	Nanotechnologies to increase insulation & thermal inertia Light weight concrete with expanded clays Self healing concrete, aerogels + concrete, nanoporous concrete
Steel	Light weight steel Improved technologies Reuse of steel elements	integrated solar technologies Better thermally insulated steel Vacuum insulated panels, panels with cellulose…

Source: SET Plan – Roadmap on energy efficient materials for buildings

Major needs for building materials

Envelope: ceramic *(tiles, bricks)*

Reduced embodied energy	**Use phase**
More energy efficient and better performing process Increased recycled fraction Paper fibers for lightweight bricks	Composite ceramic tiles Surface properties: infrared reflectivity, self cleaning… Renewable energy storage Embedded sensor for life long monitoring New adhesives

Source: SET Plan – Roadmap on energy efficient materials for buildings

Major needs for building materials

Internal finishes: plasterboards, Phase Change Materials, coatings

Nanotechnologies for surface and bulk functionalities, improved durability and reduced maintenance needs

Internal liner products and coatings to promote internal day lighting

Source: SET Plan – Roadmap on energy efficient materials for buildings

Major needs for building materials

Glazing elements

Reduced embodied energy	Use phase
Alternative fuels (biomass…) More efficient & flexible process	Low emissivity surfaces Insulated frames Light directing elements Intelligent windows Glass with control light transfer Switchable properties of coatings Energy harvesting glass Cost-efficient renovation processes Steel products/joints for façades

Source: SET Plan – Roadmap on energy efficient materials for buildings

Major needs for building materials

Insulation

Reduced embodied energy	Use phase
Increase recycling content Renewable energy in production Renewable or biodegradable biobased materials Biobased binders Biotic renewables Nanotechnology based biofibers Biobased polymers	Nanoporous insulation, nanofoams Nanotechnologies for hybrid aerogels Nanotechnology coatings Materials combining structural properties &/or thermal resistance &/or lightweight Cost-effective installation and refurbishment Advanced adhesives and polymer barriers

Source: SET Plan – Roadmap on energy efficient materials for buildings

European Commission

Durability

Critical property for all building materials

Needed:

- Fundamental understanding of mechanisms

- Improved Life Cycle Analysis

- Fast and robust ageing models

- Common metrics

- Reliable test methods and inspection procedures

European Commission

Materials in FP7 EeB-PPP

2011 call on Embodied Energy

Three projects for 14.5 million € EC contribution

- *insulation*
- *Sustainable concrete*
- *Biocomposites*

Expected impact compared to State of the Art:

- *Embodied energy reduction for component at least 50%*
- *Cost reduction at least 15%*

European Commission

Materials in FP7 EeB-PPP

2012 call on Smart Windows

Four projects for 15 million € EC contribution

Expected impact compared to State of the Art:

- *reduction of U-value to 0.3 W/(m2.K)*
- *Weight reduction at least 50%*
- *Cost reduction at least 15%*

European Commission

Materials in FP7 EeB-PPP

2013 call on Eco-Innovative Materials

Expected impact compared to State of the Art:

- *Healthier indoor air environment*
- *Embodied energy reduction at least 15%*
- *Enhanced durability at least 20%*
- *Lower implementation costs at least 20%*

and

- *New lightweight building materials via nanotechnology for components with improved thermal performance and reduced construction time*

European initiative on Smart Cities

Strategic objective

*To demonstrate the feasibility of **rapidly progressing towards our energy and climate objectives** at a local level while proving to citizens that their **quality of life** and local economies can be improved through investments in energy efficiency and reduction of carbon emissions. This initiative will foster the **dissemination throughout Europe** of the most efficient models and strategies to progress towards a low carbon future.*

Source:http://setis.ec.europa.eu/aboutsetis/technoloy-roadmap/european-initiative-on-smart-cities

European initiative on Smart Cities

Buildings:

- *New buildings with net zero energy requirements or net zero carbon emissions. Anticipate requirement (e.g. 2012) for all new buildings of the local public authority (city).*
- *Refurbishment of existing buildings to bring them to the lowest possible energy consumption levels (e.g. passive house standard or level of efficiency that is justified by age, technology, architectural constrains) maintaining or increase performances and comfort. This would include innovative insulation material*

Source: http://setis.ec.europa.eu/about-setis/technology-roadmap/european-initiative-on-smart-cities

European Commission

European initiative on Smart Cities

Energy networks:

Heating and Cooling

- Innovative and cost effective biomass, solar thermal and geothermal applications
- Innovative hybrid heating and cooling systems from biomass, solar thermal, ambient thermal and geothermal with advanced distributed heat storage technologies.
- Highly efficient co- or tri-generation and district heating and cooling systems.

European initiative on Smart Cities

Energy networks:

Electricity

- Smart grids, allowing renewable generation, electric vehicles charging, storage, demand response and grid balancing.
- Smart metering and energy management systems.
- Smart appliances (ICT, domestic appliances), lighting (in particular solid state lighting for street and indoor), equipment (e.g. motor systems, water systems)
- To foster local RES electricity production (especially PV and wind applications).

Source: http://setis.ec.europa.eu/about-setis/technology-roadmap/european-initiative-on-smart-cities

European initiative on Smart Cities

Transport

- *10 – 20 testing and deployment programmes for low carbon public transport and individual transport systems, including smart applications for ticketing, intelligent traffic management and congestion avoidance, demand management, travel information and communication, freight distribution, walking and cycling.*
- *Sustainable mobility: advanced smart public transport, intelligent traffic management and congestion avoidance, demand management, information and communication, freight distribution, walking and cycling*

Source: http://setis.ec.europa.eu/about-setis/technology-roadmap/european-initiative-on-smart-cities

European initiative on Smart Cities

Indicative costs (2010-2020)

Actions	Total (M€)
1. New Buildings & Refurbishment of existing buildings (for 20 million citizen) 2. Energy networks (Heating and Cooling and Electricity) 3. Transport	10 000 - 12 000

This reflects the total sum of the required public and private investments.

European Commission

Materials for electricity grids

Advanced conductors:

High temperature superconductors

Advanced composites

Polymers with insulating properties at high voltage

Wide band gap semiconductors for power electronics

Enabling structural materials

Materials for advanced packaging at high temperatures

Materials for low temperature

Source: http://setis.ec.europa.eu/activities/materials-roadmap/Materials_Roadmap_EN.pdf/view

European Commission

Materials for electrical storage

Energy oriented materials for lower costs, higher life span batteries

Power oriented materials for electrochemical capacitors

Materials for non-chemical energy storage

Novel materials for post-Li ion, metal air, Li-S, Na ion

Source: http://setis.ec.europa.eu/activities/materials-roadmap/Materials_Roadmap_EN.pdf/view

European Commission

Materials for transport

Lighter weight materials

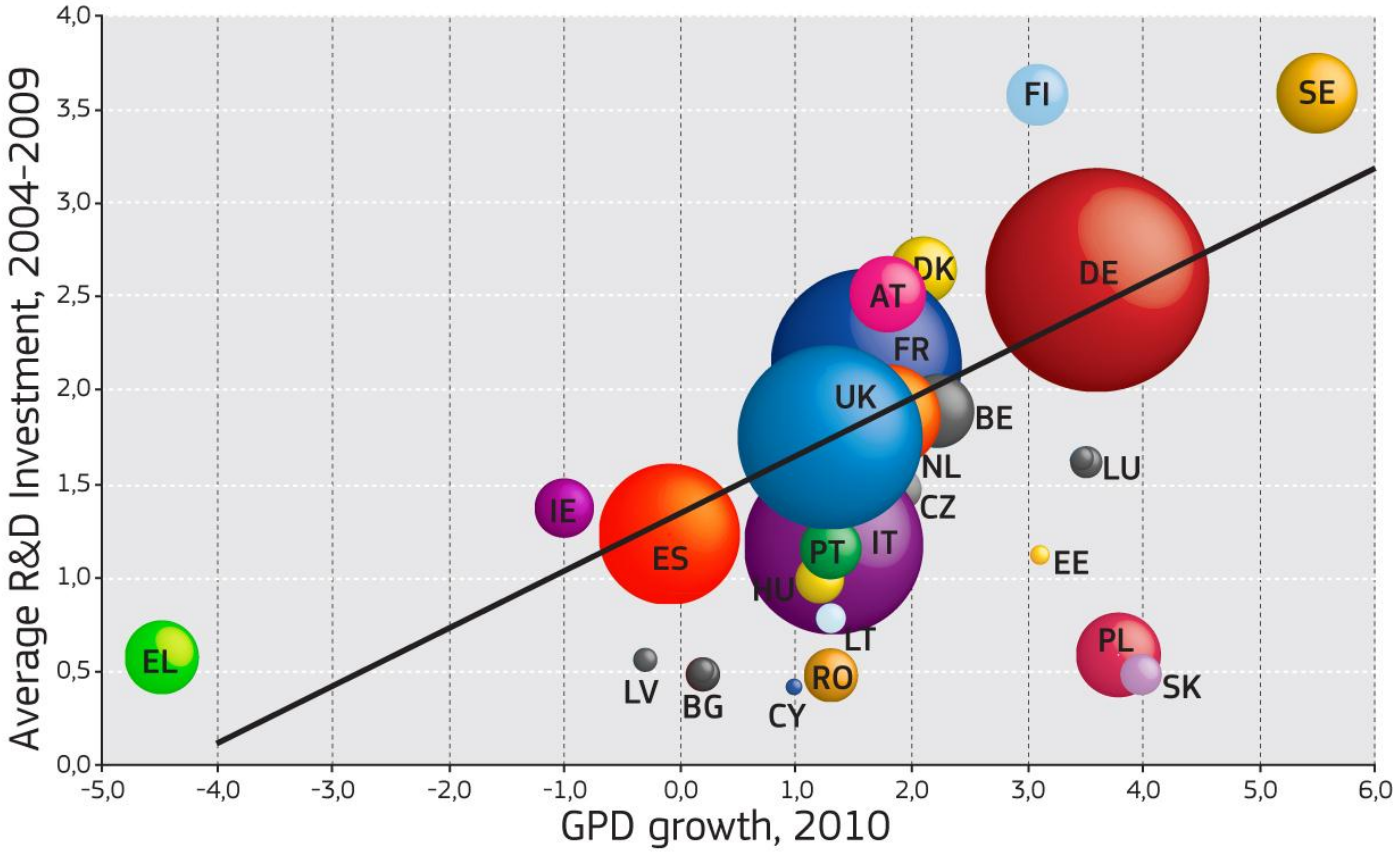
Lower costs

Trends towards composites

BUT safety for critical parts

European Commission

Investment in R&D is part of the solution to exit from the economic crises



European Commission

… e partecipate nell'ultimo bando di gara del 7° PQRST, aperto per un totale di 8,1 miliardi € !

http://ec.europa.eu/research

http://ec.europa.eu/research/fp7/index_en.cfm

http://cordis.europa.eu/

http://ec.europa.eu/research/industrial_technologies/index_en.html

http://setis.ec.europa.eu/activities/materials-roadmap

http://tinyurl.com/MATERIALS-BLOG

Grazie per l'attenzione!

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