Area 5: Nanotechnologies for multifunctional lightweight construction materials and components (5 projects) ADAPTIWALL, SESBE, ELISSA, FOAM-BUILD, MF-RETROFIT

S/T goals of the supported area

ADAPTIWALL To develop multi-functional light-weight wall panel based on:

- A light weight concrete with nano-additives component for efficient thermal storage and load bearing capacity
- An adaptive insulation panel component with switchable thermal resistance linked to an integrated sensoring and monitoring system
- A ventilation system including a total heat exchanger component using a nano-structured membrane for more efficient heat exchange and avoiding microbial growth

SESBE Smart Elements for Sustainable Building Envelopes To develop "smart" lightweight multifunctional façade components:

- Increased energy efficiency (insulation/sealing materials using aerogels; heat reflective façades using heat reflective coatings; moisture buffering and humidity control insulation materials using nanoclays);
- Increased fire resistance (application of heat reflective coatings; development of intumescent coatings for protection of metal components; use of inorganic non-combustible insulation materials);
- Functionalized surfaces (development of easy-to-clean/self-cleaning properties based on nanostructured hydrophobic surfaces; air purification properties).

S/T goals of the supported area

To implement commercial or close to the market nanomaterials (aerogels, VIPs, MMTs, CNT) and MEMs to "tune" their properties and method of application in order to induce improved thermal, structural/vibration/seismic and fire performance to multi-functional light-weight steel/dry wall prefabricated systems.

- To develop computational, design tools and methodologies to address the new modular system
- To demonstrate the concept, based on nanomaterial enabled multi-functional steel/dry wall prefabricated elements and quantify improvements in thermal, seismic and fire performance

To develop novel lightweight nanostructured halogen free flame retardant foam with reduced thermal conductivity compared to conventional counterparts.

- To design and integrate new concept for faster assembly.
- To investigate intelligent monitoring systems for external biofilm protection incorporating a sensor system for moisture prediction and ventilation system for active response.

S/T goals of the supported area

To develop a light-weight, durable, cost effective and high performance panel with:

- Improved PCM efficiency through the incorporation of nanoscale fillers and clay aerogel insulation layers with very low thermal conductivity;
- Photocatalytic coating with doped TiO2 nanostructured particles (selfcleaning properties) and an intumescent coating in which a lightweight nanomaterial is incorporated into the paint.

S/T goals of the supported area

- Implementation of nano-materials and aerogels in construction materials and elements to improve energy efficiency of the buildings
- Faster and more efficient retrofitting process
- Validation the concept in different climatic conditions
- Optimization of the solutions design on health, environmental impact (LCA) and costs (LCCA)
- Development of multi functional light weight building components with improved fire, seismic and acoustic performance.

Expected impact of the supported area

- Improvement of thermal, fire and seismic performance of building components incorporating nano-technology based materials.
- Development of building solutions with noble materials and making them available for wide application at competitive cost
- Creation of a healthy and comfortable indoor climate
- Reduce the cost of nano-based products making their wide scale commercial application feasible addressing the zero-carbon targets for the construction sector.
- Solve problems in relation to incorporation of nano-enabled materials in building elements and assess the integrated performance.
- Provide business growth opportunities to the large and small business involved.
- Reduction of refurbishment time and cost requirements
- Improvement of building aesthetics

Technical cross-cutting issues

What technical cross-cutting issues among your projects should be taken into account to increase the overall impact

- Minimize duplication of research work that can be openly accessed (especially in what concerns fire and seismic safety)
- Streamlining of activities in fire research e.g. on VOC gases, key flammability properties, toxicity, aging to provide input for LCA databases.
- Exploit know-how from previous projects on LCA/LCCA to push forward knowledge in the frame of new projects
- Support in the recyclability of products
- Develop educational material jointly with other projects
- Investigate potentials for joint large scale demonstrations

Technical cross-cutting issues

What technical cross-cutting issues among your projects should be taken into account to increase the overall impact

- Joint dissemination/exhibition events
- Exploit modelling and simulation of existing buildings and climates
- Collaborative networks to share ideas
- Evaluation of materials for long term performance
- Possible different technologies combinations
- Replicability (climate-environmental conditions)

Non-technical cross-cutting issues

What non-technical cross-cutting issues among your projects should be taken into account to increase the overall impact?

- Perceptions of nanotechnology; safety issues
- Market and commercialisation potentials
- Costs for demonstration on real-scale buildings
- Common cluster and dissemination activities
- Increase visibility of the project results
- Organization of large scale events - addressing politicians, legislation and end users

Non-technical cross-cutting issues

What non-technical cross-cutting issues among your projects should be taken into account to increase the overall impact?

- Addressing architects and consumers, reaching wider target groups
- Set up of educational material based on most relevant research results
- Exchange of non-confidential project results
- Standardisation by joint efforts
- Psychological barriers and perceptions of the new materials or technologies
- Homogenization of knowledge across Europe
- Wider acceptance of retrofitting methods

Synergies and benefits of clustering

What cluster activities have you undertaken in the last year
Signature of NDA in the frame of the Nano-E2B-cluster; participation in cluster meetings Participation in INDTECH2014 and thematic Workshop, 8 April Athens; preparation of CSA proposal- AMANAC
How have cluster activities added value to your projects?
- Better overview of recent material developments and involved stakeholders - Direct access to studies on assessment of material properties - Critical evaluation of market trends - Overview of business opportunities - Acquaintance with the experts in the field - Increased project visibility - Identification of solutions to common problems - Networking with different types of organisations and sharing of information.

Synergies and benefits of clustering

How can cluster activities help exploitation of results after the projects end?

- Web based platform with project results, material data base
- Training on relevant standards and certification procedures
- LCA/LCC practices
-Create communication channels that can last after the end of the project
- Identify gaps in current research activities and draw road map of future related RTD
- Objective evaluation of project results
- Cooperation in dissemination/raising awareness, further optimization of processes and materials