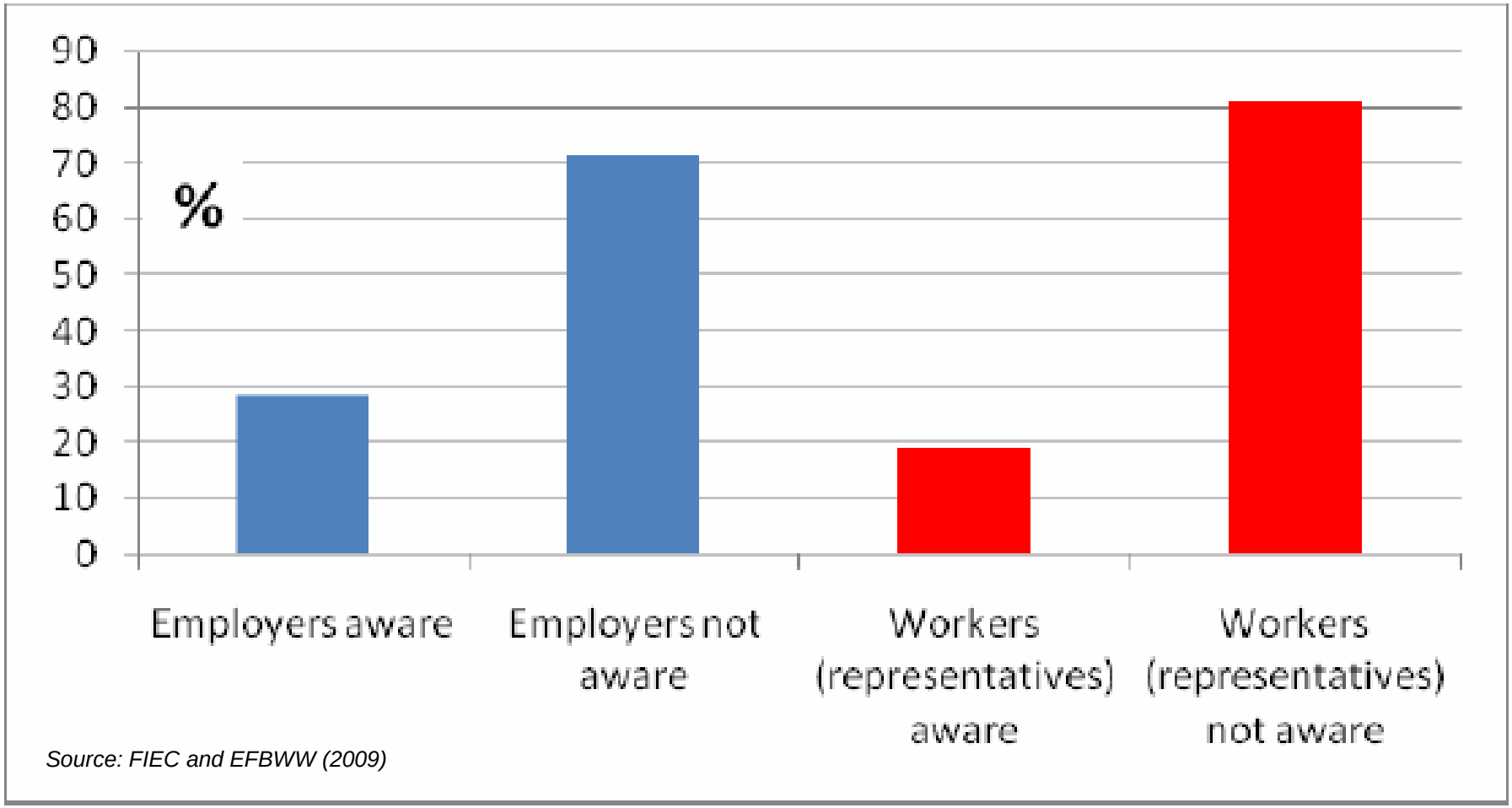
Scaffold

Innovative strategies, methods and tools for occupational risks management of manufactured nanomaterials in the construction industry

SCAFFOLD: Innovative strategies, methods and tools for occupational risks management of manufactured nanomaterials in the construction industry

Jesús M. López de Ipiña
TECNALIA Research and Innovation
Industry and Transport Division



Source: FIEC and EFBWW (2009)

Innovative strategies, methods and tools for occupational risks management of manufactured nanomaterials in the construction industry

- Companies and workers are using and handling MNMs and nano-products in construction
- Exposures are produced at different stages of the construction life cycle
- Occupational Legislation: complex scenario (Stakeholders)
- **Uncertainty** for industry
- **Proactive approach**

SCAFFOLD is an **industry-oriented** idea specifically focussed on providing **practical, robust, easy-to-use and cost effective solutions** to the **European construction industry**, regarding current **uncertainties** about occupational exposure to MNMs.

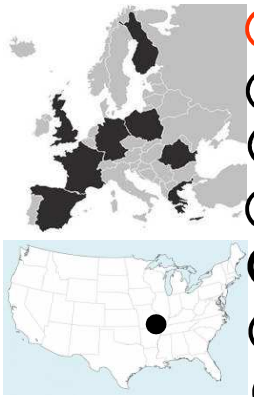
The aim of the SCAFFOLD project is to develop, test, validate in real conditions and disseminate a **new holistic, consistent and cost effective Risk Management Model (RMM) to manage occupational exposure to MNMs in the construction sector.**

This will be done by integration of a set of innovative strategies, methods and tools developed by the project into consistent state-of-the-art safety management systems (OSHAS 18001 + ISO 31000).

Project Duration: Three years (2012 – 2015)
Project Budget: 3,7 M€
Call identifier: FP7-NMP-2011-SMALL-5
Work program topic addressed: NMP.2011.1.3-2 Worker protection and exposure risk management strategies for nanomaterial production, use and disposal.
Project EC Funding: 2,5 M€

Innovative strategies, methods and tools for occupational risks management of manufactured nanomaterials in the construction industry

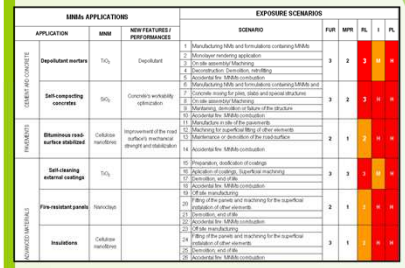
No.	Beneficiary name	Short name	Country
1	Fundación TECNALIA Research and Innovation	TECNALIA	Spain
2	Commissariat à l'Énergie Atomique et aux Énergies Alternatives	CEA	France
3	National Centre for Scientific Research "DEMOKRITOS"	DEMOKRITOS	Greece
4	Centralny Instytut Ochrony Pracy - Państwowy Instytut Badawczy	CIOP-PIB	Poland
5	Acciona Infraestructuras S.A.	ACCIONA	Spain
6	Asociación Española de Normalización y Certificación	AENOR	Spain
7	Mostostal Warszawa S.A.	MOSTOSTAL	Poland
8	ROSSAL SRL	ROSSAL	Romania
9	Tecnología Navarra de Nanoproductos S. L.	TECNAN	Spain
10	NETCOMPOSITES Limited	NETCOMPOSITES	UK
11	Institutul de Cercetari Pentru Echipamente si Tehnologii in Constructii	ICECON	Romania
12	European Virtual Institute for Integrated Risk Management	EU-VRI	Germany
13	Tyoeterveyslaitos	FIOH	Finland
14	Regents of University of Minnesota	UMN-PTL	United States



SEVENTH FRAMEWORK PROGRAMME
GA: 280535

Innovative strategies, methods and tools for occupational risks management of manufactured nanomaterials in the construction industry

SCAFFOLD initial roadmap



- ✓ 6 selected construction applications
- ✓ 5 selected MNMs (TiO_2, SiO_2, CelluloseNF, CNF and Nanoclays)
- ✓ 6 categories of selected exposure scenarios
- ✓ 5 Industrial Use Cases for demonstration

Information and data about strategies, methods and tools for MNMs Risk Management in Construction

Analysis and detection of industrial needs & gaps (WP1)

Selected industrial needs and gaps

Relevant useful information 1

New knowledge: innovation beyond the State-of-the-art

SCAFFOLD focused research on:
- ✓ MNMs Risk Prevention (WP2)
- ✓ MNMs Risk Assessment (WP3)
- ✓ MNMs Risk Protection (WP4)

2

SCAFFOLD intermediate outcomes:
New Strategies and methods for Risk Prevention, Risk Assessment and Risk Protection

INTEGRATION of solutions: Risk Management Model & Toolkit (WP5)

Relevant useful information 3

Models for OHS Management (OHSAS 18001 - ISO 31000)

RMM and Toolkit

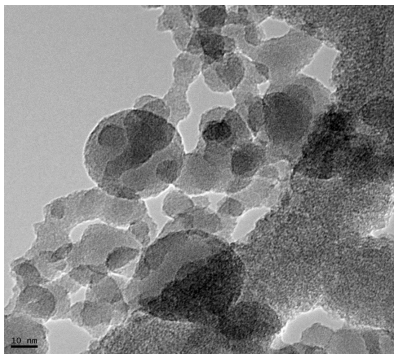
DEMONSTRATION in real industrial scenarios (WP6)

Main SCAFFOLD final outcomes:
- Risk Management Model (RMM)
- Toolkit for RMM implementation
- Customized RMM & Toolkit for SMEs

State-of-the-art knowledge

- **Six applications of MNMs in construction**:

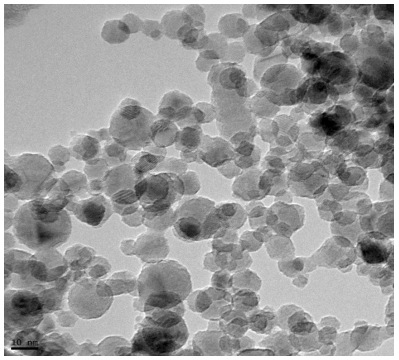
1. Depollutant mortars
2. Self-compacting concretes
3. Stabilised, Bituminous road-surface
4. Self-cleaning external coatings
5. Fire-resistant panels and
6. Insulations



- **Five MNMs**: TiO_2, SiO_2, Cellulose Nanofibres, Carbon Nanofibres and Nanoclays

- **Six categories of exposure scenarios** (integrating 26 individual exposure scenarios):

1. Manufacturing NMs
2. Manufacturing products containing MNMs,
3. Preparation, mixing, and application on site
4. Assembly and machining
5. Demolition and disposal
6. Accidental fires (Combustion of MNMs)



- **Five Industrial Use Cases (IUC) – demonstration activities** – covering three stages of the MNMs Life Cycle

1.- Manufacturing NMs	2.- Manufacturing CP containing NMs	3 &4.- Preparation and use of CP containing NMs		5.- End o life of CP containing NMs
		Buildings	*Civil Works*	
				
TECNAN (ES)	**ICECON (RO)**	**MOSTOSTAL (PL)**	**ACCIONA (ES)**	**ROSSAL (RO)**

✓ *Test the SCAFFOLD RMM into industrial construction companies in real-life situations to demonstrate their validity and use for effective management of MNMs occupational exposure along Life Cycle in the European Construction Sector.*

✓ *Focus research activities on some specific and priority industrial applications, scenarios and MNMs of the European Construction industry.*

✓ *Focus the project research tasks in the IUC (industrial demonstration) from the very beginning of the project.*

✓ *Develop demonstration activities (IUC) across Europe considering different safe-cultures and awareness levels as well us company scales (large and SMEs).*

Innovative strategies, methods and tools for occupational risks management of manufactured nanomaterials in the construction industry

SCAFFOLD

Risk Management Model (RMM)

OSHAS 18001

ISO 31000

(RTD)

SCAFFOLD Toolkit + SMEs

WP6 (DEMO)

IMPLEMENTATION:
Industrial cases

VERIFICATION:
Audits

WP7

STANDARDIZATION:
"OSHAS 18001 Application guide for construction industry regarding MNM risks"

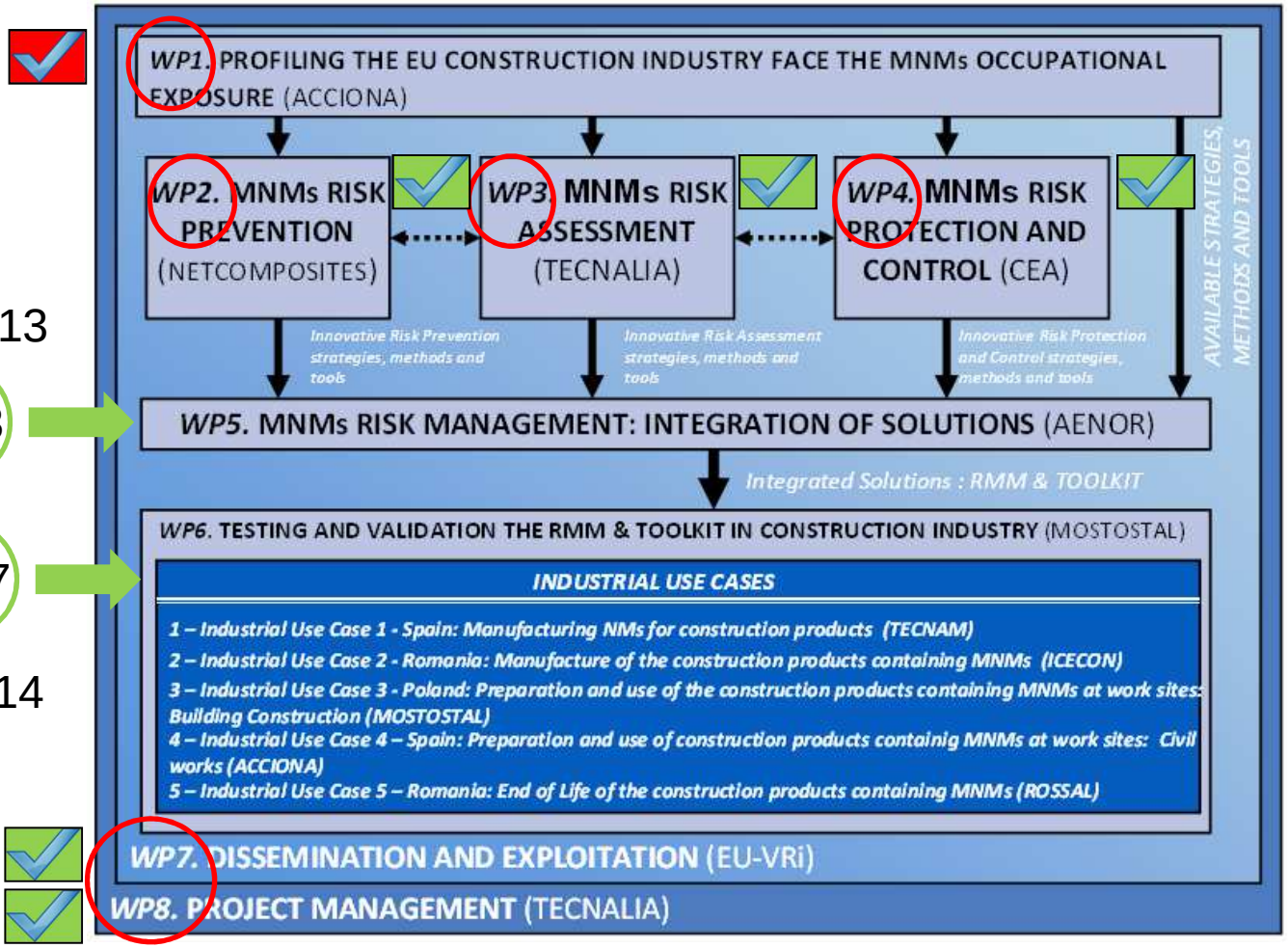
General status of the project (May 2013)

May 2013

M 13

M 27

July 2014

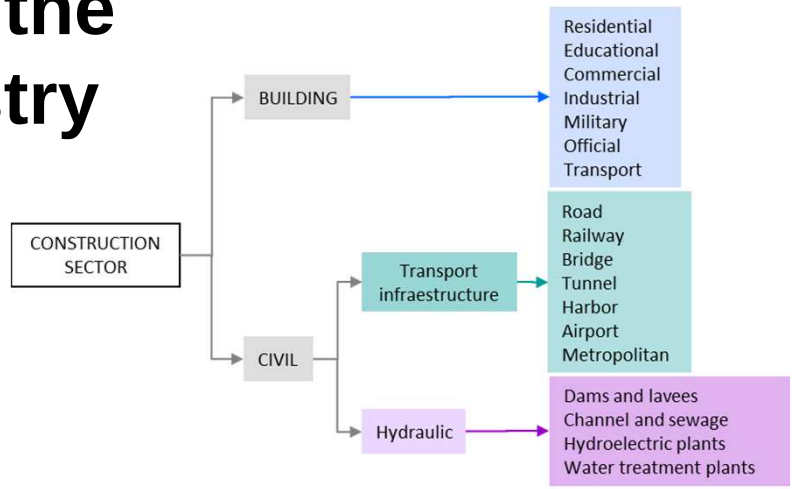


1.- Objectives WP1: Profiling the European construction industry

1. To develop a **Life Cycle Analysis (LCA)** for each of project select MNMs (TiO_2, SiO_2, Cellulose Nanofibers, Carbon Nanofibers and Nanoclays) (**Processes**)

2. To collect and analyse **sound available information** on NMs occupational exposure

3. To develop a **roadmap** on occupational exposure to MNMs in the construction sector.



PROCESSES INVOLVED IN THE CONSTRUCTION SECTOR

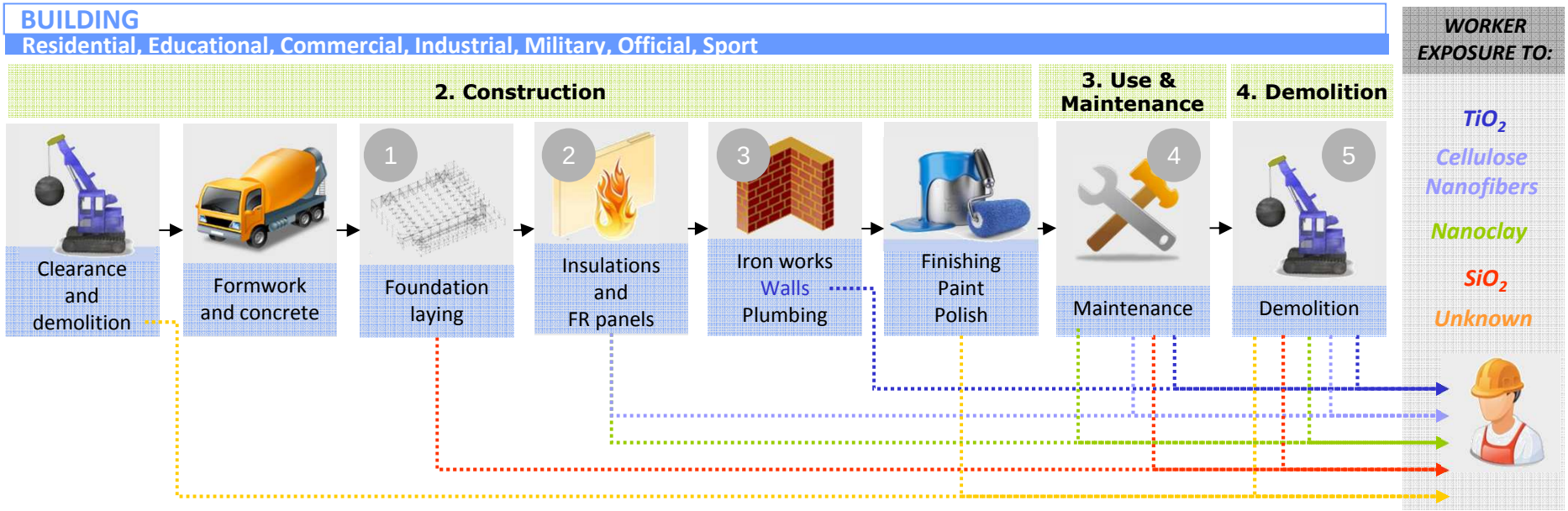
Innovative strategies, methods and tools for occupational risks management of manufactured nanomaterials in the construction industry

LCA - Process

Process Data Sheet

BUILDING

Residential, Educational, Commercial, Industrial, Military, Official, Sport



EXPOSURE SCENARIOS:

1 **FOUNDATION LAYING**

ES7: Concrete mixing for piles, slabs and special structures

ES8: On-site Assembly/Machining

2 **INSULATIONS AND FIRE RESISTING PANNELS**

ES19/ES23: Off-site manufacturing → *Not considered in the project*

ES20/ES24: Fitting of the pannles and machining for the superficial instalations of other elements

3 **WALLS**

ES15: Preparation, dosification of coatings

ES16: Application of coatings, superficial machining

4 **MAINTENANCE**

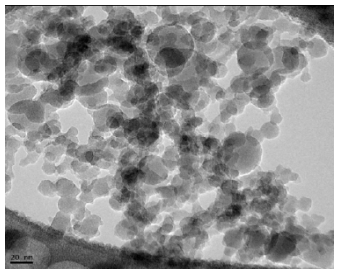
ES10/ES18/ES22/ES26: Accidental Fire: MNMs combustion

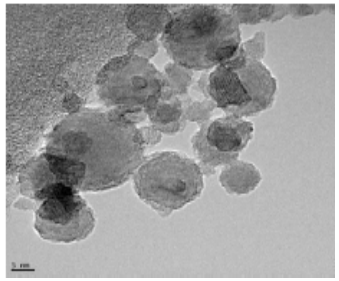
5 **DEMOLITION**

ES9/ES17/ES21/ES25: Demolition, end of life

WP2: Risk prevention (Safer product)

1. To develop intrinsically **safe MNMs formulations** (**stable dispersions**)
2. To develop **fire retardant nanocomposite formulations** with minimum risk to health & safety
3. To develop strategies for **safe nano-filled concrete, bituminous pavements, coatings and insulation**
4. To **integrate** previous results in a **common vision** on new strategies, methods and tools for MNMs risk prevention



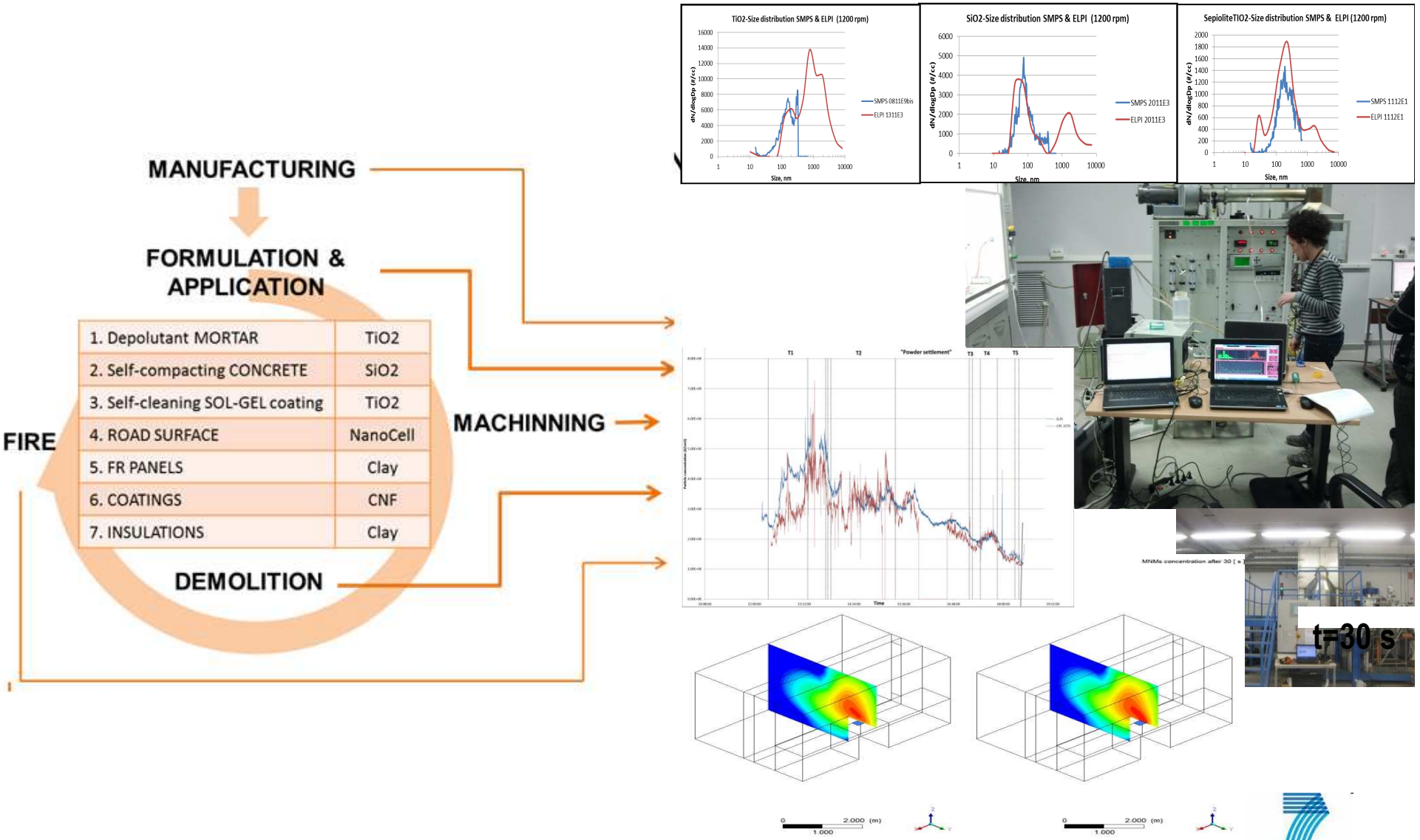


WP3: Risk Assessment

1. To test the effectiveness of the current solutions for collective protection efficiency to MNMs selected by the project
2. To test the effectiveness of the current solutions for personal protection efficiency (e.g., masks, gloves, clothing) to nanopowders and
3. To develop novel risk protection strategies and methods for the sector, including a proposal method for ISO standardization, a decision making strategy for PPEs selection and a new device for MNMs trapping.
4. To develop a control banding approach to be adapted for construction sector
5. To develop an exposure register model and the guidance for monitoring health of probably exposed workers
6. To integrate previous results in a common vision on new strategies, methods and tools for MNMs protection.

GA: 280535

Innovative strategies, methods and tools for occupational risks management of manufactured nanomaterials in the construction industry



WP4: Risk Protection

1. To test effectiveness of current solutions for **collective protection** against the MNMs selected by the project
2. To test effectiveness of current solutions for **personal respiratory protection** (e.g., masks) (MNMs selected by the project)
3. To test effectiveness of current solutions for **dermal protection** (e.g. gloves, clothing) (MNMs selected by the project)
4. To develop **novel risk protection strategies and methods** for the sector, including a proposal method for ISO standardization, a decision making strategy for PPEs selection and a new device for MNMs trapping
5. To develop a **control banding approach** customized for the construction sector
6. To develop an exposure register model and the **guidance for monitoring health** of probably exposed workers
7. To integrate previous results in a **common vision** on new strategies, methods and tools for MNMs protection

SEVENTH FRAMEWORK PROGRAMME
GA: 280535

WP5: Risk Management

1. To develop the **Risk management Model (RMM)** by using a convergent approach with requirements of the OHSAS 18001 and ISO 31000 standards: RMM structure, specific elements, implementation and audit process, compatibility and convergence with other management systems.
2. To construct an innovative **Toolkit** (Software) to facilitate the RMM initial review, planning, implementation, monitoring and audit in the construction companies
3. To **customize** the RMM approach for construction **SMEs**
4. To integrate previous results in a **common vision** on new strategies, methods and tools for MNMs risk management defining methods and tools to be used in each case

Innovative strategies, methods and tools for occupational risks management of manufactured nanomaterials in the construction industry

WP7: Dissemination and exploitation¡¡

1. To disseminate the achieved results and knowledge via **general dissemination** (web, conferences, articles, papers…)
2. To communicate, share and transfer relevant knowledge about the project results to the **European construction industry** in particular and to the other interested parties in general .
3. To coordinate specific dissemination actions with the **European Nanosafety Cluster** and **non-European partners**
4. To convey the results of the project into the relevant standardization committees with **pre-standards and CE marking activities**
5. To formulate a **proposal for an European strategy on MNMs** occupational risk management in the construction industry
6. To guide the project towards an adequate **exploitation strategy**

Expected Impact

1. **European Construction Industry and Society**:
   - ✓ Workers exposed
   - ✓ SMEs are more vulnerable to occupational risks
2. **Market (products)**:
   - ✓ Safe Nanoproducts (e.g. Nanocomposites)
   - ✓ Safety Management systems (e.g. OHSAS 18001)
   - ✓ New safety services for market (e.g. OHS, certification)
3. **European policies, regulations and standards:**
   - ✓ New information to elaborate better regulations and new standards (OHS and Safety of products)
   - ✓ Supporting deployment of new Community Strategy on Health and Safety at work, Action Plan for Construction of the Lead Market Initiative (LMI), European policy on nanotechnology, H2020, etc.
4. **Strategic Research Agendas** (SRAs) of the European Technology Platforms (ETPC, ETPIS, NANOFUTURE).

Innovative strategies, methods and tools for occupational risks management of manufactured nanomaterials in the construction industry

Thank you very much for your attention

(jesus.lopezdeipina@tecnalia.com)
(http://www.scaffold.eu-vri.eu/)

SEVENTH FRAMEWORK PROGRAMME
GA: 280535