Newsletter September 2015

# LIFE PHOTOSCALING



## Sustainability of photocatalytic technologies on urban pavements: From laboratory tests to in field compliance criteria

Welcome to the first newsletter of the LIFE PHOTOSCALING project.

PHOTOSCALING project, co- funded by the European Commission began 1st October 2015, has duration of 52 months and a total budget of 1.761.341 euros. Its implementation will allow undertaking the gap between the study of the photocatalytic efficiency in laboratory and full-scale measurements.

LIFE PHOTOSCALING involves several actions: As preparatory action, the Madrid City Council has already made a public inclusive call, offering to European manufacturers of pavement photocatalytic materials, the possibility of supplying one or various products for selection and, if selected, testing in the demonstrator platforms. Eight different implementation actions will be carried out, going from the selection of the elements for the platforms (already done); construction of them in a pilot plant technical scale at the CSIC installations; development of prototypes and accelerated ageing under simulated effect of the real-life urban environment. An indicators-based assessment of the behaviour of the products and/or materials will developed; the photocatalytic processes will be modelled coupled with the environmental actions; a decision support tool, including LCA will be developed, and then it will be validated and implemented in full scale conditions in a street in Madrid. Additionally, monitoring of the impact of the project, and diffusion and dissemination actions will be carried out.

# The Project

**LIFE-PHOTOSCALING´s global objective** is **to demonstrate the validity** of the **photocatalytic technology** in urban agglomerations, establishing the instruments to scaling up from laboratory measurements to application in our cities, by developing **a decision support tool**, to assess the **sustainability of each particular solution in each particular environment** to encourage the **widespread use** of this technology.

Some attempts have been made in order to apply this technology in a real scale. However, in those cases important problems were encountered to monitor the **system from a global point of view** that **makes it very difficult or even impossible to evaluate** if the technique is really working. That is why there is still a **barrier that discourages public authorities** and most architects and engineers to promote the use of this technology, together with the fact that **there are not any compliance criterions'** concerning neither **activity** nor **durability** or possible **secondary effects**.

## LIFE PROGRAM

The LIFE programme is the EU's funding instrument for the environment and climate action. The general objective of LIFE is to contribute to the implementation, updating and development of EU environmental and climate policy and legislation by co-financing projects with European added value.

LIFE began in 1992 and to date there have been four complete phases of the programme (LIFE I: 1992-1995, LIFE II: 1996-1999, LIFE III: 2000-2006 and LIFE+: 2007-2013). During this period, LIFE has co-financed some 3954 projects across the EU, contributing approximately €3.1 billion to the protection of the environment.

## Their global objective will be met through the following partial objectives:

1: Development of two demonstration platforms on an intermediate pilot plant technical scale.

2: Technical development of a prototype for in-situ measuring the photocatalytic efficiency.

3: Development of performance indicators for evaluation of the: Photocatalytic efficiency, durability of the material itself concerning their intrinsic properties and evaluation of the possible unwanted deleterious effects.

4: Modelling of the photocatalytic processes coupled with the environmental actions.

5: Development of a decision support tool, to undertake the sustainability of each particular solution including a life cycle assessment (LCA).

6: Validation of the tool developed in real –full scale- conditions.

7: Breaking the barriers to the implementation of this technology after having probed safe for human health: communication of the lessons learnt and standardisation efforts.

CSIC

CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

## Coordinating beneficiary

**The State Agency for National Research Council (CSIC)** is the largest public institution dedicated to research in Spain and the third in Europe. Its fundamental purpose is to develop and promote research for the benefit of scientific and technological progress, for which it is open to collaboration with Spanish and foreign. According to its Statute, has as its mission the promotion, coordination, development and dissemination of scientific and technological research, multidisciplinary in nature, in order to contribute to the advancement of knowledge and the economic, social and cultural, as well as to staff training and counseling of public and private entities in this area. The CSIC plays a central role in science and technology policy, covering from basic research to knowledge transfer to industry. The engine is made up their research centers and institutes.

The Eduardo Torroja Institute for Construction Science, IETcc, belongs to the CSIC Area of Materials Science and Technologies. IETcc basic function is to conduct scientific research and technological developments in the field of construction and materials. This is achieved through the development of R & D funded by the National Research Plan, the European Union and the Autonomous Communities, as well as through research contracts with companies in the construction sector.

## Associated beneficiaries

¡MADRID!

Air pollution is one of the major environmental problems local administrations have to deal with in big cities of both developed and newly industrialising countries.
To this end, the municipality of Madrid has developed various actions such as the "Madrid's air quality plan 2011-2015" which is a key project from the city Council as a part of its strategy to consolidate and strengthen the process of transforming the city from a conventional into a sustainable urban model. One of the key issues of this action is the development of sustainable paving strategies where it fits the main objectives of the present project. The Madrid city council sees in decontaminating pavements a huge opportunity to contribute to reduction of air pollution in big cities.

**Universidad Politécnica de Madrid (UPM)**

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is the oldest and largest Spanish technical university, with more than 4,000 faculty members, around 38,000 undergraduate students and 6,000 postgraduates in 21 Schools of study including most of engineering disciplines. The industrial engineers' school, to which the participants in this project are affiliated, dates from 1809. This school is host to the UPM research group on Environmental Technologies and Industrial Resources, framework for the research activities of the participants involved in this project.

The participants from UPM have promoted and participated in tens of R&D projects, mainly in the air quality modelling field, funded by public administrations (national, regional and local) as well as private companies. From 2002, the UPM works for the Spain's Ministry of Environment in the development and analysis of atmospheric emissions.

# Expected results

**LIFE-PHOTOSCALING is expected to** result in **toppling of the barriers and** the **progressive implementation** of the photocatalytic technology to work towards the achievement of the following targets after finishing the project: Reduction in the concentration of NOx by a 5 % average in five years and a 15 % average in 10 years in Madrid City without emission of nano-particles as airborne contaminants. This will be achieved through the following results during on-going of the project:

1. Reduction in the concentration of contaminants at the specific places of **both pilot areas** of around a 20% for NOx, at always below the limits of the in force NECD.

2. Validated methodology and prototype for **in situ measuring of the efficiency of the photocatalytic materials.**

3. Validated methodology and prototype for **assessing the release of particles from the active pavement.**

**4.** A compendium of at **least 5 protocols for the measurement and evaluation of the intrinsic durability and durability of the efficiency.**

**5.** A compendium of at **least 3 protocols for the measurement and evaluation of the possible deleterious effects.**

**6.** At least 2 **drafts to be submitted** for consideration to the CEN TC 386 "Photocatalysis" and/ or other national **standardisation** committees.

7. Quantified efficiency for "other" surface **contaminants (oil, fuel, graffiti ,..)**

8. **A database**, to be updated in the future,containing the **properties and the scores** for all studied photocatalytic materials and systems on three groups of indicators: 1) Photocatalytic efficiency, 2) Durability of the material itself concerning their intrinsic properties, and 3) possible secondary deleterious effects.

9. **Methodology for quantifying potential problems derived from the use of photocatalysis with the result of zero** emission of nano-particles as airborne contaminants.

10. **Quantitative model** between **relevant assessment criteria and environment conditions**

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CSIC Consejo Superior de Investigaciones Científicas

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