



# TOWARD THE DESIGN OF **ECO-EFFICIENT** ASPHALT PAVEMENTS (BY USING INDUSTRIAL BY-PRODUCTS AND RECYCLED MATERIALS)



Speaker : Marta Vila Cortavitarte



GOBIERNO  
DE ESPAÑA



UNIÓN EUROPEA  
FONDO  
EUROPEO DE  
DESARROLLO  
REGIONAL

*"Una manera de hacer Europa"*



GITECO  
UC UNIVERSIDAD  
DE CANTABRIA



UC  
UNIVERSIDAD  
DE CANTABRIA

## PhD General Aim

## Evaluation guide

The use of **recycled materials** and **industrial by-product** in asphalt mixtures to :

- Decrease raw materials' use
- Avoid sending materials/by-products to landfill



**Currently** focusing on **SIMA+ Project** whose aim is to improve the technical, economic and environmental feasibility of the **induction healing technology** by magnetic induction **using metallic by-products as inductors**.

## PhD General Aim

## Evaluation guide

The use of **recycled materials** and **industrial by-product** in asphalt mixtures to :

- Decrease raw materials' use
- Avoid sending materials/by-products to landfill



**Currently** focusing on **SIMA+ Project** whose aim is to improve the technical, economic and environmental feasibility of the **induction heating technology** by magnetic induction **using metallic by-products as inductors**.

Steps followed so far:

## PhD General Aim

## Evaluation guide

The use of **recycled materials** and **industrial by-product** in asphalt mixtures to :

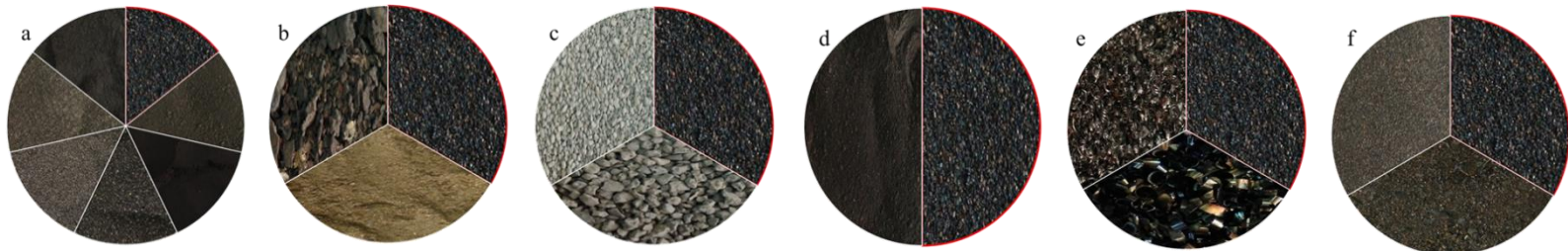
- Decrease raw materials' use
- Avoid sending materials/by-products to landfill



**Currently** focusing on **SIMA+ Project** whose aim is to improve the technical, economic and environmental feasibility of the **induction heating technology** by magnetic induction **using metallic by-products as inductors**.

Steps followed so far:

### By-products characterisation



## PhD General Aim

## Evaluation guide

The use of **recycled materials** and **industrial by-product** in asphalt mixtures to :

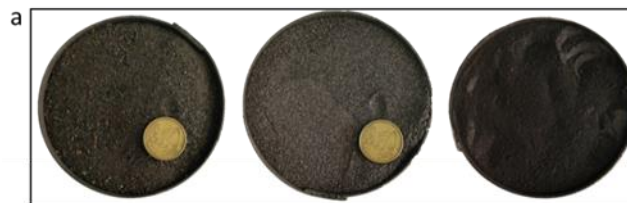
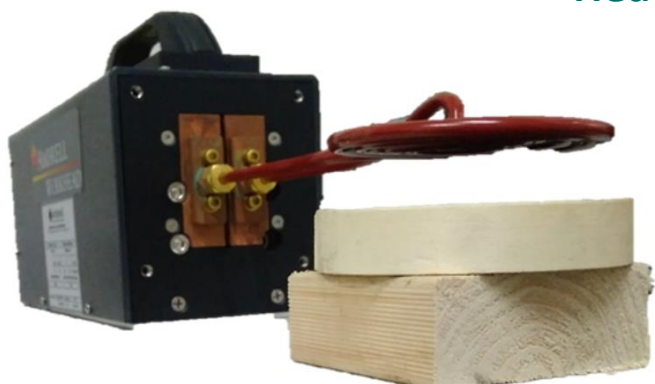
- Decrease raw materials' use
- Avoid sending materials/by-products to landfill



**Currently** focusing on **SIMA+ Project** whose aim is to improve the technical, economic and environmental feasibility of the **induction heating technology** by magnetic induction **using metallic by-products as inductors**.

Steps followed so far:

### Heating abilities test for by-products







## PhD General Aim

## Evaluation guide

The use of **recycled materials** and **industrial by-product** in asphalt mixtures to :

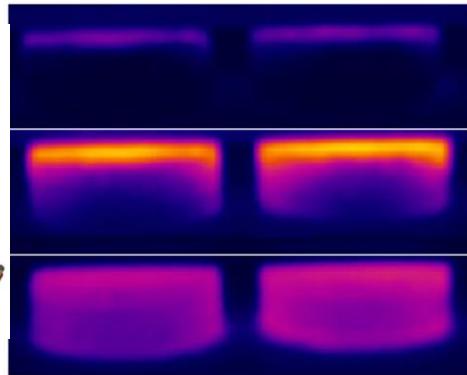
- Decrease raw materials' use
- Avoid sending materials/by-products to landfill



**Currently** focusing on **SIMA+ Project** whose aim is to improve the technical, economic and environmental feasibility of the **induction heating technology** by magnetic induction **using metallic by-products as inductors**.

Steps followed so far:

### Healing Ratio measurements



2/11

## PhD General Aim

## Evaluation guide

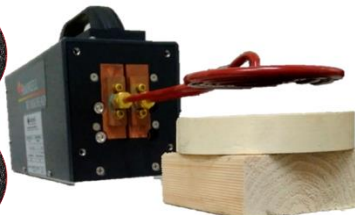
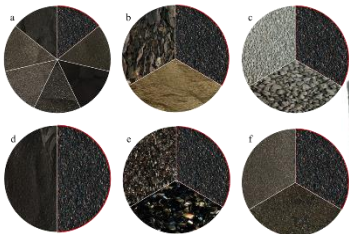
The use of **recycled materials** and **industrial by-product** in asphalt mixtures to :

- Decrease raw materials' use
- Avoid sending materials/by-products to landfill



**Currently** focusing on **SIMA+ Project** whose aim is to improve the technical, economic and environmental feasibility of the **induction heating technology** by magnetic induction **using metallic by-products as inductors**.

Steps followed so far:



2/11



## PhD General Aim

## Evaluation guide

| Basic competences | Science and Technique | Technology | Training courses | Results | SWOT analysis | Work plan | Mobility | Funding | Ethics |
|-------------------|-----------------------|------------|------------------|---------|---------------|-----------|----------|---------|--------|
| CB11              | ✓                     | ✓          | ✓                |         |               |           |          |         | ✓      |
| CB12              |                       |            |                  | ✓       |               | ✓         |          |         |        |
| CB13              |                       |            |                  | ✓       |               |           |          |         |        |
| CB14              |                       |            |                  |         | ✓             |           |          |         |        |
| CB15              |                       |            |                  | ✓       |               |           | ✓        |         |        |
| CB16              |                       |            |                  | ✓       |               |           | ✓        |         |        |

CB11 - Systematic understanding of a field of study and command of research skills and methods related to this field.

CB12 - Ability to conceive, design, or create, put into practice, and adopt a substantial research or creative process.

CB13 - Ability to contribute to broadening the frontiers of knowledge through original research.

CB14 - Ability to make a critical and evaluative analysis and synthesis of new and complex ideas.

CB15 - Ability to communicate with the academic and scientific community and with society in general about their areas of knowledge through the usual means and languages used in the international scientific community.

CB16 - Ability to promote scientific, technological, social, artistic, or cultural advances in academic and professional contexts within a knowledge-based society.

## PhD General Aim

## Evaluation guide

| Capacities and personal skills | Science and Technique | Technology | Training courses | Results | SWOT analysis | Work plan | Mobility | Funding | Ethics |
|--------------------------------|-----------------------|------------|------------------|---------|---------------|-----------|----------|---------|--------|
| CA01                           | ✓                     | ✓          | ✓                |         |               |           |          |         |        |
| CA02                           |                       |            |                  | ✓       |               |           |          |         |        |
| CA03                           |                       |            |                  |         |               | ✓         |          |         |        |
| CA04                           |                       |            | ✓                |         |               |           |          | ✓       |        |
| CA05                           |                       | ✓          |                  | ✓       |               |           |          |         |        |
| CA06                           |                       |            |                  |         | ✓             |           |          |         |        |

CA01 - Operate effectively within contexts where there is little specific information.

CA02 - Find the key questions that need to be answered in order to solve a complex problem.

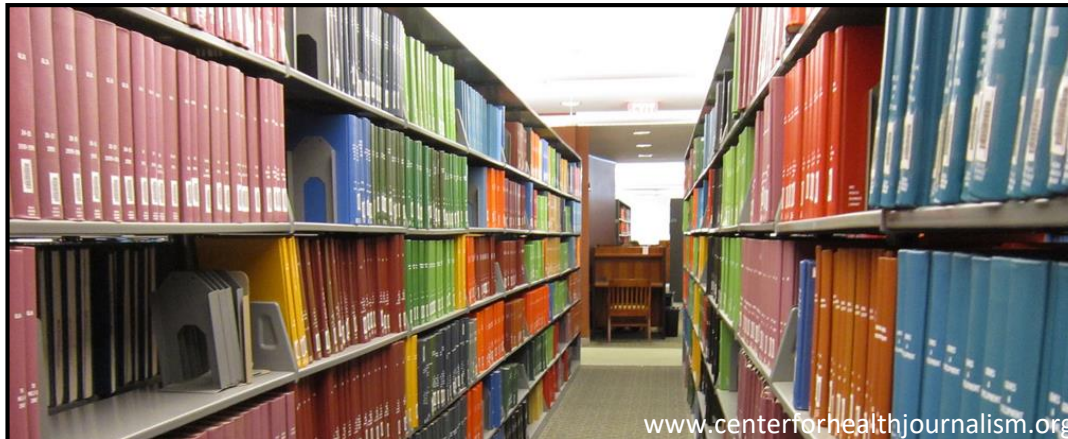
CA03 - Design, create, develop, and undertake novel and innovating projects in the field of knowledge.

CA04 - Work in an international and multi-disciplinary context on a team as well as independently.

CA05 - Integrate different areas of knowledge, cope with complexity, and formulate opinions with limited information.

CA06 - Intellectual criticism and defense of solutions.

- Science & Technique / Technology
  - Review of the theme
  - Read the laboratory methodology involved
  - Design and try to follow a plan based on previous pints.
  - Learn how research works ( how to publish, how to write, etc.)



## PhD General Aim

## Evaluation guide

Sci & Tech

Technology

**Courses**

Results

SWOT

Work Plan

Mobility

Funds

Ethics

- *EDUC Basic and Advanced Training Courses (2017)*. Duration: 80 hours.

**Organiser: Doctoral School of the University of Cantabria.**

- *LATEX for Scientific writing use. Basic Level*. Duration: 12 hours
- Use and analysis of information spatial component through GIS. Duration 12 hours.
- Workshop of writing European Proposals. Duration: 20 hours
- Patents: What every researcher must know. Duration: 9 hours

**Organiser: CeFoNT. (New Technologies Training Centre , UC) total duration: 53 hours.**

- *ERA Career Day*. Duration: 12 hours.

**Organisers: EURAXESS Project and UC**

- *CRE Day: Professional Career for Scientifics*. Duration: 7.5 hours

**Organisers: Ramón Areces Foundation and Científicos Retornados a España (CRE)**

- *Students workshop to participate in organs of evaluation*. Duration: 5 hours

**Organiser Unibasq (Agency for Quality of the Basque University System)**

- Currently Part of external review panel of EUR-ACE® labels

**Organiser ANECA (The National Agency for Quality Assessment and Accreditation of Spain)**

- *Basic Course of Security in laboratories (2017)*. Duration: 10 hours

**Organiser: University of Cantabria**



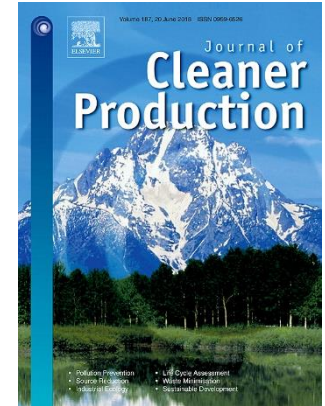
6/11

|            |            |         |                |      |           |          |       |        |
|------------|------------|---------|----------------|------|-----------|----------|-------|--------|
| Sci & Tech | Technology | Courses | <b>Results</b> | SWOT | Work Plan | Mobility | Funds | Ethics |
|------------|------------|---------|----------------|------|-----------|----------|-------|--------|

**Vila-Cortavitarte, M.;** Lastra-González, P.; Calzada-Pérez, M. Á.; & Indacoechea-Vega, I. (2018). *Analysis of the influence of using recycled polystyrene as a substitute for bitumen in the behaviour of asphalt concrete mixtures.*

*Journal of Cleaner Production*, 170, 1279–1287.

<https://doi.org/10.1016/j.jclepro.2017.09.232>



**Impact factor: 5.715**

**Citations: 1**

**Vila-Cortavitarte, M.;** Jato-Espino, D.; Castro-Fresno, D.; Calzada-Pérez, M.Á. (2018) *Self-Healing Capacity of Asphalt Mixtures Including By-Products Both as Aggregates and Heating Inductors.*

*Materials* 11, 800.

<https://doi.org/10.3390/ma11050800>

**Impact factor: 2,654**





**Marta Vila Cortavitarte**, Pedro Lastra González, Miguel. Á. Calzada Pérez & Irune Indacoechea Vega (Jun 2017). *Análisis de la influencia del uso de poliestireno reciclado como sustitutivo del betún en el comportamiento de hormigones bituminosos y mezclas prosas.*

**VII Simposio Iberoamericano en Ingeniería de Residuos.**

Sited in Santander, Spain



VII Simposio Iberoamericano  
en Ingeniería de Residuos  
Hacia una economía circular

**Marta Vila Cortavitarte**, Pedro Lastra González, Daniel Castro Fresno & Pablo Pascual Muñoz (April 2018). *Development and optimization of the induction healing of asphalt mixes including alternative materials and sustainable technologies.*

**Transport Research Arena 2018.** Poster Presentation.

Sited in Vienna, Austria



2 conference abstract accepted so far to the **7th ICONFBMP**  
**(International Conference of Bituminous mixtures and pavements)**

Sited in Thesalonika, Greece.



## PhD General Aim

## Evaluation guide

|            |            |         |         |             |           |          |       |        |
|------------|------------|---------|---------|-------------|-----------|----------|-------|--------|
| Sci & Tech | Technology | Courses | Results | <b>SWOT</b> | Work Plan | Mobility | Funds | Ethics |
|------------|------------|---------|---------|-------------|-----------|----------|-------|--------|

|                                    | HELPFUL<br>(for your objective)  | HARMFUL<br>(for your objective)  |
|------------------------------------|--|--|
| INTERNAL<br>(within organisation)  | <p><b>S</b></p> <ul style="list-style-type: none"> <li>• Eager to work, improve and publish</li> <li>• Huge variety of by-products to work</li> <li>• Well- equipped laboratory</li> </ul> | <p><b>W</b></p> <ul style="list-style-type: none"> <li>• Coordination to use lab equipments</li> <li>• self- organisation</li> <li>• Lack of research experience</li> <li>• Academic writing in English</li> </ul> |
| EXTERNAL<br>(outside organisation) | <p><b>O</b></p> <ul style="list-style-type: none"> <li>• Collaboration with enterprises</li> <li>• International stay granted</li> </ul>   | <p><b>T</b></p> <ul style="list-style-type: none"> <li>• Other potential studies of healing with by-products inductors and with cold asphalt emulsion mixtures.</li> </ul>   |

## PhD General Aim

## Evaluation guide

|            |            |         |         |      |           |          |       |        |
|------------|------------|---------|---------|------|-----------|----------|-------|--------|
| Sci & Tech | Technology | Courses | Results | SWOT | Work Plan | Mobility | Funds | Ethics |
|------------|------------|---------|---------|------|-----------|----------|-------|--------|

- Work plan.

Mixture full characterisation

Optimisation of mixtures and healing

Try Induction in CAEMs

Numerical simulation

- Mobility



Budget for an international stay in the near future



TECHNISCHE UNIVERSITÄT WIEN



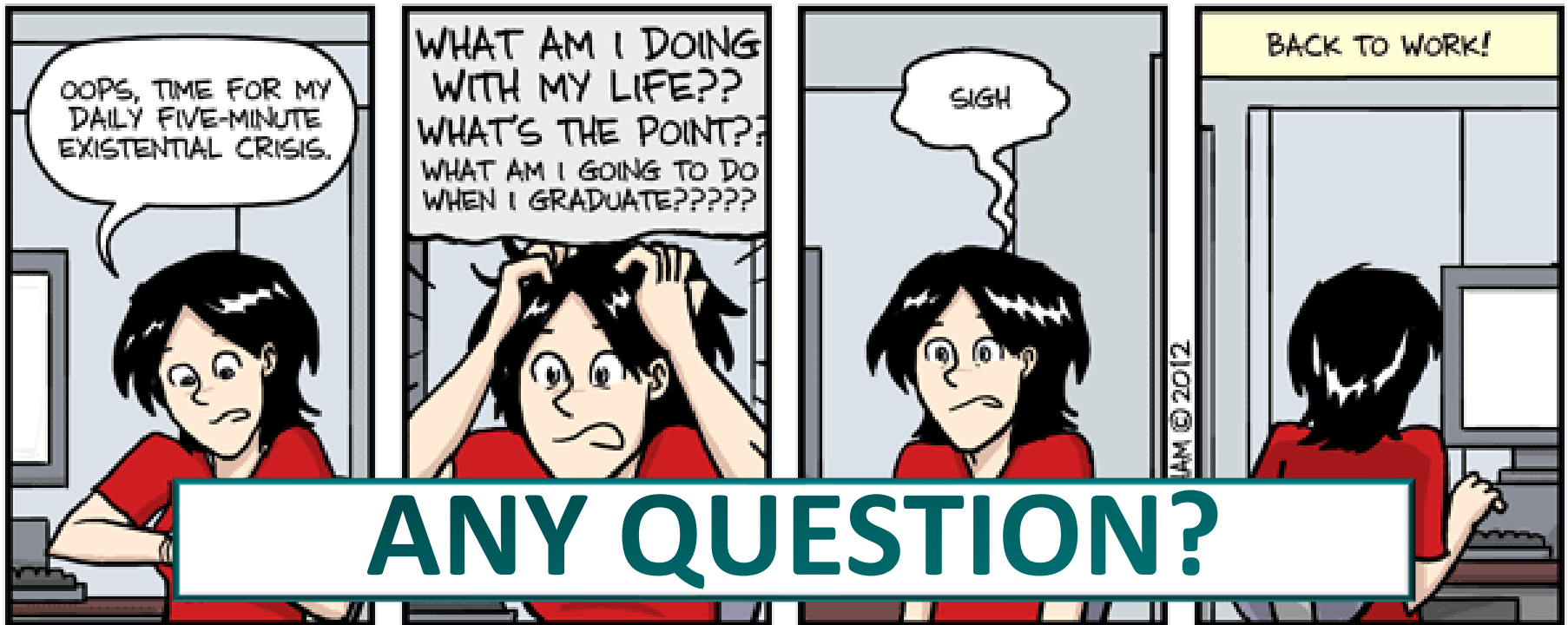
- Funding



- Ethics

# THANK YOU FOR LISTENING

TOWARD AN ECO-EFFICIENT ASPHALT PAVEMENTS



## ANY QUESTION?

[WWW.PHDCOMICS.COM](http://WWW.PHDCOMICS.COM)



GOBIERNO  
DE ESPAÑA



UNIÓN EUROPEA  
FONDO  
EUROPEO DE  
DESARROLLO  
REGIONAL

"Una manera de hacer Europa"



GITECO  
UC UNIVERSIDAD  
DE CANTABRIA

Escuela  
de Doctorado

UC  
UNIVERSIDAD  
DE CANTABRIA