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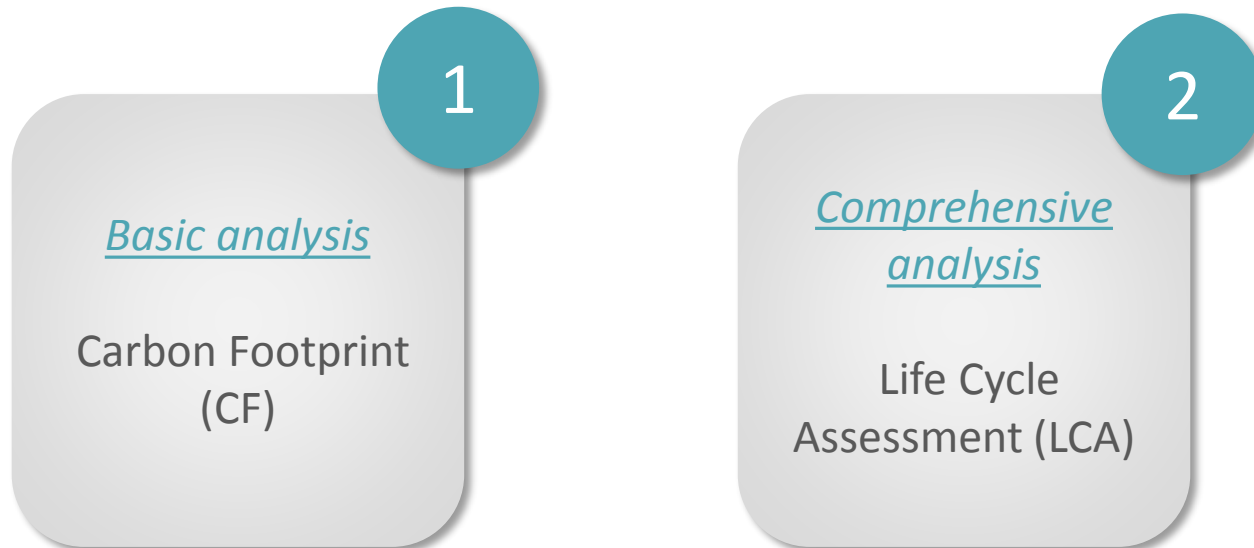
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LIFE CYCLE ASSESSMENT (LCA) OF PAVEMENTS

In 2016 the Joint Research Centre (JRC) published a “Revision of [Green Public Procurement Criteria](#) for Road Design, Construction and Maintenance” in order to reduce the environmental impact roads produce.

In the report, the JRC identifies two types of analysis:



The recommendations made by the JRC were (among others):

A

Considering the impacts produced during the 5 stages of a road life:

Materials production

Construction

Use

Maintenance

End-of-life

B

Calculating 12 impact categories:

Global warming potential

Acidification

Eutrophication

Human toxicity

Land use

Etc.

The existing tools to carry out the analysis can be classified in:

A

Generic LCA tools (Gabi, SimaPro):

- **Advantages:**
 - They are flexible. It is possible to produce any type of LCA model.
 - A large database is available.
- **Disadvantages:**
 - They are expensive.
 - It is necessary to know about pavements and about the LCA methodology to carry out the analysis.
 - The LCA models should be created from scratch.

B

Specific pavement tools:

- **Advantages:**
 - They are cheaper. Some of them are even freely available.
 - No specific knowledge is needed.
 - It requires less time to perform the analysis
- **Disadvantages:**
 - They are not so flexible.
 - Not all the tools permit modifying the database if more information about an specific project is available.
 - The databases are not usually updated.

The following tools are being or have been developed in Europe:

	<i>asPECT</i>	<i>CO2ladder</i>	<i>Dubocalc</i>	<i>Klimatkalkyl</i>	<i>SEVE</i>
Country	United kingdom	The Netherlands	The Netherlands	Sweden	France
Developer	HA, MPA, RBA and TRL	Rijkwaterstaat	Rijkwaterstaat	Swedish TA	Usirf
Standard	ISO 14044 IPCC2007	ISO 14040	ISO 14040	IPCC2007	ISO 14040
Stages	1.Materials 2.Construction 3.Use 4.Maintenance 5.End-of-life	1.Materials 2.Construction 3.Use 4.Maintenance 5.End-of-life	1.Materials 2.Construction 3.Use 4.Maintenance 5.End-of-life	1.Materials 2.Construction 3.Use 4.Maintenance 5.End-of-life	1.Materials 2.Construction 3.Use 4.Maintenance 5.End-of-life
Impacts	1.GWP	1.GWP	1.GWP 2.ADP 3.ODP 4.POCP 5.HTP 6.FAETP 7.Ecotoxicity sediments 8.TETP 9.AP 10.Over fertilization 11.Depletion of renewable materials	1.GWP 2.Energy	1.GWP 2.Energy 3.Resources

In Spain, the following works are being developed:

- “Análisis Ambiental y de costes de ciclo de vida de firmes y pavimentos”. CEDEX.
- Asefma’s monograph regarding the carbon footprint of the Spanish pavement sector.
- Economic analysis of the different Spanish pavement sections. IECA.
- Aragon Government's spreadsheet.

	<i>Aragon spreadsheet</i>
<i>Stages</i>	1.Materials 2.Construction 3.Use 4.Maintenance 5.End-of-life
<i>Impacts</i>	1.GWP 2.Energy

It is needed:

- To create a database containing information regarding the Spanish construction techniques and materials.
- To develop an optimised LCA tool specific for Spanish roads.
- To analyse the influence of the different processes involved in the road life.
- To study the environmental repercussion of innovative asphalt mixtures and materials.

TRAINING COURSES

- Uso y análisis de la componente espacial de la información mediante GIS. Nivel básico. 9h. PFPU. 02/2017
- Uso y análisis de la componente espacial de la información mediante GIS. Nivel avanzado. 6h. PFPU. 02/2017
- Curso Básico sobre el Nuevo Doctorado y las Técnicas de Presentación del Trabajo Científico. 40h. EDUC. 03/2017
- Curso Básico de Seguridad en Laboratorios 2017. 1ª Edición. 10h. UC. 04/2017
- Escribiendo propuestas europeas (Taller). 24h. PFPU. 05/2017
- Curso Avanzado sobre el Futuro Profesional del Doctorando. 40h. EDUC. 05/2017
- Excel nivel avanzado. 12h. PFPU. 01/2018

CONFERENCES

- Alterpave/Biorepavation workshop. “Use of end-of-life materials, waste and alternative binders as useful raw materials for pavements construction and rehabilitation”. 06/07/2017. Nantes (France)
- PPRS NICE 2018. HEALROAD Symposium. “Environmental impact of the new technology (LCA)”. 27/03/2018. Nice (France).
- IALCCE. “Life Cycle Assessment of asphalt mixtures healed by induction heating”. Paper accepted. 28-31/10/2018. Ghent (Belgium). (Paper accepted)

PUBLICATIONS

- Leonor Patricia Güereca; Daniel Jato-Espino; Esther Lizasoain-Arteaga. “Leonor Patricia Güereca; Daniel Jato-Espino; Esther Lizasoain-Arteaga”. In book: Handbook of Environmental Materials Management, Publisher: Springer International Publishing, Editors: Chaudhery Mustansar Hussain, pp.1-37
- Lizasoain-Arteaga, Esther; Indacoechea-Vega, Irune; Pascual-Muñoz, Pablo; Castro-Fresno, Daniel. “Environmental impacts of induction-heated asphalt mixtures”. (Under development)

LIFE CYCLE ASSESSMENT (LCA) OF PAVEMENTS

Basic competences	Science and Technique	Technology	Training courses	Results	SWOT analysis	Workplan	Mobility	Funding	Ethics
CB11	✓	✓	✓						
CB12				~		✓	✗		
CB13				~					
CB14					✓		✗		
CB15				~					
CB16				~					✓

Capacities and personal skills	Science and Technique	Technology	Training courses	Results	SWOT analysis	Workplan	Mobility	Funding	Ethics
CA01	✓	✓	✓						
CA02				~					
CA03						✓		✓	
CA04			✗				✗		
CA05	✓	✓	✓						
CA06					✓				



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**Thanks for
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