LIFE Project Number  
**LIFE12 ENV/ES/000315**

**FINAL Report**  
Covering the project activities from 01/10/2013 to 31/05/2017

**Reporting Date**  
<29/11/2017>

**LIFE+ PROJECT NAME or Acronym**  
*Footwear carbon footprint (CO2Shoe)*

### Project Data

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<tr>
<th><strong>Project location</strong></th>
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</tr>
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<td><strong>(%) of eligible costs</strong></td>
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### Beneficiary Data

<table>
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<tr>
<th><strong>Name Beneficiary</strong></th>
<th>Asociación de Investigación para la Industria del Calzado y Conexas (INESCOP)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contact person</strong></td>
<td>Mr. Joaquín Ferrer</td>
</tr>
<tr>
<td><strong>Postal address</strong></td>
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<tr>
<td><strong>Visit address</strong></td>
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<td>+34 965 39 52 13</td>
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<td>+34 965 38 10 45</td>
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<td><strong>E-mail</strong></td>
<td><a href="mailto:jerrer@inescop.es">jerrer@inescop.es</a></td>
</tr>
<tr>
<td><strong>Project Website</strong></td>
<td><a href="http://www.co2shoe.eu">www.co2shoe.eu</a></td>
</tr>
</tbody>
</table>
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2. Executive Summary

This report presents the activities carried out under the project LIFE “Footwear Carbon Footprint - CO2Shoe” (LIFE12 ENV/ES/000315) over the whole project period (between 01/10/2013 and 31/05/2017).

The main objective and the core of the CO2Shoe project was to develop a specific Carbon Footprint (hereafter CF) calculation tool for the footwear sector to quantify the GHG emissions, measured as kg CO$_2$e, produced by each pair of shoes. The use of this tool in the footwear sector will lead to improve the environmental impact of footwear manufacture through the reduction of the GHG emissions.

In order to achieve this objective, the CO2Shoe project relied on the participation of 6 partners, Asociación de Investigación para la Industria del Calzado y Conexas (INESCOP), as the project coordinator, and Centro Tecnológico do Calçado de Portugal (CTCP), Instytut Przemysłu Skórzanego, Oddział w Krakowie (IPS), C.G.S. di Coluccia Michele & C. s.a.s (CGS), Confédération Européenne de l’Industrie de la Chaussure (CEC), and Federación de Industrial del Calzado Español (FICE), as project associated beneficiaries. All of them acted according to the Common Provisions and the proposal approved by the EC, as well as under the provisions of the Partnership Agreement.

In general the project achieved an adequate progress along its development from 1st October 2013 till 31st May 2017. Due to technical reasons, minor changes were made to the initial plan, both in terms of deadlines and content. It is to be noted that these minor changes in no way affected the ultimate objective of the project. Thus, at the end of the project the CF tool was ready to be used and 36 different footwear styles were evaluated to calculate their CF. After implementing the suggested improvements the CF was evaluated again to compare the results obtained and to quantify the CF reduction achieved (6%).

Regarding project management, it is to be highlighted that an addendum was made to the Partnership Agreement of the Project LIFE CO2Shoe – LIFE12 ENV/ES/000315 between the coordinating beneficiary INESCOP and the project associated beneficiary FICE, in Elda on 7th March 2016.

INESCOP, as the coordinator, was the communication intermediary between the project beneficiaries and the Commission, both directly (when reports were delivered) and through the designated LIFE External Assistance Team. The project progress was reported to them on a regular basis. Furthermore, 4 monitoring visits were received by INESCOP and 6 coordination meetings were carried out between project partners.

Summary of each task carried out:

Project activities started with Action A1 (Assessment of the available resources for the design of the calculation tool), with the identification and revision of the main available LCA and CF methodologies, as well as other resources (LCA software tools, PCRs, databases, related bibliography, etc.) to select the most suitable to be used as a reference and guidelines for the design of the CO2Shoe tool.

Within Action B1 (Establishment of system’s scope for footwear and identification of GHG emissions), the system’s scope was established to define the goal of the CF study, the system’s boundaries, the functional unit, the assumptions, GHG addressed, etc. Due to the iterative approach of LCA and CF studies, the implementation period of this task was extended until the end of the project. Two B1 draft Deliverables titled “Report describing the scope of the system” were prepared and submitted in previous reports (IR, MR) and the final Deliverable was prepared at the end of the project.
Next, to develop Action B2 (Data collection for the development of the CF calculation tool), all the data necessary to build the CO2shoe tool were obtained (mainly emission factors from Ecoinvent database and bibliography studied). Due to the continuous update of emission factors identified and search for alternative processes and materials used in the footwear industry (related to Action B7), the implementation period of this task was extended until the end of the project, like Action B1. Two B2 draft Deliverables titled “Report containing necessary data to build the tool” were prepared and submitted in previous reports (MR, PR) and the final Deliverable was prepared at the end of the project.

Action B3 (Development of the CF calculation tool specific for footwear) was developed in parallel to Action B2, since these tasks are very much related to each other. Therefore, the implementation period of this task was extended until the end of the project also. A B3 draft Deliverable titled “Tool for the calculation of CF” was produced and submitted in a previous report (MR) and the final Deliverable was prepared at the end of the project.

In order to detect possible faults in the tool developed and to ensure that the tool met all the requirements of the methodology used as a reference, 2 actions were undertaken at the same time: The pilot test of the CF calculation tool on a footwear style (Action B4) and the verification of the tool by an external company (Action B5). Throughout these 2 actions several improvements and corrections of the CO2Shoe tool were implemented and the tool was validated by a 3rd independent entity. As a result of these actions Deliverable B4 titled “Questionnaire to assess the tool designed” was released.

At this point, the main objective of the project (to develop a specific CF calculation tool for the footwear sector) was reached. However, it is to be highlighted that although the CO2Shoe tool was ready, updates of the tool were also implemented throughout all project execution. These updates consisted of, on the one hand, updating the Emission Factors (hereafter EFs) of materials and processes incorporated and, on the other hand, searching alternative materials that allow the CF to be reduced (since their EFs are lower than those of conventional materials), which had not been initially considered. As a consequence, this action was very much related to Action B7 (Recommendations for improvement of the CF).

With Action B6 (1st pilot application to different footwear styles produced in the EU) started the 2nd phase of the project. 36 CF calculations were obtained on several footwear styles produced in the EU (Spain, Portugal, Poland and Italy). Each footwear company involved in the pilot application received a specific report with the results obtained in the CF calculations, including mitigating measures to apply for the reduction of their GHG emissions. Therefore, Action B7 (Recommendations for improvement of the CF in footwear), which consisted in searching alternative materials and processes that allow the CF to be reduced, was very much related to Action B6, as well previous actions (B2 and B3). Deliverable B6 titled “1st pilot application of the tool at European footwear companies” was prepared and submitted in a previous report (PR). In addition, Deliverable B7 titled “Carbon footprint improvements in footwear” was prepared and submitted in a previous report (PR) and the final Deliverable was prepared at the end of the project.

One year after footwear companies had received their CF reports, Action C1 (2nd pilot application to different footwear styles produced in the EU) started, which aimed to obtain a 2nd estimation of the CF in a range of different footwear styles (same styles as those evaluated in Action B6). Therefore, this action was carried out after the companies had been informed about mitigating measures. During the 2nd phase a new version of the CO2shoe tool was used (containing alternative materials and processes with regard to the original version). Deliverable C1 titled “2nd pilot application of the tool at European footwear” was prepared.
To conclude the CF study, **Action C2 (Comparative study between the 1st and the 2nd pilot application)** was developed. The objective of this action was to provide information about the improvements achieved by the footwear companies with regard to the CF calculated in actions B6 (1st pilot phase) & C1 (2nd pilot phase). The results obtained were summarised in Deliverable C2 titled “Comparative report between the pilot applications”.

Furthermore, in relation to Action C3 (**Socio-economic impact assessment**), the 1st questionnaires to assess the companies’ knowledge of the CF were prepared and filled in by European footwear companies in the 1st six months of the project. The data obtained were processed and submitted in a previous report (IR) in the Deliverable titled “Report about the results of the questionnaires”. Subsequently, at the end of the project, an updated version of the questionnaires was circulated among the European footwear companies. The results obtained were processed and they were summarised in the final Deliverable C3.

Concerning communication and dissemination actions (**Actions D1-D3**), notice boards were prepared and hung in each partner’s premises. The CO2Shoe project website ([http://www.co2shoe.eu](http://www.co2shoe.eu)) was launched in the first 6 months of the project and it is currently available in all partner’s languages. It contains the project newsletters launched as well as a photo gallery. The project’s corporate image was created and different versions of leaflets, posters, etc. were developed to be used as dissemination materials in different events (fairs, seminars, conferences, congress, etc.). Several articles were published in specialised journals and magazines. The video of the project was developed in English, Spanish, Italian, Polish, Portuguese and French. Finally, the Layman’s Report was also prepared in English, Spanish, Italian, Polish and Portuguese. The video and the Layman’s Report are widely displayed in the project web page.

With reference to project **Management actions (Action E1)**, all partners were involved in general management tasks (meetings, reporting, budget control, etc.) to ensure smooth coordination. Every scheduled meeting (6) was held to address technical and management issues about the project. In addition, INESCOP received 4 visits of the LIFE external monitoring team and all project reports initially scheduled (3) were submitted. Table 01 summarises the main management issues addressed throughout the project execution.

With regard to **Networking activities with other projects (Action E2)**, INESCOP took advantage of its participation in different events to establish relationships with other projects and companies whose activities are related to the CO2Shoe project.

**Action E3** focused on the preparation of the **After-LIFE Communication plan** in order to ensure the dissemination of the project results after the end of the project. Deliverable E3 titled “**After-LIFE Communication plan**” was prepared.

Finally, with regard to project financial issues, the budget has been executed close to 105%, with some non-significant deviations which did not affect the optimal execution of the project.

Project expenses declared by associated beneficiaries were monitored on a regular basis during the whole duration of the project and, when the consolidated and the final financial reports of Coordinating beneficiary and associated beneficiaries were completed, an independent **Financial Audit (Action E4)** was carried out on the project. Furthermore, the associated beneficiaries have also provided INESCOP with an audit report on the project costs declared in their respective final financial report issued by an independent auditor from their respective countries of origin (taking into account compliance with country-specific financial systems and regulations).
<table>
<thead>
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<th>Date</th>
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</tr>
<tr>
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<td>Jun’14</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; project report (Inception Report)</td>
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<td>Apr’15</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; project meeting. IPS (Cracow - Poland)</td>
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<td>Jun’15</td>
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<tr>
<td>Nov’17</td>
<td>4&lt;sup&gt;th&lt;/sup&gt; project report (Final Report)</td>
</tr>
</tbody>
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*Table 01. CO2Shoe project important management reports, meetings, etc.*
3. Introduction

**Background:**

In general, the environmental impact associated to activities within the footwear industry is very low. However, faced with the large production of footwear at a global level, 23 billion pairs of footwear in 2015 (Source: World Footwear. Yearbook 2016), the associated environmental impacts take on a significant dimension that needs to be assessed with the aim of establishing measures to improve the situation.

When it comes to managing the environmental impact of a product or an activity, it is important to rely on indicators that allow the quantification of the impact, in that this will make it possible to assess the performance over time. Although different environmental management tools are currently being employed to evaluate the environmental performance of products, e.g. footwear, currently the CF is becoming one of the most popular tools.

The CF can be defined as a simplified LCA in which only the impact category of climate change is taken into consideration. Therefore, it is an environmental indicator that quantifies the total set of GHG emissions caused by a product throughout its life cycle, from raw materials extraction till the product’s end of life.

**Problem:**

Although there are many tools available for CF calculation, most of them are generic tools that cannot be applied to specific products, such as footwear.

**Solution – Main objective of the project:**

To develop a specific CF calculation tool (CO2Shoe tool) for the footwear sector to quantify the GHG emissions, measured as kg CO$_2$e, produced by each pair of shoes.

**Expected results and environmental benefits:**

- Application of the CO2Shoe tool to 36 footwear styles produced by EU member states.
- Identification of solutions addressed to reduce GHG emissions that can be applied in the footwear industry.
- Reduction of GHG emissions released into the atmosphere by the footwear styles evaluated.
- Promotion of the CO2Shoe tool within the European area.

**Expected longer term results**

The use of the CO2Shoe tool in the European footwear sector will lead to improve the environmental impact of footwear manufacture through the reduction of GHG emissions. This action will help achieve the EU member states’ set goals for 2020 (20-20-20), which implies the reduction of GHG emissions by 20% below 1990 levels, with a further reduction to 80-95% by 2050.
4. Administrative part

4.1 Description of the management system

The CO2Shoe project consortium includes 6 partners from 5 different EU countries:
- Asociación de Investigación para la Industria del Calzado y Conexas (INESCOP) - Spain
- Centro Tecnológico do Calçado de Portugal (CTCP) - Portugal
- Instytut Przemysłu Skórzanego, Oddział w Krakowie (IPS) - Poland
- C.G.S. di Coluccia Michele & C. s.a.s (CGS) - Italy
- Confédération Européenne de l’Industrie de la Chaussure (CEC) - Belgium
- Federación de Industrial del Calzado Español (FICE) - Spain

All of them acting according to the LIFE Common Provisions (2012) and the proposal approved by the EC, as well as under the provisions of the Partnership Agreement. This document was provided to the Commission as Annex 6.1 in the IR delivered in June 2014.

As shown in Figure 01 the project consortium is composed of:
- A group of footwear technical expert organisations from 4 EU member countries: INESCOP (Spain), CGS (Italy), CTCP (Portugal) and IPS (Poland).
- CEC and FICE. They are mainly responsible for carrying out the long range dissemination of the project within the EU.

INESCOP is an independent organisation of scientific-technical services aimed at companies in the footwear sector and related industries like the tanning sector. INESCOP has been working for over 40 years on meeting the needs of the industries in these sectors, with regards
to the carrying out of tests, quality control, studies of materials, the development and implementation of new technologies, training, information and documentation, environmental issues, industrial design, fashion and applied research. Specifically, the Environment Department at INESCOP develops different activities within the environmental field offering its services with the aim to provide a comprehensive solution to companies in the footwear sector and similar sectors: Environmental Management Systems, Clean Tanning Technologies, atmospheric and noise emissions, eco-labelling, wastewater, industrial waste and training for the companies. In addition, INESCOP has experience in the research and development of new techniques aimed at reducing the environmental impact of activities carried out within the footwear sector and related industries.

**CTCP** is a non profit private organisation that serves a range of consumer product industries — footwear, leather, leather goods, accessories, safety products, rubber and plastics, footwear machinery, sectoral software, polymers. Today more than 400 private companies are members of CTCP. CTCP provides testing, consultancy, training and applied research services to members and other clients including: physical and chemical testing of raw materials and final products; chemical analysis of water, air, waste; product certification; CE marking; fitting and comfort analysis; test methods and standards development; environment and safety R&D and consulting; production and manufacturing consulting; quality certification schemes (ISO 9000, ISO 14000 & ISO 17000); training services and professional expertise; sectoral studies; software development; research and industrial development (materials, products, systems and environment R&D); information and communication services; and business intelligence.

**IPS** is a public body aimed at supporting and assisting entrepreneurs from the light industry to enhance their effectiveness and help to protect their competitive position. Increasing “environmental” awareness and more and more strict “pro-environmental” legislation, ecology is one of the most important aspects of their activity at the moment. This activity is led on several levels. The first level is a R&D activity in the field of new, eco-friendly technologies. In the last 10 years, over 15 new technologies have been developed and implemented in manufacturing processes. It includes both solutions to reduce harmful effects of various manufacturing processes and new methods for recycling of waste generated by light industry. The second level of their “pro-environmental” activity includes a promotion of eco-friendly solutions and consultancy services.

**CGS** is a private commercial body with twenty-year expertise in the fields of Applied Research, Industrial Consultancy and Civil Engineering. Since its establishment in 1990, CGS’ working strategy has consisted in accomplishing interventions to reduce the traditional gap between research and industry. In order to achieve this, CGS has followed three different lines: Technical, Financial and Management. In short, the activity of CGS deals with the following three main operative fields: Scientific Research, Industrial Services and Consulting and Design and Implementation of turnkey plants and civil works. CGS has carried out project management and scientific research activities in various projects financed by the European Union.

**CEC** is the official body watching over the interests of the European Footwear Industry. CEC not only represents the national footwear federations within the European Union but also follows the activities of the footwear industry in Central and Eastern Europe countries. Currently, the European Confederation of the Footwear Industry gathers together 15 footwear federations and 13,500 footwear manufacturers from the EU. Besides, CEC also represents three observer federations.

**FICE** is a business organisation that represents the overall interests of the footwear sector, both at regional and national level as well as internationally since it was set up in 1977. It
comprises 11 associations and gathers together more than 500 companies representing up to 90% of production and exports in the sector across Spain. FICE’s work is aimed at fostering business competitiveness, boosting companies' strengths and guaranteeing a future for the sector through a variety of strategies, which include internationalisation, promotion, training and information, marketing and distribution, quality, brand support, environmental issues and new technologies. It is worth mentioning that FICE also encourages commitment to innovation.

INESCOP is acting as the coordinator, carrying out the global management of the project through INESCOP’s specialised technical staff. Management activities carried out include preparation of the Partnership Agreement (submitted with the Inception Report), management of project coordination meetings, preparation of materials for project meetings: agenda, minutes, technical and management presentations, management of financial issues of the project: timesheets, invoices, budget control, etc., giving assistance and training to the project partners for financial and technical issues, monitoring of follow-up indicators, continuous reports about project progress to LIFE external monitoring team, preparation of documents to be submitted to the EC and direct contact with the EC.

During the project period, the contact between the partners was intensive through different communication means like emails, phone conversations and a specific meeting.

Each partner was in contact with footwear companies in their respective countries. It is important to highlight that these contacts are essential for the adequate progress of the project.

Figure 02 shows the scheduled and final timetable for the different actions. In general, actions made adequate progress according to the schedule envisaged in the proposal.

It is only worth to mention delays in some actions (A1, B2, B3, B4, B5, B6 and C3) with regard to the scheduled plan – for example, in Action B2 (Data collection for the CF calculation tool) due to the high work load implied by this action, or in Actions B6 and C1 (1st and 2nd pilot applications) due to delays in previous actions. As a consequence, the CO2shoe project finished 2 months later (May 2017) than the scheduled date (March 2017). It is to be noted that these delays in no way affected the ultimate objective of the project.

4.2 Evaluation of the management system

The project management process was realised following the indications of the Common Provisions of the LIFE Programme. The details of the partnership agreement were explained at the start of the project during the kick-off meeting, and the implementation of the partnership agreement and the progress of the project were checked in progress meetings throughout the life of the project. 6 progress meetings were held during the project with the objective of evaluating and checking project objectives and management system.

Concerning the Partnership Agreement, it is to be noted that an addendum was made between the coordinating beneficiary INESCOP and the project associated beneficiary FICE, in Elda on 7th March 2016. It was submitted to the EC with the PR.

INESCOP, as the coordinator, was the communication intermediary between the project beneficiaries and the Commission, both directly (when reports were delivered) and through the designated LIFE monitoring team. Thus, the project progress was reported to the LIFE monitoring team on a regular basis. Furthermore, 4 monitoring visits were received by INESCOP (Mar’14, Jun’15, Jun’16 and Jun’17).

Table 01 (page 7) shows more details about project reports and LIFE monitoring team visits.
5. Technical part

5.1. Technical progress, per task

As a general overview of the project, table 02 shows the progress achieved in the project tasks from the beginning (1st October 2013) until the end of the project (31st May 2017).

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<tr>
<td>Action B1 &quot;Establishment of the system’s scope and identification of gas emissions&quot;</td>
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<tr>
<td>Action B2 &quot;Data collection for the carbon footprint calculation tool&quot;</td>
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<tr>
<td>Action B3 &quot;Development of a carbon footprint calculation tool specific for footwear&quot;</td>
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<tr>
<td>Action B4 &quot;Pilot Test of the carbon footprint calculation tool on a footwear style&quot;</td>
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<td>Action B5 &quot;Verification of the tool by an external company&quot;</td>
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<td>Action B6 &quot;First pilot application to different footwear styles produced in the EU&quot;</td>
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<tr>
<td>Action B7 &quot;Recommendations for improvement of the CF in footwear&quot;</td>
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<td>Action C1 &quot;Second pilot application to different footwear styles produced in the EU&quot;</td>
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<td>Action C2 &quot;Comparative study between the first and the second pilot application&quot;</td>
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<tr>
<td>Action C3 &quot;Socio-economic impact assessment&quot;</td>
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<tr>
<td>Action D1 &quot;Web page, notice boards, leaflets, posters and other materials&quot;</td>
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<tr>
<td>Action D2 &quot;Production of a video on the topic of the carbon footprint of footwear&quot;</td>
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<td>Action D3 &quot;Seminars, international dissemination, Layman’s report&quot;</td>
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<td>Action E4 &quot;Audit&quot;</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 02. General progress of the project

5.1.1. Action A1: Assessment of the available resources for the design of the carbon footprint calculation tool

Summary of the action:
- **Objective:** to select a methodology for the quantification of the CF of a product (footwear).
- **Expected results (proposal):** a methodology from which the CF calculation tool is conceived.
- **Scheduled timetable:** from October 2013 to November 2013.
- **Implementation timetable:** from October 2013 to May 2014.
- **Status:** completed.
- **Comments:** due to technical reasons this action and Action B1 (Establishment of the system’s scope for footwear and identification of GHG emissions) were closely related because in order to develop both actions it was necessary to review many sources of information (LCA and CF standards, PCRs, EPDs, LCA software tools, etc.). Therefore, although Action A1 was satisfactorily accomplished there was a slight delay with regard the original plan.
- **Related actions:** B1, B2 & B3.

Description of the Action:

The CF is considered as one of the main environmental indicators to assess the impact of products. Previously there was a broad spectrum of methodologies in use and under development for calculating the CFPs, which accounted for the large differences observed between the results obtained according to the methodology employed.

As a consequence, the results obtained differed depending on the methodology applied and there were difficulties in the application of the existing methodologies in specific sectors,
such as footwear, that often include a wide range of materials, components or stages throughout their manufacturing process and during the product life cycle.

Therefore, we identified and selected the main methodologies available to be studied in detail to select the methodology that best suited the footwear sector.

As CF is a simplified version of the LCA studies, where only one impact category (Climate Change) is considered. First of all, the main LCA standards available were identified, selected and studied:


Secondly the main CF standards available were identified, selected and studied:


Finally, the CO2Shoe project selected ISO/TS 14067:2013 (see Figure 03) as a reference standard to develop the CO2Shoe tool and, therefore, to make CFP quantifications. The main technical reasons to select this standard were:

- It is an international standard.
- It is a specific standard for products (currently there are many standards for products and organisations).
- It is a standard for quantification and communication of the CFP.

Note: although the communication is outside the scope of the CO2Shoe project objectives, this is a very interesting option for footwear manufacturers.
Subsequently, in order to improve the knowledge of ISO/TS 14067:2013, in December 2013 a specific training seminar about this standard (see Figure 04) was held in Madrid.

Furthermore, a study of the main available LCA software tools and databases associated was conducted. These materials were necessary to obtain the EFs of each process and material incorporated into the CO2Shoe tool.

Note: an EF is a coefficient that converts activity data into GHG emissions (kg CO$_2$e/process unit).

The LCA software tools studied were:
- SimaPro.
- Umberto.
- GaBi.

Finally, the CO2Shoe project decided to work with SimaPro software (and the associated Ecoinvent database). Thus, a SimaPro license was purchased in 2014.

In addition, a specific training seminar about SimaPro software was held in INESCOP premises in February 2014 (see Figure 05).
It is to be noted that SimaPro software was used throughout all project execution to update the EFs used in the CO2Shoe tool developed (related to Actions B2 and B3). Therefore, the license was renewed each year (2015, 2016 and 2017) to update the software and its associated databases. Figure 06 shows a screenshot of SimaPro software.

![Figure 06. SimaPro software screenshot](image)
5.1.2. Action B1: Establishment of the system’s scope for footwear and identification of GHG emissions

Summary of the action:

- **Objective**: to establish the scope of the footwear system: objectives, life cycle stages, system boundaries, functional unit, cut-off rules GHG considered, etc.
- **Expected results (proposal)**: a report describing the scope of the system, including the sources of GHG emissions to be considered for the development of the calculation tool.
- **Scheduled timetable**: from December 2013 to March 2014.
- **Implementation timetable**: from October 2013 to May 2017 (end of the project).
- **Status**: completed.
- **Comments**: LCA and the CF have an iterative approach. This applies to all phases of the LCA, including the goal and scope definition. Therefore, the definition of the goal and scope of the system under study needed a continuous reassessment. In addition, documents used to establish the system scope (Standards, PCRs, etc.) are living documents (updated continuously). As a consequence, the implementation of this action was extended until the end of the project. In parallel, Deliverable B1 associated to this action was a living document subject to changes as experience is gained in the system under study and it was submitted together with every CO2Shoe project report.
- **Related actions**: A1, B2, B3, B6, B7, C1 & C2.
- **Outline the perspectives for continuing the action after the end of the project**: to review documents (Standards, PCRs, etc.) for the continuous reassessment of the system’s scope.

Description of the Action:

As mentioned above, Action A1 and Action B1 were closely related. Therefore, all documentation identified and studied in Action A1 was used to carry out this action. More specifically, the main documents followed to establish the system scope were:


As ISO/TS 14067:2013 states that “where relevant PCR or CFP-PCR exists, they shall be adopted”, the CO2Shoe had to identify and study the PCRs related to footwear production.

Note: a PCR is a guide for the rules that set how environmental product claims are made. These rules are called PCRs and are necessary for claims based on a quantitative life cycle assessment, such as CFPs, water footprints, and EPDs.

Although many PCRs were identified and studied, finally the main PCRs followed to establish the system scope were:

- **PRODUCT GROUP: UN CPC 2933 LEATHER FOOTWEAR. 2013:15. VERSION 1.01. VALID UNTIL: 2016-09-16. Updated in 2017-07-27 to version 2.0 (valid until 2021-07-27).
Among all, the PCR LEATHER FOOTWEAR (see Figure 06) was selected as a primary reference to establish the system scope.

It is important to note that these documents are living documents so it was necessary to review the new versions launched to detect any changes and, therefore, to review the system’s scope continuously (iterative technique of the LCA studies). For example, the first version of the PCR Leather footwear identified, studied and followed was version 1.0. This document was updated in February 2014 to version 1.01 (valid until September 2016). Subsequently the document was updated in July 2017 to version 2.0 (valid until July 2021). Therefore it was necessary to review this PCR 3 times throughout the project execution. Another example was the PCR Leather. The first document used to obtain the EFs of tanning processes was a draft dated June 2015. Finally, this document was approved in March 2017, and is currently I force.

Figures 07 and 08 show the 1st and 2nd flow chart of the system under study. This is an example of change related to the approach of the study (finally cradle to grave instead of cradle to gate approach) to comply with the mandatory requirements established in ISO/TS 14067:2013 standard. The main reason to change the approach was to be eligible for CFP labelling, even though this was out of the scope of the project, but it may be an interesting option for companies (marketing).
It was also necessary to make another change related to the functional unit. This means that the primary packaging of a pair of shoes had to be included in the functional unit in order to meet the requirements of PCR “Leather footwear”.

During this action we had the external assistance of an LCA external expert (BSI). Actually this external assistance was used in this action and in related Actions B2, B3, B4 & B5.
5.1.3. Action B2: Data collection for the development of the carbon footprint calculation tool

**Summary of the action:**
- **Objective:** to obtain the necessary information to build the CF calculation tool for footwear (mainly EFs).
- **Expected results:** a report that includes all the EFs incorporated into the CO2Shoe tool developed.
- **Scheduled timetable:** from February 2014 to June 2014.
- **Implementation timetable:** from June 2014 to May 2017 (end of the project).
- **Status:** completed.
- **Comments:** since all the information gathered in this action was used to build the CF calculation tool (Action B3), these 2 actions (B2 and B3) were closely related and were carried out at the same time. There was a slight delay in these two actions due to the high work load implied by them. In addition, Action B2 was closely related to Action B7 (Recommendations for improvement of the carbon footprint) due to the need to search EFs associated to alternative materials. Additionally, due to the need to update the CO2Shoe tool continuously, these actions were extended until the end of the project. In parallel, Deliverable B2 associated to this action was a living document and it was submitted together with every CO2Shoe project report.
- **Related actions:** B1, B3, B6, B7, C1 & C2.
- **Outline the perspectives for continuing the action after the end of the project:** continuous update of EFs identified.

**Description of the Action:**
In short, the main task of this action was to obtain the EFs needed to be included in the CO2Shoe tool. Therefore, this action was closely related to Action B3 (Development of a CF calculation tool specific for footwear).

An EF is a coefficient that converts activity data (inventory data) into GHG emissions (kg CO\(_2\)e/process unit). To calculate the CF of each process, one only has to multiply the inventory data of the process by the related EF. Figure 09 shows an example to calculate the CF of energy consumption.

**Example:** energy consumption

- **Inventory data:** 50,000 kWh/year
- **Inventory data:** 10,000 pair/year
- **Emission factor:** 0.479 kg CO\(_2\)e/kWh

\[
\frac{50,000 \text{ kWh/year}}{10,000 \text{ pair/year}} \times 0.479 \text{ kg CO}_2\text{e/kWh} = 2.395 \text{ kg CO}_2\text{e/pair}
\]

*Figure 09. Carbon footprint calculation example*

The difficulty encountered to develop this action was that, although there are many public sources of EFs, these factors are associated to general processes, other than specific footwear processes. Therefore, the main source used to obtain EF of the main processes, materials, etc. that can be found in the footwear life cycle was Ecoinvent database, using a specific LCA tool (SimaPro software). Figure 10 shows an EF obtained using SimaPro software.
It is to be noted that there are no data in Ecoinvent database associated with some specific materials and processes, as for instance, leather production. Therefore, these processes had to be created using existing processes in SimaPro software to obtain the relevant EFs, with the associated unforeseen work load it implied. Figure 11 shows the Cr tanned leather (bovine hides) process created in SimaPro to obtain the related EF.

This action was closely related to Action B7 (Recommendations for improvement of the CF) because, once the tool was ready to carry out Action B6 (1st pilot application), it was necessary to search alternative materials and processes to the conventional ones that could imply an improvement (lower CF). To carry out this search, apart from SimaPro software, many sources had to be reviewed (alternative databases, EPDs, other European Projects, etc.).
Figures 12 and 13 shows examples of alternative sources used to obtain EFs associated to added materials and processes.

![Radifloor EPD](image1)

**Figure 12. Radifloor EPD - Source used to obtain Nylon 6 raw white yarn EF**

On the other hand, as EFs are continuously updated, Action B2 and related actions (B1, B3, B7) were extended until the end of the project due to the need to update the CO2Shoe tool developed in Action B3 to be used in Action C1 (2nd pilot application).

With regard to the footwear sector’s activity data, the available literature was studied (secondary data) to obtain validated references to establish some of the study assumptions.

![Green Footprint Project](image2)

**Figure 13. LIFE Green Footprint project - Source used to obtain Bio-Polyurethane EF**

As mentioned in Action B1, in this action BSI provided technical assistance through an external LCA expert.
5.1.4. Action B3: Development of a carbon footprint tool specific for footwear

Summary of the action:

- **Objective**: to develop a specific carbon footprint calculation tool (as a spreadsheet) for the footwear sector to quantify the GHG emissions of a pair of shoes (the core of the project).
- **Expected results (proposal)**: tool (spreadsheet) for the calculation of the carbon footprint of a pair of shoes.
- **Scheduled timetable**: from June 2014 to October 2014.
- **Implementation timetable**: from June 2014 to May 2017 (end of the project).
- **Status**: completed.
- **Comments**: due to the need to update the CO2Shoe tool continuously, this action was extended until the end of the project. In parallel, Deliverable B3 associated to this action was a living document and it was submitted together with every CO2Shoe project report. Although there was a slight delay with regard to the original plan the CO2Shoe tool was ready to be used in Action B6 (1st pilot application).
- **Related actions**: B1, B2, B6, B7, C1 & C2.
- **Outline the perspectives for continuing the action after the end of the project**: continuous update of the CO2Shoe tool (add alternative processes and EF update).

Description of the action

The CO2Shoe tool is an IT application, developed in the form of a spreadsheet (see figure 14) that allows the calculation of the specific CF of footwear. The CFP calculations made with the CO2Shoe tool meet the GHG quantification requirements under ISO/TS 14067:2013.

![Figure 14. Sheet nº1 of the latest CO2Shoe tool version (No. 5)](image)

Prior to the development of the CO2Shoe tool, a questionnaire was prepared in the form of a spreadsheet to collect inventory data (LCI), i.e. all system inputs and outputs. The work related to this task, which is in turn associated with Actions B4 (pilot test), B6 (1st pilot application) and C1 (2nd pilot test) had to start earlier than planned in order to ensure that the
tool and the questionnaire followed the same format to facilitate the transfer of inventory data to the tool.

The LCI was prepared by INESCOP in English (see figure 15) so that the partners could use it. Each RTD centre was in charge of translating it into their respective language (Spanish, Italian, Portuguese and Polish).

Figure 15. Sheet nº1 of the CO2Shoe LCI (version No. 2)

In addition, in order to facilitate the completion of the LCI by footwear enterprises, a LCI user’s manual was prepared (see figure 16). This document explains the steps to be followed in order to fill in the questionnaire correctly.
Finally, in order to meet the tool verification requirements from the verification entity (Action B5), a CO2Shoe tool user’s manual was prepared (see figure 17).

The tool developed includes the EFs of the main processes, materials, etc. that can be found in the footwear life cycle. Therefore, on entering the inventory data (LCI) in the tool, the CF calculation are automatically obtained, expressed in kg CO₂e.

Moreover, as mentioned in previous actions, the CF tool was continuously updated with the data collected in Action B2, so the new versions of the tool developed include also the updated EFs and the new processes and materials that were identified in Action B7. Therefore, this action was extended until the end of the project. It is to be noted that the work load implied in this task is huge because throughout the project execution several SimaPro software updates and several Ecoinvent database updates were made (see figure 18). Table 04 summarises all updates made throughout the project execution. Therefore, as mentioned in Action A1, the SimaPro license had to be renewed each year (2015, 2016 and 2017) to update the software and its associated databases.
Documentation of changes implemented in ecoinvent database 3.2

(2015.11.30)

Figure 18. Cover page of Ecoinvent database changes in V3.2

<table>
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</thead>
<tbody>
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</tr>
<tr>
<td>Jul’17</td>
<td>SimaPro software version 8.4</td>
</tr>
</tbody>
</table>

Table 04. Summary of SimaPro updates made

As mentioned in Action B1, throughout this action BSI provided technical assistance through an external LCA expert.
5.1.5. **Action B4: Pilot test of the carbon footprint calculation tool on a footwear style**

5.1.6. **Action B5: Verification of the tool by an external company**

Note: due to technical reasons, Action B4 (pilot test) and Action B5 (tool validation) were carried out at the same time.

**Summary of the action:**

- **Objective:** the final objective of these 2 actions was to make improvements in the CO2Shoe tool:
  - Pilot test: 1st tool improvement
  - Verification: 2nd tool improvement
- **Expected results (proposal):** calculation of the CF of a shoe style produced by a Spanish footwear company and its verification.
- **Scheduled timetable:** from November 2014 to December 2014 (B4) and from January 2015 to February 2015 (B5).
- **Implementation timetable:** from December 2014 to June 2015.
- **Status:** completed.
- **Comments:** once again, as a result of the delays in previous actions the work related to these two actions was also delayed with respect to the initial plan. However, these delays in no way affected the ultimate objective of the project.
- **Related actions:** B4 & B5.

**Description of the Action:**

The objective of the pilot test, that includes CFP verification, was to detect possible faults in the CO2Shoe calculation tool as well as to know first-hand the main limitations and problems that footwear businesses may face during the LCI phase. With regard to the tool validation, the objective was to ensure that the methodology used, data and sources, as well as the calculations were made in a logical, coherent and clear way. And the final objective of these 2 actions was **to make improvements in the CO2Shoe tool** developed in Action B3.

The work related to these 2 actions started by making contacts with some external verification entities (AENOR, SGS, Bureau Veritas, BSI) to select the final verification entity. After having analysed the offers received, AENOR was finally selected as the verification entity due to technical reasons.

As a result of these contacts, slight changes were made in both actions to improve their development. First of all, it is more correct to refer to “tool validation” and “CFP verification” instead of “tool verification” as mentioned in the project proposal. Furthermore, the project team was advised to carry out Actions B4 and B5 in parallel, since whenever CFP verification is carried out, this requires the validation of the calculation tool used.

Secondly, the company for the pilot experience was selected. The company selected was **División de Anatómicos, S. L. (Dian)**, a Spanish company. The main reasons to select Dian were its proximity to INESCOP (situated less than 10 km away) and the fact that Dian is a company that is really aware of environmental issues. In fact, Dian is one of the few footwear companies awarded with the EU Ecolabel on some of its footwear styles.

As mentioned in Action B3, before starting the pilot action with Dian, INESCOP prepared the inventory table (LCI), developed as a spreadsheet inventory file and a guidelines document to obtain input and output data from companies relative to the footwear style evaluated.
After this, INESCOP carried out an informative Workshop in DIAN premises to provide general information about the CF concept as well as about the operation of the LCI.

After Dian had selected a footwear style to calculate the CF (see figure 19) the footwear company, in collaboration with INESCOP, gathered all the necessary information to complete the LCI related to the style selected. At this point, the company had difficulties in getting information from some of their suppliers due to confidentiality issues. To solve this, where primary data were not available, secondary data were used, as described in the questionnaire manual.

![Figure 19. Style MARSELLA in black colour](image)

Once the LCI had been filled, INESCOP was in charge of transferring all data to the CO2Shoe tool to calculate the CFP of the MARSELLA footwear style. As mentioned above, the tool automatically applies the relevant EF.

Next, the CFP study report was prepared (draft version), as required in ISO/TS 14067:2013, to inform the company about their CFP (confidential report). This report required, among others, a sensitivity analysis, a review of system boundaries based on the inventory data of the style analysed, and a study of the results obtained.

At this point, AENOR started with the tool validation and CFP verification. First of all, **phase I previous validation** took place, which consisted of a preliminary analysis of the tool to evaluate its correct operation. The work focused on:

- Evaluation of the tool according to the requirements of the reference standard ISO/TS 14067:2013.
- Evaluation of the inclusion of the different life cycle stages of the functional unit (a pair of shoes with its primary packaging) in the tool.
- Evaluation of the adaptation of the tool to the PCR selected (Leather footwear).
- Revision of EFs included in the calculation tool, as well as their sources.
- Revision of calculation formulas and their suitability according to the different product life cycle stages.
- Evaluation of available data and information about GHG and the product to be verified.
- Revision the “CO2Shoe tool user’s manual – Rev. 0” to determine its compliance with the requirements established in ISO/TS 14067:2013.
An AENOR technician visited INESCOP on 4th March 2015 to check the tool on site. As a result of the work carried out, AENOR sent INESCOP the “Report of phase I previous validation” on 9th March 2015. The report highlighted two issues that were subsequently corrected.

The next step was the verification of the calculated CF of a product with the aim of getting an independent assurance that the declaration made by INESCOP (CFP report) is complete (accurate, consistent, transparent and without marked divergences) and in accordance with the requirements of the reference standard used. The verification process was split into 2 parts, although the CFP report (draft version) was previously prepared.

Then the auditing team revised the first version of the CFP report and visited the footwear company (DIAN) to request evidences and records of the inventory data used. The company was visited on 30th March 2015 by two AENOR technicians and 2 INESCOP technicians. During the visit, the work focused on:

- Visit to production facilities.
- Evaluation of data and information available (invoices, purchase orders, etc.).
- Checking the information available against verification criteria.
- Revision of evidences and calculations for each life cycle stage.

The second part of the process consisted of a second visit to INESCOP by AENOR technicians to complete the revision of the EFs used in the tool and the general aspects of the CFP report.

As a result of this, AENOR sent INESCOP the “Report of phase I previous verification: document revision and visit to the facilities”, on 1st April 2015. The report mentioned 5 non-conformities, 3 clarifications and 1 observation, which were all addressed subsequently.

Explanatory notes:

- Clarification (CL): deviation relative to data used.

On 21st April 2015, INESCOP sent AENOR the amended CFP report to address the shortcomings detected.

To complete the process, on 11th May 2015, an INESCOP technician visited AENOR offices in Madrid to carry out the final validation of the CO2Shoe tool and ensure that the NCs detected in the verification report had been solved.

Finally, in June 2015, AENOR sent INESCOP the final audit reports as well as the certificate of the CFP calculated (see figure 20).
Figure 20. CFP certificate issued by AENOR

To sum up, the CO2Shoe tool was validated and the calculated CFP was verified.

It is worth mentioning the significance of the assessment received from the LCA expert (BSI) and the verification entity (AENOR) so that these actions could be adequately developed.
5.1.7. Action B6: 1st pilot application to different footwear styles produced in the EU

Summary of the action:
- **Objective:** to obtain a 1st estimation of the GHG emissions in a range of different footwear styles.
- **Expected results (proposal):** 36 CF calculations on several footwear styles produced in Spain, Italy, Portugal and Poland.
- **Scheduled timetable:** from March 2015 to August 2015.
- **Implementation timetable:** from April 2015 to March 2016.
- **Status:** completed.
- **Comments:** the work related to this action was delayed with respect to the initial plan. However, this delay in no way affected the ultimate objective of the project.
- **Related actions:** B1, B2, B3, B7, C1 & C2.

Description of the Action:

The first part of the project ended with the completion of Actions B4 & B5, and the second part began with Action B6, which aims to obtain a 1st estimation of the CF in 36 different footwear styles. The results obtained made it possible to take actions (Action B7) to reduce said value at a later stage (Action C1).

With the aim of obtaining a first estimation of the CF in footwear, 9 footwear styles were evaluated in each of the participating countries (Spain, Italy, Poland and Portugal) so 36 CF calculations were carried out in this pilot application.

The work of this action started with the 3rd coordination meeting that was held in Poland, on 28th April 2015 (see figure 21). In this meeting INESCOP showed the RTD centres the questionnaire (LCI) developed previously as well as the LCI user's manual and explained the methodology for completing the inventory data. In addition, during the coordination meeting INESCOP explained some issues to be taken into account during this action:

- The footwear styles evaluated must remain in time because the CF quantification (before and after the recommendations) are based on the same style.
- It is important to visit the companies and to develop training workshops for companies to explain the basic concepts of the CF and the LCI (with the use of the guidelines document developed).
- A base period must be established, which will be taken as a reference for the calculations to be carried out.
- 9 CF calculations per RTD Centre (not limited to 3 companies per Centre).

Note: this is a change with regard the proposal that established that within each company 3 footwear styles were selected (12 footwear companies in total).

Initially each RTD centre explained the participating companies the basic concept of the CF and how to complete the LCI with its inputs/outputs data.

As the LCI had been developed in English in the previous action, each RTD Centre was in charge of translating it into their respective language to be sent to the footwear companies. After the LCIs had been filled in by companies, for which the RTD Centres assisted them, each RTD Centre translated each questionnaire into English to be reported to INESCOP. In total, 36 LCI were filled in, one per evaluated style. Then INESCOP used the CO2Shoe tool to calculate the related CF each footwear style and sent each RTD Centre the related reports (36 CF reports in total, one per evaluated style). Finally each footwear company received a
report, through the corresponding RTD Centre, with the CF results and with specific improvement opportunities identified to be implemented in Action C1 (2nd pilot application).

![3rd coordination meeting – Technical part](image)

Figure 21. 3rd CO2Shoe project progress meeting (Poland, Apr’15)

Figure 22 shows a stand of the CO2Shoe project with some of the footwear styles evaluated.

![CO2Shoe project stand at INESCOP premises](image)

Figure 22. CO2Shoe project stand at INESCOP premises

Finally, a newsletter with a summary of the results obtained in this 1st pilot application was prepared and it is available in the CO2Shoe website (see figure 23).
RESULTS OBTAINED IN THE PILOT ACTION

A pilot action was conducted, in which 16 companies from 4 different countries (Spain, Italy, Poland and Portugal) participated. The carbon footprint of 36 footwear models was calculated.

The results obtained in this action showed carbon footprint values between 1.3 and 25.3 kg CO2eq, with an average of 10 kg CO2eq per pair of shoes (with its packaging).

The carbon footprint value varied according to the footwear style under study (women’s fashion, men’s, indoor, children’s or safety footwear), in that the design, materials and weight were quite different, as illustrated in the photographs below:

The following graph shows the average contribution of the most significant stages of the footwear life cycle.

![Figure 23. Results reported in Newsletter No. 2 of the CO2Shoe project](image)
5.1.8. Action B7: Recommendations for improvement of the carbon footprint in footwear

**Summary of the action:**
- **Objective:** to give suggestions for improvements in reducing the CF.
- **Expected results (proposal):** a detailed report in which the mitigating measures are established.
- **Scheduled timetable:** from July 2015 to October 2015.
- **Implementation timetable:** from July 2015 to May 2017 (end of the project).
- **Status:** completed.
- **Comments:** due to the need to search CF improvements, this action was extended until the end of the project. In parallel, Deliverable B7 associated to this action was a living document and it was submitted together with every CO2Shoe project report.
- **Related actions:** B1, B2, B3, B6, C1 & C2.
- **Outline the perspectives for continuing the action after the end of the project:** continuous search of processes and materials identified as CF improvement and related EFs.

**Description of the Action:**

The aim of Action B7 was to give suggestions for improvement in reducing the footwear styles’ CF, thus contributing to the reduction of GHG emissions.

Work within this action focused on the search of alternative processes and materials the EFs of which were lower than those of traditional processes and materials.

The mitigating measures focused on the selection of raw materials (obtained from renewable resources, recycled or biodegradable, reduction the quantity of materials, selection of nearer suppliers, etc.) and footwear assembly (efficient lighting systems, energy from renewable sources, etc). These measures were divided into two categories: general measures and specific measures.

This task was very difficult because, although there are some alternative “eco” materials, in general they are not available in CF databases and, therefore, it is impossible to know their EF. Therefore, as an alternative source we had to study a lot of related bibliography (alternative SimaPro databases, EPDs, other European Projects, etc.). Thus, this action was closely related to Action B2 (Data collection for the CF calculation tool). Therefore, this action was extended until the end of the project, like Actions B2 & B3.

In addition, Action B7 was very much related to previous Action B6 (1st pilot application) because the mitigating measures identified and proposed as CF reduction were associated to the CF results obtained in the pilot application. Below there is a list with the major “hot spot” identified:
- Energy consumption.
- Raw materials used in components.
- Packaging (cardboard box).
- Footwear end of life (landfill).
- Distribution of products (means of transport).
- Means of transport of components suppliers.
- Chemicals consumption.
To conclude the work associated to this action several RTD centre – footwear enterprise meetings were held to explain the CFP results obtained in Action B6 and the recommendations for improvement identified to reduce the evaluated styles’ CF (see figures 24 and 25).

*Figure 24. Workshop at Angel Infantes premises*

*Figure 25. Workshop at Skarpol premises*

The mitigating measures proposed had to help footwear companies improve their CF in Action C1 (2nd pilot application). However, it is to be noted that the later adoption of the recommendations for improvement by the footwear companies depended on their technical and financial possibilities.
5.1.9. Action C1: 2nd pilot application to different footwear styles produced in the EU

Summary of the action:

- Objective: to obtain a 2nd estimation of the GHG emissions in a range of different footwear styles to assess to which extent mitigating measures imply an improvement to the CF.
- Expected results (proposal): 36 CF calculations on several footwear styles produced in Spain, Italy, Portugal and Poland.
- Status: completed.
- Comments: the work related to this action was delayed with respect to the initial plan. However, this delay in no way affected the ultimate objective of the project.
- Related actions: B1, B2, B3, B6, B7 & C2.

Description of the action:

After the footwear companies had enough time (12 months) to implement the recommended mitigating measures to reduce the evaluated styles’ CF, the CF calculations were made on the same styles and in the same way as in the 1st pilot action (Action B6).

Work related to this action started with the update of the LCI developed previously in Action B3 (Development of CO2Shoe tool). This updating was necessary to add the new materials and processes incorporated into the CO2Shoe tool afterwards as CF improvements. As in Action B3, the LCI was prepared by INESCOP in English (see figure 26) so that the partners could use it. Each RTD Centre was in charge of translating it into their respective language (Spanish, Italian, Portuguese and Polish).

Again footwear companies filled in the LCI and each RTD Centre translated the LCIs into English to be reported to INESCOP. Then INESCOP used the latest CO2Shoe tool version to calculate the related CF each footwear style and sent each RTD Centre the related reports (36 CF reports in total, one per evaluated style). Finally each footwear company received a report, through each related RTD Centre, with the CF results and with specific improvement opportunities identified to be implemented.

In addition, a newsletter with a summary of the results obtained in this 2nd pilot application was prepared and it is available in the CO2Shoe website.

To conclude, below there is a list of comments received from footwear manufactures related to both pilot applications to be into account in the future:

- Difficulty to obtain all inventory data because some of them depend on third parties (suppliers & customers).
- Footwear manufacturers are very interested in the CFP label.
- Need to omit some company names and the suppliers & customers' names in inventory data (confidentiality).
- Difficulty to understand the section corresponding to transport in the input and output of the materials in the stage 3 of the questionnaire.
- Difficulty to identify the type of chemicals used in assembling.
- Footwear manufacturers have problems in assessing the amount of adhesives and solvents used per pair of shoes.
- Difficulty to implement the specific measures proposed.
Figure 26. Sheet no. 1 of the CO2Shoe LCI (version No. 4.1)
5.1.10. Action C2: Comparative study between the 1st and the 2nd pilot application

Summary of the action:
- Objective: to provide information about the improvement achieved by the companies with regard to the CF of footwear calculated in Actions B6 & C1.
- Implementation timetable: from January 2017 to May 2017 (end of the project).

Description of the Action:
The CO2Shoe project made 2 different pilot applications. In the 1st pilot application (Action B6) 36 footwear styles produced in EU companies (Spain, Portugal, Italy and Poland) were evaluated to calculate their CF.

Subsequently each footwear company received a report with the CF results as well as with specific improvement opportunities identified to reduce the CF.

Then companies had a base period (12 months) to implement some of the proposed mitigating measures to reduce the evaluated model CF.

Finally, with the objective of evaluating the CF improvement achieved by each footwear style, a 2nd pilot application (Action C1) was made to calculate the CF in the footwear models.

When the CF of the 36 footwear styles was calculated in the second application, there was a new version of the calculation tool different from the one used in the first application. This was due to the fact that the tool is being continuously updated as emission factors change over time. For this reason, and in order to know the real improvements achieved, leaving any alteration caused by the changes in tool versions aside, the carbon footprint calculations of the first pilot application were also made with the updated version (V4) of the tool.

Then the average results obtained in the two pilot applications with the same tool version (V4) were compared in order to know the real reduction achieved after the implementation of improvements in production processes. The CF reduction achieved was nearly 6%.

In a deeper analysis of the obtained results and discarding non comparable results and shoemodels, the obtained CF reduction is even larger, up to a 11.25%.
5.1.11. Action C3: Socio-economic impact assessment

Summary of the action:

- Objective: to assess the socio-economic impact of the project among footwear businesses.
- Scheduled time table:
- Implementation timetable:
  - 2nd phase: from October 2016 to March 2017
  - Comparative study: from April 2017 to May 2017 (end of the project).
- Status: completed.
- Comments: the work in the 1st phase was completed in the scheduled timetable; however, the 2nd phase started was slightly extended until the end of the project. The work in the 1st phase and the comparative study were extended until the end of the project.

Description of the action:

The objective of this action is to assess the socio-economic impact of the project among footwear businesses. This action is divided into two main phases. Both phases were satisfactorily completed and all task related to the period covered were carried out.

To develop the 1st phase, a questionnaire to assess footwear companies’ knowledge of the carbon footprint was prepared by INESCOP (Spanish and English versions). Subsequently, the questionnaire was distributed among all RTD centres involved in the project in order for them to translate it into their respective languages. The RTD centres circulated the questionnaire among the footwear companies in their respective countries to obtain 146 filled-in questionnaires. Finally, INESCOP processed the results obtained.

To develop the 2nd phase (October 2016) another questionnaire was prepared, which was filled in by 164 companies. The work was conducted by INESCOP in Spain, IPS- Institute of Leather Chemistry in Poland, C.G.S. di Coluccia Michele & C. in Italy, European Confederation of the Footwear Industry - CEC in Belgium and CTCP- Centro Tecnológico do Calçado in Portugal, from October 2016 to March 2017. With the results obtained in this phase, INESCOP conducted a statistical study.

Once the 2nd phase had been completed, and in order to check how companies’ awareness had increased over time (30 months) with regard to environmental issues and their socio-economic impact, a comparative study was conducted on the feedback obtained from the questionnaires collected in both phases.

The results show a significant increase in companies’ awareness of environmental issues and the socio-economic impact of the footwear sector, as well as more initiative from the companies’ side when considering the implementation of an environmental management system as something good and relevant for them.
5.1.12. Communication and dissemination actions (D1, D2, D3)
Note: These actions are described in section 5.2

5.1.13. Action E1: Project management
Note: This action is described in the administrative part (section 4)

Summary of the action:

- **Objective**: to establish new relationships with other working groups within the same scientific discipline as well as with groups whose work is developed in other fields to promote cooperation.
- **Expected results (proposal)**: establishment of information exchange channels with other projects.
- **Scheduled timetable**: from October 2013 to March 2017 (whole project).
- **Implementation timetable**: from October 2013 to May 2017 (end of the project).
- **Status**: completed.

Description of the action:

This action was carried out in parallel to Action D3. Thus, INESCOP, taking advantage of its participation in different events, established relationships with other projects related to the CO2Shoe project topic. Below there are some of the events where INESCOP developed networking actions throughout the project execution:

**Networking with the project LIFE12 ENV/ES/000243 - LIFE ShoeBAT - Promotion of best available techniques in the European footwear and tanning sectors.**

- Use of the information obtained in the Shoebat project about energy consumption in tanning companies in Action B2 (data collection) and Action B3 (CO2Shoe tool) in the form of data for the LCI of the tanning process to include this process in the SimaPro software in order to obtain the corresponding EF.

**Networking with the project IEE/11/949 – INDECO - Industry alliance for reducing energy consumption and CO2 emissions.**

- Use of the information obtained in the energy audits of the INDECO project in Action B2 (data collection) and Action B3 (CO2Shoe tool) in the form of data for the LCI of the tanning process to include this process in the SimaPro software in order to obtain the corresponding EF.

**Networking with the EU pilot test project – Product Environmental Footprints (PEFs).**

- Contact with Mr. De Rosa, Primiano, member of UNIC Environmental Service, who was working on a similar initiative of the EC: the Single Market for Green Products. The aim is to allow the growth of a “green products” market, creating unambiguous criteria to evaluate PEFs. This will help industries and consumers to overtake the barriers constituted by the different standards and methods already existing, which are now creating an excess of different and incomparable information. The final result will allow a clear communication of products’ environmental performances through available, complete, transparent and comparable information. More information available from:

  http://ec.europa.eu/environment/eussd/smep/

**Networking with SUBENCO Company.**

- The CO2Shoe project had a specific networking activity with SUBENCO div. Euro Brand Management from Munich, Germany. SUBENCO is a company specialised in the footwear industry; they focus solely on global packaging sustainability in the supply chain. Luigi Grosso, the MD of SUBENCO, contacted CEC and INESCOP because they were interested in the project and in calculating and reducing footwear CF values. A non-disclosure agreement was signed about some solutions that this company has available to reduce the CF of footwear packaging. Furthermore, SUBENCO has benefited from being
included in the database of the project LIFE ShoeBAT (LIFE12 ENV/ES/000243) – Promotion of best available techniques in the European footwear and tanning sectors, which is also coordinated by INESCOP.

**Networking with the project ECO/13/630585 - Recyclite Project (Eco-I)**

- Contact with Mr. Croft, Christel, Technical Director of Luxus Limited, a partner in the European project Recyclite (Eco-Innovation programme). Thanks to this contact, it was possible to incorporate recycled polypropylene (PP) into the CO2Shoe tool. More information available from:

5.1.15. Action E3: After-LIFE Communication plan

Summary of the action:
- Objective: to continue with the CO2Shoe dissemination after LIFE+ financial support.
- Status: completed

Description of the action:
The After-Life Communication plan describes the methods that will be employed for maintaining the dissemination and communication of the CO2Shoe project. It was prepared in 5 languages: English, Spanish, Italian, Portuguese and Polish.

Main strategy and activities have been planned in order to:
- Communicate and disseminate CO2Shoe objectives and achieved results.
- Disseminate the use of the CF calculation tool among European footwear companies.
- Increase awareness on the environmental impact, in terms of contribution to global warming, derived from production processes among footwear sector’s companies.
- Reduce the GHG emissions within the footwear sector.
- Promote the use of low-carbon processes and favour Eco-design in production models as a way to improve products from an environmental perspective from their initial stage.
- Encourage the exchange of experiences and knowledge.

Besides, during the establishment of the after-LIFE Communication strategies, the following aspects were taken into account:
- Target audience: footwear and related industries, other interested industries, general public…
- Communication tools: project website, multimedia material, newsletters, leaflets…

Figure 27: After-Life communication plan in English
5.1.16. Action E4: Audit

Summary of the action:
- Objective: to verify the compliance with national legislation and accounting rules and to certify that all costs incurred comply with the LIFE+ common provisions.
- Status: completed

Description of the action:
Once the project and the final financial reports of the Coordinating beneficiary and associated beneficiaries had been completed, a financial audit was performed by an independent registered auditor.

The purpose of the audit was to obtain evidences of the accuracy of the consolidated statement of expenditure of the project and also the individual statement of expenditure of beneficiaries, in accordance with EU Financial Guidelines, LIFE Common Provisions and the National legislation and Accounting principles and rules. Taking into account the international character of the Consortium, and the fact that compliance with national legislation and regulations had to be verified, the associated beneficiaries provided an audit report on their project costs carried out by independent registered auditors. These audit reports, together with the evidences and supporting documents made available by beneficiaries allowed the auditor in charge of the project audit to overcome difficulties relating to interpretation of national regulations and reconcile all the expenses mentioned in the statements with eligibility criteria.

Furthermore, the audit covered the use of funds from all sources of financing and verified that all project income had been declared.

Below there is a list to specifying the audit report situation each project partner:
- INESCOP: provides audit report as a project partner and as project coordinator. The associated audit costs are justified in INESCOP's financial statement.
- FICE: provides audit report as a project partner.
- CEC: provides audit report as a project partner.
- IPS: provides audit report as a project partner.
- CGS: provides audit report as a project partner.
- CTCP: provides audit report as a project partner.
5.2 Dissemination actions

5.2.1 Objectives

The dissemination plan set out in the project proposal was:

- Spreading the project, its results and benefits among a wide audience, such as footwear and related industries, non related industries and the general public.
- Dissemination efforts were mainly focused on footwear manufacturers since the carbon footprint calculation tool is primarily designed to be used by such stakeholders.
- Dissemination activities were also targeted to related industries, such as tanning companies, components companies and textile companies.

5.2.2 Dissemination: overview per activity

Action D1: web page, notice boards, leaflets, newsletters, posters and other dissemination materials

Summary of the action:

- Objective: to create different materials for project dissemination.
- Scheduled time table: from October 2013 to March 2017 (whole project).
- Implementation timetable: from October 2013 to May 2017 (whole project).
- Status: completed

Description of the action:

Below there is a summary of dissemination materials created during the project:

1. CO2Shoe project website (28,742 visits)

The CO2Shoe project Website (http://www.co2shoe.eu) was continuously updated with information generated by INESCOP and the rest of the partners (dissemination, news, progress, leaflet, newsletter...). The project website is available in all CO2Shoe partners' languages: Spanish, Italian, Portuguese and Polish, and in English as the official language of the project.

Figure 28: CO2Shoe project website

2. Notice boards (6 units)

A project notice board was prepared in the first months. It was aimed at displaying information about the project. Each partner translated and located the notice board in their premises where it was publicly visible and accessible.

Figure 29: CO2Shoe project notice board in English
3. **Leaflets** (9,690 units)

A CO2Shoe leaflet was prepared to be distributed in dissemination events, such as fairs, conferences, workshops, etc. This leaflet is available in English, Spanish, Italian, Portuguese and Polish.

![Figure 30: CO2Shoe leaflet](image)

4. **CO2Shoe newsletters**

Different newsletters about the CO2Shoe project were published and they are available in the project website.

![Figure 31: no 1](image)  ![Figure 32: no 2](image)  ![Figure 33: no 3](image)  ![Figure 34: no 4](image)

5. **Merchandising**

Different materials oriented towards project dissemination were created (folders, umbrellas, ball pens, note books and USBs).

![Figure 35. CO2Shoe dissemination materials](image)
Indicators:
- Corporate image: done
- CO2Shoe project website: done (28,742 visits).
- Notice board: done. Available in English, Spanish, Italian, Portuguese and Polish. (6 units)
- Leaflet: done. Available in English, Spanish, Italian, Portuguese and Polish. (9,690 units)
- Posters: done. Available in English, Spanish, Italian, Portuguese and Polish. (8 posters)
- Newsletter: no. 1 (in English), no. 2 (in English, Spanish, Italian, Portuguese and Polish), no. 3 (in English) and no. 4 (in English, Spanish, Italian, Portuguese and Polish).
- Brochures (2,350 units)
- Factsheets (440 units)
- Several Power Point presentations: done
- Merchandising:
  - USBs (905 units)
  - Folders (600 units)
  - Notebooks (200 units)
  - Ball pens (200 units)
  - Umbrellas (100 units)
  - Paper bags (100 units)
Action D2: production of a video on the topic of the carbon footprint of footwear

Summary of the action:
- Objective: to spread knowledge of the CO2Shoe project among European footwear companies.
- Status: completed.

Description of the action:
The video is available in DVD format and it was prepared in 6 languages: English, Spanish, Italian, Portuguese, Polish and French (1,500 copies).

In addition, a promo video summarising the project is available from a YouTube channel (see figure 38).

![YouTube](http://www.youtube.com/watch?v=CO2Shoe_video)

Figure 36. CO2Shoe promo video in YouTube

Such videos can also be accessed from the public area of the website (http://www.co2shoe.eu/en/multimedia, see figure 37). Video language is automatically selected depending on the active language for the website.
Figure 37. CO2Shoe video in the project website
Action D3: seminars, conferences, participation in European fairs, appearance in specialist journals and press, international dissemination, Layman's report

- Objective: to spread the project, its results and benefits among a wide audience.
- Scheduled timetable: from October 2013 to March 2017 (whole project).
- Implementation timetable: from October 2013 to May 2017 (whole project).
- Status: completed

Description of the action:

The CO2Shoe project was widely disseminated in international events, such as seminars, conferences, workshops, fairs, etc. In addition, during the whole project, several press releases and news were prepared by the project partners.

Below there is a summary of dissemination activities carried out during the project:

1. Seminars, conferences and other events

   1.2. October 2013 – Krakow, Poland – Dissemination event about CO2Shoe project.
   1.3. October 2013 – Valencia, Spain – LIFE Valencian projects meeting.
   1.10. April 2014 – Paris, France – General Assembly of the French Footwear Federation “Fédération Francaise de la Chaussure”.
   1.11. May 2014 – Athens, Greece – Union for the Mediterranean Ministerial Conference on Environment and Climate Change.
   1.15. September 2014 – Cracow, Poland – 19th IGWT Symposium commodity science in research and practice – Current achievement and future challenges.
   1.22. January 2015 – Brussels, Belgium – 1st physical Environmental Footprint consultation meeting of the EU leather pilot project.
1.23. February 2015 – Felgueiras, Portugal – Contributos dos projetos de I&D para a melhoria de SST no setor do calçado.
1.25. March 2015 – Igualada, Spain – 2º Jornada técnica de calzado.
1.28. April 2015 – Braga, Portugal – I&D empresarial e inovaçao tecnologica.
1.29. July 2015 – Madrid, Spain – Certification Ceremony: Validation and Verification of the CO2Shoe tool by AENOR.
1.34. January 2016 – Porto, Portugal – Kick-off meeting of the Erasmus+ project Fit2Com.
1.35. February 2016 – Brussels, Belgium – Final conference of the social dialogue project “A Future for European Leather!”
1.36. February 2016 – Chennai, India – UITIC International Technical Footwear Congress.
1.41. May 2016 – Elda, Spain – Visit of the Valencian Institute of Business Competitiveness and meeting with footwear companies.
1.42. May 2016 – Brussels, Belgium – Presentation at Valencian Chamber of Commerce.
1.44. July 2016 – Elda, Spain – A step to sustainability workshop.
1.47. October 2016 – Brussels, Belgium – Attracting Investment and Upgrading Skills in TCLF Industries Seminar.
1.50. December 2016 – Castellón, Spain – Networking day of the LIFE CO2Formare project.
1.51. December 2016 – Brussels, Belgium – CEC’s General Assembly
1.53. January and March 2017 – Pisa, Italy – Dissemination events with shoe manufacturers.
1.54. February 2017 – Felgueiras, Portugal – Seminar by Escola Profissional.
1.55. March 2017 – Brussels, Belgium – Learn2Work meeting
1.56. March 2017 – Elda, Spain – Footwear and health workshop.
1.57. March 2017 – Felgueiras, Portugal – Sustainable development in the footwear sector Seminar.
1.60. May 2017 – Brussels, Belgium – The Assocalzaturifici board meeting

2. International Trade Fairs

2.1. October 2013 – Alicante, Spain – FUTURMODA Trade Fair
2.2. November 2013 – Rimini, Italy – ECOMONDO Trade Fair
2.4. November 2013 – Pisa, Italy – ECOCITY Trade Fair.
2.5. February 2014 – Poznan, Krakow – Targy Mody Poznan Trade Fair.
2.7. March 2014 – Milan, Italy – MICAM Trade Fair.
2.10. August 2014 – Milan, Italy – MICAM Trade Fair.
2.11. September 2014 – Madrid, Spain – MOMAD Trade Fair.
2.18. April 2015 – Alicante, Spain – CO-SHOES Fair.
2.22. February 2016 – Milan, Italy – SIMAC Tanning Tech.
2.23. February 2016 – Düsseldorf, Germany – GDS Trade Fair.
2.27. September 2016 – MOMAD Shoes Fair.
2.28. September 2016 – Milan, Italy – Lineapelle Fair.
2.29. February 2017 – Milan, Italy – MICAM Trade Fair.

3. General press releases

3.1. Periódico Levante – September 2013
3.2. INESCOP’s press release – 4th quarter 2013
3.3. CEC’s press release – December 2013
3.4. UITIC News – September 2014
3.5. Revista del Cuero de Colombia – February 2015
3.7. LAS PROVINCIAS Website – July 2015
3.10. LIFE Website – September 2015
3.11. ECONOMÍA 3 Magazine – September 2015
3.13. CEC’s press release – May 2016
3.15. International Leather Maker Magazine – May 2016
3.20. UITIC News – March 2017

4. Other newsletters

4.1. INESCOP’s newsletters:
   Newsletter no 160_ September 2013
   Newsletter no 163_ December 2013
   Newsletter no 168_May 2014
   Newsletter no 180_May 2015
   Newsletter no 183_August 2015
   Newsletter no 189_February 2016
   Newsletter no 190_March 2016
   Newsletter no 194_July 2016
   Newsletter no 199_December 2016
   Newsletter no 203_April 2017

4.2. CTCP’s newsletter:
   Newsletter no 1_January 2014

5. Articles

5.1. LEDERPIEL Magazine – October 2014
5.2. MAT-ECO_SHOES Conference Proceedings – November 2014
5.3. Journal of aqeic – December 2014
5.4. CONEIA Conference Proceedings – March 2015
5.5. REVISTA DEL CALZADO Magazine – September 2015
5.6. WORLD FOOTWEAR Magazine – September 2015
5.7. INFORMACIÓN ALICANTE Newspaper – March 2016
5.8. AENOR Magazine – September 2016
5.9. Świat butów magazine – October 2016
5.10. MAT-ECO_SHOES Conference Proceedings – November 2016

6. Layman’s report

The Layman’s report was prepared in 5 languages: English, Spanish, Italian, Portuguese and Polish.
Indicators:

- Seminars, conferences and other events: 60 events.
- Dissemination at European fairs: 31 fairs.
- Other newsletters: 10 INESCOP’s newsletters and 1 CTCP’s newsletter.
- Technical articles: 10 articles
- Dissemination on the radio: 1 interview.
- Dissemination on the TV: 1 programme
- Social networks: Facebook, Twitter and YouTube
5.3 Evaluation of Project Implementation

Table 05 shows the status of each project action (foreseen in the proposal vs. final results achieved):

<table>
<thead>
<tr>
<th>Task</th>
<th>Foreseen in the revised proposal</th>
<th>Achieved</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action A1</strong></td>
<td>1 methodology from which the CF calculation tool will be conceived</td>
<td>1 methodology from which the CF calculation tool will be conceived</td>
<td>Objective accomplished</td>
</tr>
<tr>
<td><strong>Action B1</strong></td>
<td>1 report describing the scope of the system, including the sources of GHG emissions to be considered for the development of the calculation tool</td>
<td>1 report describing the scope of the system, including the sources of GHG emissions to be considered for the development of the calculation tool</td>
<td>Objective accomplished</td>
</tr>
<tr>
<td><strong>Action B2</strong></td>
<td>1 report containing the information provided by each partner, as well the sources, dates and time period covered</td>
<td>1 updated report containing the emission factors incorporated into the CO2Shoe tool</td>
<td>Objective accomplished and upgraded</td>
</tr>
<tr>
<td><strong>Action B3</strong></td>
<td>1 tool (in the form of a spreadsheet) for the calculation of the CF of a pair of shoes, available in English and Spanish</td>
<td>1 updated tool (in the form of a spreadsheet) for the calculation of the CF of a pair of shoes. 1 life cycle inventory (LCI) to obtain input/output data. 1 CO2Shoe tool user’s manual (added). 1 CO2Shoe questionnaire user’s manual (added).</td>
<td>Objective accomplished and upgraded with 3 added actions</td>
</tr>
<tr>
<td><strong>Action B4</strong></td>
<td>1 calculation of the CF of a shoe style produced by a Spanish footwear company. 1 assessment questionnaire of the calculation tool filled in. 1 CF calculation tool for footwear.</td>
<td>1 life cycle inventory (LCI) filled in. 1 calculation of the CF of a shoe style produced by a Spanish footwear company. 1 CF calculation tool for footwear.</td>
<td>Objective accomplished</td>
</tr>
<tr>
<td><strong>Action B5</strong></td>
<td>1 verification of the CF calculation for the shoe style considered in Action B4. 1 improved calculation tool and methodology.</td>
<td>1 verification of the CF calculation for the shoe style considered in Action B4. 1 validation of the CO2Shoe tool. Multiple improvements of the CO2Shoe tool, the life cycle inventory and the methodology.</td>
<td>Objective accomplished</td>
</tr>
<tr>
<td><strong>Action B6</strong></td>
<td>36 CF calculations of several footwear styles produced in Spain, Italy, Portugal and Poland. 1 detailed report on the application of the tool in European footwear companies, showing the carbon footprint value obtained in each of the applied cases and the most determining aspects of GHG emissions.</td>
<td>36 CF calculations of several footwear styles produced in Spain, Italy, Portugal and Poland. 1 detailed report on the application of the tool in European footwear companies, showing the carbon footprint value obtained in each of the applied cases and the most determining aspects of GHG emissions.</td>
<td>Objective accomplished</td>
</tr>
<tr>
<td><strong>Action B7</strong></td>
<td>1 detailed report in which the mitigating measures to be applied to each of the companies and their styles will be established</td>
<td>1 detailed report in which the mitigating measures to be applied to each of the companies and their styles are established</td>
<td>Objective accomplished</td>
</tr>
<tr>
<td><strong>Action C1</strong></td>
<td>36 CF calculations of different footwear styles produced in Spain, Italy, Portugal and Poland. 1 detailed report on the application of the tool in European footwear</td>
<td>36 CF calculations of different footwear styles produced in Spain, Italy, Portugal and Poland. 1 detailed report on the application of the tool in European footwear</td>
<td>Objective accomplished</td>
</tr>
<tr>
<td>Action C2</td>
<td>1 comparative report on the CF values obtained before and after the implementation of mitigating measures A reduction of at least 10% of the initially calculated CF values</td>
<td>Objective accomplished</td>
<td></td>
</tr>
<tr>
<td>Action C3</td>
<td>Initial questionnaires completed in European footwear companies. Final questionnaires completed in European footwear companies. 1 report on the questionnaires explaining in what way the level of awareness amongst businesses with regard to their CF has grown.</td>
<td>Objective accomplished</td>
<td></td>
</tr>
<tr>
<td>Action D1</td>
<td>1 video of the project available in English, Spanish, Italian, Portuguese and Polish. 1000 copies of the video on DVD.</td>
<td>Objective accomplished and overcome</td>
<td></td>
</tr>
<tr>
<td>Action D2</td>
<td>1 video of the project and 1 promotional video available in English, Spanish, Italian, Portuguese, Polish and French. 1500 copies of the video on DVD</td>
<td>Objective accomplished and overcome</td>
<td></td>
</tr>
<tr>
<td>Action D3</td>
<td>Attendence to 60 conferences, seminars and other events. Attendance to 31 European fairs. Publication of 10 technical articles. Layman’s report available in English, Spanish, Italian, Portuguese and Polish. Layman’s report in CO2Shoe website.</td>
<td>Objective accomplished and overcome</td>
<td></td>
</tr>
<tr>
<td>Action E1</td>
<td>Suitable project progress</td>
<td>Objective accomplished</td>
<td></td>
</tr>
<tr>
<td>Action E2</td>
<td>Establishment of an information exchange channel with other projects</td>
<td>Objective accomplished</td>
<td></td>
</tr>
<tr>
<td>Action E3</td>
<td>1 after-LIFE communication plan in English and Spanish</td>
<td>Objective accomplished and overcome</td>
<td></td>
</tr>
<tr>
<td>Action E4</td>
<td>1 audit report</td>
<td>Objective accomplished</td>
<td></td>
</tr>
</tbody>
</table>

| Table 05. Status of each project action |
5.4 Analysis of long-term benefits

1. Environmental benefits
   a. Direct / quantitative environmental benefits:

   As a direct result of the project, there are some environmental benefits achieved after footwear companies implemented some of the recommendations for improvement the CF of their products established in Action B7 (Recommendations for improvement of the CF).

   As explained in chapter 5.1.10 the CF obtained in the 2nd pilot application (Action C1), once the suggested improvement had been implemented, showed an average decrease by 6%.

   Finally, it is to highlight the incorporation of eco-design in production among footwear companies, taking environmental issues into account from the product design stage, as for example:

   - Use of self generated photovoltaics.
   - Use of “eco” materials with lesser environmental impact.
   - Reduce wastage.
   - Proximity to suppliers to reduce impacts derived from transportation.
   - Improve quality to reduce the number of product rejections to avoid that finished products end up as waste.

   b. Relevance for environmentally significant issues or policy areas

   In general the CO2Shoe project supports the European legal principles with regard to GHG emissions:

   - European legal principles with regard to climate and energy package, the objective of which is to transform Europe into a low-carbon economy and increase energy security. The final targets to be reached by 2020 are to cut GHG by 20%, to establish a 20% share for renewable energy, and to improve energy efficiency by 20%.

   - Directive 2010/75/EU on industrial emissions (Integrated Pollution Prevention and Control - IPPC). This document promotes measures to allow the reduction of pollution at source.

   - Commission recommendation 2013/179/EU on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations. This document refers to the standard ISO/TS 14067:2013 several times, used in the CO2Shoe project as reference standard.

   In addition, this project supports the general principles of the Intergovernmental Panel on Climate Change (IPCC), whose main contribution to date was made on the 3rd Conference on Climate Change (COP3, Kyoto, 1997) where the Kyoto Protocol was established. This Protocol is the first international legally binding agreement that sets mandatory objectives in terms of GHG reduction. Directive 2002/358/CE, concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfilment of commitments thereunder.

2. Long-term benefits and sustainability
   a. Long-term / qualitative environmental benefits

   The environmental benefits that have been described in the previous section could be extrapolated in the long term, so it can be deduced that the environmental benefits can be relevant in the future.
If these values are extrapolated, considering that every year about 920 million pairs of shoes are produced in the EU (Source: World Footwear 2016) could imply the **reduction of 513,700 tonnes of CO$_2$e/year in Europe**. Also, if these figures were extrapolated to the global footwear production (about 23,000 million pairs of shoes/year), a 6% reduction in GHG emissions could imply the **reduction of nearly 13 million tonnes of CO$_2$e/year worldwide**. Therefore, the CO2Shoe project contributes to the fight against Climate Change through GHG emissions reduction.

In addition, there are other environmental benefits associated with the reduction in energy, materials, chemicals and water consumption or savings in solid waste and wastewater generation. Nevertheless, it is impossible to quantify these improvement values.

Furthermore, this project meets the objective of Life + Environment Policy and Governance in that it had contributed to the development and demonstration of innovative technologies, thus enhancing the knowledge of the CF in the European footwear sector. In this sense the CO2Shoe project contributed to the implementation and dissemination of the CF of a pair of shoes in the European footwear sector.

b. **Long-term / qualitative economic benefits**

The CO2Shoe project contributes to the economic benefits for companies due to the fact that it reinforces the product, the brand or the company image. Thus, the application of the CF of products may become a business opportunity, since sustainable products are a market niche and they tend to be highly appreciated by the public. In addition, it can even be an advantage in public procurement processes, in accordance with EU legislation through **Directive 2014/24/EU**.

Furthermore, the incorporation of eco-design in footwear production through the CF (savings in energy, water or waste, etc.) reduces the cost of production and, therefore, contributes to improve the economic benefits for companies.

c. **Long-term / qualitative social benefits**

The environmental benefits of the project are expected to benefit the general health and wellbeing of the population reducing GHG emissions, global warming and climate change.

With regard to employment, the benefits of the project can also be relevant for the employability related to environmental technicians in charge of environmental issues in footwear companies.

It is also worth to highlight that it is expected that the project will contribute to increase the knowledge and competences of current and future footwear workers about general environmental issues, as the CF, GHG emissions, global warming problem, etc.

d. **Continuation of the project actions by the beneficiary or by other stakeholders**

The CO2Shoe tool developed in the framework of the project will be kept operational and updated in time after the project execution. The aim at the end of the project is to provide footwear companies with the use and service of this tool, which will allow them to quantify the CF of a pair of shoes to reduce the related GHG. In this sense INESCOP, as the developer and owner of the CO2Shoe tool, is considering the option of exploiting it as a new green service for EU footwear companies. Thus, any footwear company could calculate the CF of footwear styles. As a result, the company would receive a CFP report, as well a CFP certificate and CFP labels (see figure 39).
Additionally, dissemination of the project will continue after its end. Thus, the beneficiaries will take advantage of their participation in conferences, seminars, courses, etc. to continue to disseminate the project results obtained, as well the CO2Shoe tool developed.

3. Replicability, demonstration, transferability, cooperation:

As mentioned above, the project results will be disseminated in order to promote its replicability in all EU footwear manufacturers (in addition to Spain, Italy, Portugal and Poland). To this end, it will be necessary to include additional EFs in the CO2Shoe tool, such as the specific electricity mix or specific consumption of fossil fuels (natural gas, oil, coal, etc.).

Moreover, although the CO2Shoe tool is specific for the calculation of the footwear CF, the tool incorporates some EFs from materials that could be used by other sectors. For example, to develop the CO2Shoe it was necessary to obtain the EFs of different types of leather. This information could be interesting to other sectors that use leather as a raw material (leather goods, automotive sector, furniture, etc.).

4. Best Practice lessons:

The CF can be used as an environmental indicator allowing the identification of those materials and/or processes employed in the manufacturing of a product causing the greatest environmental impacts. These are the so-called ‘hotspots’.

Some generic Best Practices suggested to reduce the CF are:

Energy
- Improve energy efficiency.
- Use electricity from renewable sources.

Figure 39. INESCOP’s CPF certificate and CFP label
- Use self-generated photovoltaics.

**Materials**
- Reduce the weight of materials.
- Use materials with lesser impact.
- Reduce the wastage of the materials used.
- Use water-based adhesives.
- Reduce chemicals consumption.

**Suppliers**
- Close suppliers.
- Take environmental friendliness into account when selecting suppliers.

**Others**
- Reduce the final weight of the product (footwear and its packaging).
- Reduce the number of product rejections to avoid that finished products end up as waste.

5. **Innovation and demonstration value:**

The CF of Dian’s footwear style (Marsella) calculated in the CO2Shoe project was the 1st CF of a footwear product verified according to ISO/TS 14067:2013. The project is expected to promote the quantification of the CF of products in the footwear industry. For this purpose, some demonstration workshops were organised throughout the project execution.

In addition, the project has demonstrated the usefulness of the CO2Shoe tool that can be used as an environmental and energy management tool to evaluate the environmental behaviour of the footwear production process, due to the fact that it helps to identify the system’s ‘hot spots’, i.e. the materials and production process stages that generate the highest environmental impact.

The new carbon footprint tool developed (CO2Shoe tool) had been tested evaluating 72 (36 into the 1st pilot application and 36 into the 2nd pilot application) different footwear models were made into the EU (Spain, Italy, Poland and Portugal).

6. **Long term indicators of the project success:**

Below there is a list of possible indicators of the project success:
- Number of CF of footwear styles calculated.
- Number of the visits to the CO2Shoe website and/or downloads of documents.