



**Climate Governance: Implementing public policies to calculate and reduce organisations' carbon footprint**

**LIFE Clim'Foot  
Project No.: LIFE14 GIC/FR/000475**



## **National Report of Croatia**

### **C4. Voluntary programme: Calculation of organization's carbon footprint by end-users**



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## Preparation of the Voluntary programmes

### 1. Training session for end-users (C4.1.1)

#### **1.1. Training session for end-users**

Two two-day training sessions were organised in the framework of the activity C4.1.1., the first one for public and then for private sector.

The training seminar for public sector „Calculating the carbon footprint of an organisation with the Bilan Carbone tool“, in the framework of the LIFE Clim'Foot project, was held on 23<sup>rd</sup> and 24<sup>th</sup> of December 2016 in the Energy Institute Hrvoje Požar (Savska cesta 163, Zagreb), with 11 participants from 8 public organisations.

While the training seminar for private sector, was held on the 29<sup>th</sup> and on the 30<sup>th</sup> of December 2016 in the Energy Institute Hrvoje Požar premises, with 16 participants from 10 private organisations.

#### **1.2. Description of the end-users trainings**

The objective of the training seminars for public and private sector was introducing the participants to the scope and framework of the Carbon Footprint of Organisations and to the methodology of the Carbon Footprint calculation using the Bilan Carbon tool.

The agenda for both public and private organisations was the same. After the registration of all participants, national project coordinator Mr Željko Jurić has welcomed all the participants to the seminar. Furthermore, all participants introduced themselves. After the introduction, Mr Jurić presented the agenda of the training seminar.

Ms Branka Jelavić, PhD gave a short presentation about the Institute and the fields of work, especially the involvement in the EU projects. After that Ms Željko Jurić gave an overview about the Project and the main Project activities and expected results for all work packages, energy and climate challenges, as well as international and national legislative framework. Ms Leila Luttenberger gave an overview of the results of the Quiz on energy, climate & carbon footprint. The methodological framework for the carbon footprint calculation was given by Mr Veljko Vorkapić. All participants were involved in groups for defining parameters for Carbon Footprint calculation of three specific organisations (Congress organizer, Car manufacturer and Food services for airplanes), showing a lot of enthusiasm. After the lunch break, Mr Željko Jurić introduced the participant into the Bilan Carbone Tool. Starting with the sheet Description and passing through sheet Energy. The Non-energy sheet was presented by Mr Veljko Vorkapić. The Inputs, Packaging, Freight and Transporting people sheets were covered by Mr Dinko Đurđević. During the 1<sup>st</sup> Day there were a lot of questions about how to collect the input data and which input data will be most suitable for the Bilan Carbon tool.

The 2<sup>nd</sup> Day session started with recapitulation of the first day. Consequently, Mr Dinko Đurđević has continued with the presentation of sheets Direct waste, Capital goods, Use stages and End-of-life. Mr Željko Jurić finalized the presentation of the Bilan Carbone tool with

Emission factors, Utilities, CO<sub>2</sub>e overview, GHG Protocol, ISO 14069 norm and Graphs sheets. After that, Mr Dinko Đurđević gave a presentation about the carbon footprint calculation for the private organisation (imaginary private company: Handylight Ltd), while Mr Željko Jurić continued with the presentation of the carbon footprint calculation for the public organisation (imaginary public organisation: City Holding).

The training seminar finished with defining actions for mitigation of the carbon footprint. All the participants were involved in groups for defining of measures to mitigate the carbon footprint. In the final presentation, main future steps and implementation phases were described. During the 2<sup>nd</sup> Day there were also a lot of discussion. Participants completed evaluation forms, in which expressed their opinion on the seminar content and trainers.

The related agendas for public and private training session are shown in Figure 1 and Figure 2.

Figure 2.



Figure 1. Agenda of private organisations training session

|  |   |
|--|---|
|     |      |
| <p>Training for private sector:<br/>„Calculating the carbon footprint of an organisation with the Bilan Carbone® tool“, in the framework of the LIFE ClimFoot project</p> <p>29<sup>th</sup> and 30<sup>th</sup> November 2016<br/>Energy Institute Hrvoje Požar,<br/>Savska cesta 163, Zagreb</p>   |   |
| <p><b>AGENDA</b><br/>First day (29<sup>th</sup> November 2016)</p>   |   |
| <ul style="list-style-type: none"> <li>8<sup>00</sup> - 9<sup>00</sup> Registration of participants</li> <li>9<sup>00</sup> - 9<sup>20</sup> Welcome, introduction and individual presentations</li> <li>9<sup>20</sup> - 9<sup>35</sup> Presentation of the Energy Institute Hrvoje Požar (B. Jelavić, EIHP)</li> <li>9<sup>35</sup> - 9<sup>55</sup> Presentation of the LIFE ClimFoot project (Ž. Jurčić, EIHP)</li> <li>9<sup>55</sup> - 10<sup>25</sup> Synthesis of main energy-climate challenges (Ž. Jurčić, EIHP)</li> <li>10<sup>25</sup> - 10<sup>45</sup> Overview of international and national regulations (Ž. Jurčić, EIHP)</li> <li>10<sup>45</sup> - 11<sup>00</sup> Break</li> <li>11<sup>00</sup> - 11<sup>20</sup> Analysis of the quiz results (L. Luttenberger, EIHP)</li> <li>11<sup>20</sup> - 11<sup>50</sup> Methodological principles of CF calculation (V. Vorkapić, EIHP)</li> <li>11<sup>50</sup> - 12<sup>30</sup> Defining perimeters for CF calculation (Ž. Jurčić, EIHP)</li> <li>12<sup>30</sup> - 13<sup>30</sup> Lunch</li> <li>13<sup>30</sup> - 13<sup>50</sup> Overview of the Bilan Carbone tool (Ž. Jurčić, EIHP)</li> <li>13<sup>50</sup> - 14<sup>20</sup> Presentation of the calculator - Description and Energy (Ž. Jurčić, EIHP)</li> <li>14<sup>20</sup> - 14<sup>45</sup> Presentation of the calculator - Non-energy (V. Vorkapić, EIHP)</li> <li>14<sup>45</sup> - 15<sup>00</sup> Break</li> <li>15<sup>00</sup> - 16<sup>00</sup> Presentation of the calculator - Inputs, Packaging and Freight (D. Durđević, EIHP)</li> <li>16<sup>00</sup> - 16<sup>30</sup> Final discussion of the first day</li> </ul> | <p style="text-align: center;"><b>AGENDA</b><br/>Second day (30<sup>th</sup> November 2016)</p> <ul style="list-style-type: none"> <li>9<sup>00</sup> - 9<sup>15</sup> Recapitulation of first day and introduction in second day</li> <li>9<sup>15</sup> - 10<sup>00</sup> Presentation of the calculator - Transporting people, Direct waste and Capital goods (D. Durđević, EIHP)</li> <li>10<sup>00</sup> - 11<sup>00</sup> Presentation of the calculator - Use stages and End-of-life (D. Durđević, EIHP)</li> <li>11<sup>00</sup> - 11<sup>15</sup> Break</li> <li>11<sup>15</sup> - 12<sup>00</sup> Presentation of the calculator - Emission factors, Utilities, CO<sub>2</sub>e overview, GHG protocol, ISO 14069 and Graphs (Ž. Jurčić, EIHP)</li> <li>12<sup>00</sup> - 12<sup>30</sup> Presentation of carbon footprint calculation for private sector - case study (D. Durđević, EIHP)</li> <li>12<sup>30</sup> - 13<sup>00</sup> Presentation of carbon footprint calculation for public sector - case study (Ž. Jurčić, EIHP)</li> <li>13<sup>00</sup> - 13<sup>15</sup> Break</li> <li>13<sup>15</sup> - 13<sup>35</sup> Defining actions for carbon footprint reduction (Ž. Jurčić, EIHP)</li> <li>13<sup>35</sup> - 14<sup>15</sup> Main steps and organisation of the implementation phase (Ž. Jurčić, EIHP)</li> <li>14<sup>15</sup> - 15<sup>00</sup> Evaluations and final discussion</li> </ul> |

*Figure 2. Agenda of private organisations training session*

All the participants were very actively involved in the seminar. They actively participate in discussions, questioning, and giving ideas about the input data for the carbon footprint. Questions raised during the trainings are listed below.

1. In Utilities sheet, what is the period that we take in account type of change for Land Use Change? If we have a situation that change of land use was in year of calculation, we probably should calculate emissions. But, if we have a situation that change of land use was in the past (e.g. 2 years ago). Should we include land use change (and how) or not?
2. In Inputs sheet, do we have to account the meals for personnel that lunches outside of the building or brings their own lunch?
3. In Inputs sheet (and in Direct waste sheet), regarding Water network, how do we explain what is Water network without infrastructure?
4. In Transporting people sheet, regarding employees commuting, in the first table - Car (home-work), what does reimbursement or fuels supply (owned means of transport) stand for?
5. If the end-user has more than one facility on its location, how do they calculate it? For instance, one of our participants has on their location several warehouses that are separated. Another one has under its jurisdiction the local market and cemetery. Do they have to calculate it for every facility separately or include everything in one tool?
6. In Capital goods sheet, for Vehicles, machines and tools, what is the suggested Depreciation period? Since we don't legally have a period for this, what should we suggest them to use?

7. In case that we have a delivery of e.g. studies to our client by car, where we should put fuel consumption of car? Deliverer could be our employee or we hired delivery company.
8. For Direct waste sheet, is the transport of the waste included in the calculation of presented emission factors?
9. In the Non-energy sheet / N<sub>2</sub>O emissions / N<sub>2</sub>O emissions from animals. Do these emissions only include N<sub>2</sub>O emissions from feed production or they also include N<sub>2</sub>O emissions from manure management?
10. What is the regulation in France that regulates the Scopes that need to be calculated for carbon footprint? Some of our participants wanted this information because they are interested how it is done in France, in order to anticipate what is to be expected in Croatia, once we include it in our regulations. Is it obligatory to report carbon footprint in France using Bilan Carbone tool and preparing all GHG emissions (Scope 1, 2 and 3)?
11. What are the obligations concerning carbon footprint calculation in France? Are there some charges for high carbon footprint or benefits for lower ones?
12. In Inputs sheet, what is the level of reconstruction that is included in Bilan Carbone and where do we put materials that are used for reconstruction of buildings that are in ownership of the organisation? If the building is leased and under reconstruction, how do we put that in Bilan Carbone? Should we put e.g. information on the major reconstruction of building (surface of reconstructed area, reconstructed in the observed year or not and new depreciation period of reconstructed building) in Capital Goods sheet or in Input sheets?
13. If smaller reconstructions of the building are made, where does that go in Bilan Carbone tool?
14. We had some participants that receive inputs as finished products, e.g. they don't produce computer chips from components but receive them as finished products and implement them in new products (for example, in case of computer manufacturer). How to implement this information and data in the Bilan Carbone?
15. In Use stages sheet, some of our participants had products that are powered by renewable energy sources (e.g. consumption of electricity produced from PVs during usage of products). How do they calculate the amount of energy that is used for powering of the products? Do they even have to include it, since it is energy from clean sources or how do they put it in Bilan Carbone? There was also question concerning consumption of "green" electricity from renewable energy sources (Energy sheet). Some organizations in Croatia use only "green" electricity and pay more for it.
16. In Direct waste sheet, under Wastewater table, what is considered under *stagnant environment*? We understand that some sort of treatment is used before releasing wastewater in the environment, but shouldn't it then be some other nomenclature?
17. Considering public transport in Transporting people sheet, buses and coaches are run on which fuel? It is not said, and it is possible that some of them are run on natural gas, LPG or biodiesel and not only diesel (as is the case in Croatia). What defines the emission factor for the case in previous question? We have a selection of urban areas

and number of inhabitants in the Bilan Carbone tool, but our participants wanted to know what defines these parameters.

18. If an employee goes to a business trip for a longer period (e.g. a month) and works in another country for our organisation and uses a car there (e.g. rent-a-car), how should that be defined in the Bilan Carbone?
19. In Capital goods sheet, if the end-user decides to increase the Surface area of their location during the year in which carbon footprint is calculated, where does this information go? Are there some emission factors included for this type of reconstruction?
20. Regarding the following tables for buildings in Capital Goods sheet (2, 3, etc.), who is using these tables? Because, if the end-user has a building, they don't know the information regarding the materials that were used for construction of that building or the amount of fuel used for construction. What are these tables for? Maybe for the construction company that builds new buildings and makes the reconstructions?
21. How do we insert new data in Emission factors sheet, without impacting the formulas in the entire model? Since we are developing our own emission factors, there is a possibility that we will have to insert new data in Emission factors sheet. Is the Excel modified so the new data doesn't affect the formulas, or do we have to change some things?

### 1.3. End-users' training evaluation

At the end of each training course, training evaluation forms distributed to the participants from public and private sectors.

The evaluation form was structured in three main sections:

- Quality of the content;
- Expertise of the trainers about the subject;
- Overall evaluation.

Moreover, the evaluation form also included a question with an open answer in order to collect information about potential improvements and a feedback on the training course. Survey results submitted by 11 participants from the public sector and 15 participants from the private sector are shown in Table 1 and Table 2.

*Table 1. Results of the survey for the public sector*

| <b>Organisations from public sector</b>  |                   |                        |                   |                   |
|--|-------------------|------------------------|-------------------|-------------------|
| <b><i>Quality of the content</i></b>   | <b>Absolutely</b> | <b>Partially agree</b> | <b>Not really</b> | <b>Not at all</b> |
| You understand the main principles of the carbon footprint methodology               | 8                 | 2                      | 1                 |                   |
| Could you easily list the main steps of a CFO project?                               | 7                 | 3                      | 1                 |                   |
| You have a clear understanding of the kind of results you'll get at the end of a CFO | 3                 | 7                      | 1                 |                   |
| Could you list the three main categories of actions related to a CFO? (10 answers)   | 5                 | 4                      | 1                 |                   |



|  |   |   |   |  |
|--|---|---|---|--|
| You feel comfortable in using the Bilan Carbone spreadsheet (10 answers) | 3 | 6 | 1 |  |
| You are able to prepare a first CFO for your organisation                | 4 | 5 | 2 |  |
| You have a clear understanding of the pilot phase organisation           | 7 | 3 | 1 |  |

| <i>Expertise of the trainers about the subject</i>     | Very good | Good | Medium | Not good |
|--|-----------|------|--------|----------|
| Pedagogy of the trainers                               | 9         | 2    |        |          |
| Interest of the exercise to manipulate the spreadsheet | 8         | 2    | 1      |          |
| Quality of provided documentation                      | 6         | 5    |        |          |

| <i>Overall evaluation</i>             | Absolutely | Partially agree | Not really | Not at all |
|---------------------------------------|------------|-----------------|------------|------------|
| Are you satisfied with this training? | 7          | 4               |            |            |
| Did you reach your expectations?      | 4          | 7               |            |            |

Table 2. Results of the survey for the private sector

| <b>Organisation from private sector</b>  |            |                 |            |            |
|--|------------|-----------------|------------|------------|
| <i>Quality of the content</i>  | Absolutely | Partially agree | Not really | Not at all |
| You understand the main principles of the carbon footprint methodology               | 13         | 2               |            |            |
| Could you easily list the main steps of a CFO project?                               | 14         | 1               |            |            |
| You have a clear understanding of the kind of results you'll get at the end of a CFO | 6          | 9               |            |            |
| Could you list the three main categories of actions related to a CFO?                | 12         | 3               |            |            |
| You feel comfortable in using the Bilan Carbone spreadsheet                          | 8          | 7               |            |            |
| You are able to prepare a first CFO for your organisation                            | 7          | 8               |            |            |
| You have a clear understanding of the pilot phase organisation                       | 14         | 1               |            |            |

| <i>Expertise of the trainers about the subject</i>     | Very good | Good | Medium | Not good |
|--|-----------|------|--------|----------|
| Pedagogy of the trainers                               | 13        | 2    |        |          |
| Interest of the exercise to manipulate the spreadsheet | 14        | 1    |        |          |
| Quality of provided documentation                      | 11        | 3    | 1      |          |

| <i>Overall evaluation</i>                     | Absolutely | Partially agree | Not really | Not at all |
|---|------------|-----------------|------------|------------|
| Are you satisfied with this training?         | 13         | 2               |            |            |
| Did you reach your expectations? (14 answers) | 12         | 2               |            |            |

Seven participants from the public sector took the opportunity to comment the training seminar:

1. **Good:** certainly, usage of these kind of models for carbon footprint calculations is rarity
2. **Good:** very useful education and demanding project
3. **Good:** group working with exercises is very good for learning; **Suggestion:** quiz could be improved
4. **Good:** pace of lessons is appropriate; **Suggestion:** there is no need for improvements
5. **Good:** very detailed and well organized; **Suggestion:** more focus on the worksheets that the user fills
6. **Good:** skills of trainers; **Suggestion:** more frequent breaks
7. **Good:** pleasant atmosphere and appropriate place for seminar

Eleven participants from the private sector took the opportunity to comment the training seminar:

1. **Good:** accessibility and expertise of trainers
2. **Good:** accessibility and professionalism of trainers; **Suggestion:** allow organizations access to all documentation
3. **Suggestion:** send an invitation at least 7 days before the date of the seminar
4. **Good:** compliment to the trainers, good explanations and organization of the seminar
5. **Good:** good organization and knowledge of trainers
6. **Good:** excellent organization, expertise and kindness of trainers; **Suggestion:** prepare a tutorial to help users in completing the worksheets of the tool
7. **Good:** great effort invested in explanation of a difficult subjects; **Suggestion:** customize the templates for data entry
8. **Good:** good organization of the seminar; **Suggestion:** adjustment of emission factors and tables in the Balance Carbone tool, adaptation of measures for carbon footprint mitigation to real life, give the PowerPoint presentations in time
9. **Good:** it is obvious a huge effort in preparation of the seminar; **Suggestion:** at the beginning of the project it would be better to go in depth instead of the width of the matter
10. **Good:** praise to the organizer, especially to Mr. Juric regarding the collaboration and the effort to answer the questions; **Suggestion:** if possible, adapt the sheets of the Bilan Carbone tool to user's needs
11. **Good:** expertise, professionalism, and involvement of the trainers to clarify all dilemmas

## 2. Experimentation by end-users (C4.1.2.)

### 2.1. Demonstration phase

#### 2.1.1. Actions undertaken by beneficiaries to support end-users

After the seminars held in November 2016 for private and public organisations, the beneficiary delivered all the training materials, draft of the Bilan Carbone model and the supporting “shopping list” for data collection to the participants. The beneficiary started the data collection for his own carbon footprint in December covering years 2015 and 2016 in order to have a better picture of the work required for each scope, and finally to better support end users, based on own-experience.

From January 2017 till October 2017 the beneficiary has undertaken various communication activities to support end users in their data collection via e-mail and phone. Questionnaires sent via GoogleForms with self-assessment of carbon footprint data collection progress were delivered on monthly basis.

Succeeding the delivery of the Bilan Carbone model with national emission factors to the end-users, in October 2017, intensified work was performed by the beneficiary in view of assisting end-users in inserting input data for calculating their carbon footprint. Few end users proved to be very independent in inputting the data in the Bilan Carbone model but for the clear majority significant support from the beneficiary is needed.

In this regard, four on-site visits were performed from October 2017 till December 2018 to the following institutions:

- University of Rijeka Faculty of Economics (10<sup>th</sup> October 2017);
- Croatian Employment Service (27<sup>th</sup> November 2017);
- Zagreb Freight Station (6<sup>th</sup> December 2017);
- Croatian Institute for Public Health (18<sup>th</sup> December 2017 and 16<sup>th</sup> December 2016).

The scope of the visits was providing technical support to the end users in inputting the data in the national Bilan Carbone Clim’Foot model and thus calculating the carbon footprint for the organization.

During the visits, the beneficiary presented the LIFE Clim’Foot project to the key employees for the carbon footprint data gathering and calculation process. After a comprehensive presentation a questions & answers section was undertaken, with “practical problems solving” section i.e. data insertion in the Bilan Carbone, finding suitable emission factors, sharing common experiences in the data collection and recalculation process etc.

From January 2018 till mid-March 2018 besides regular communication via e-mails and phone, two on-site were undertaken. The beneficiary used GoogleForms to set the most suitable dates for the on-sites visits, thus communicated directly with the interested employees via e-mails and phones. In the framework of the project, two on-site visits were performed during this period:

- Valamar Riviera (1<sup>st</sup> February 2018) and

- Croatian Lottery (7<sup>th</sup> February 2018).

On-site visits performed from December 2016 till February 2018 in Croatian Institute for Public Health, Faculty of Economics in Rijeka, Croatian Employment Service, Zagreb Freight Station, Valamar Riviera and Croatian Lottery are presented in Figure 3.



Croatian Institute for Public Health



Faculty of Economics in Rijeka



Croatian Employment Service



Zagreb Freight Station



Valamar Riviera



Croatian Lottery

*Figure 3. On-site visits performed from December 2016 till February 2018*

The final version of the national Bilan Carbone Clim'Foot tool with the European and national country-specific emission factors was delivered to the Croatian end users on the 16th March 2018. There was a very extensive tool with a wide palette of possibilities for data entry. When adding new data in the national Bilan Carbone Clim'Foot tool, problems with wrongly connected cells often occurred, which required additional time for spreadsheets calibrating.

Moreover, the template for carbon footprint reporting has been partly adapted to Croatian conditions. For those purposes, the extensive work undertaken by the beneficiary itself for calculating the carbon footprint, was used as an example in the provided consortium template. After all the work has been performed, the template for carbon footprint reporting has been delivered to the end users on the 16th March 2018, together with the national Bilan Carbone Clim'Foot tool.

Considering that the related period from March 2018 till August 2018 was crucial for finalization of voluntary programme activities, intensive work was undertaken by the beneficiary in order to animate end-users to finalize their activities. Five on-site visits were performed:

- Faculty of Mechanical Engineering and Naval Architecture (21<sup>st</sup> March 2018)
- Croatian Environmental Agency (26<sup>th</sup> March 2018)
- EKONERG - Energy and Environmental Protection Institute (29th March 2018)
- Ericsson Nikola Tesla (11<sup>th</sup> May 2018)
- Končar - Power Transformers Ltd. (22<sup>nd</sup> May 2018)

On-site visits performed from March 2018 till May 2018 in Faculty of Mechanical Engineering and Naval Architecture, Croatian Environmental Agency, EKONERG - Energy and Environmental Protection Institute, Ericsson Nikola Tesla and Končar - Power Transformers are presented in Figure 4.



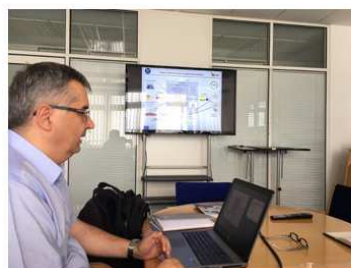
Faculty of Mechanical Engineering



Croatian Environmental Agency



EKONERG



Ericsson Nikola Tesla



Končar - Power Transformers

*Figure 4. On-site visits performed from March 2018 till May 2018*

Nevertheless, during the last months of the LIFE Clim'Foot project implementation, the beneficiary was strongly involved in solving problems regarding data entry mode in the monthly and weekly communication. During this period the economic impact assessment and survey were delivered to the end users, thus requiring further efforts in end-users support for data filling and completing.

#### 2.1.2. Activities realised by end-users

Following the training sessions, representatives from organisations have introduced the management and key employees with their role in the project, defined the parameters and the input data for carbon footprint calculation and started their calculation.

Based on questionnaires delivered from March 2017 till June 2017, 8 organisations were actively responding to the delivered questions, 7 of which were actively collecting the data for organisations' carbon footprint and 5 of them collected above half of the required data.

During the period from June 2017 till September 2017, the Municipal Utility Company Vukovar has informed us that due larger current liabilities, there are unable to keep in truck with project obligations. Croatian Agency for Environment and Nature, Faculty of Economics of the University of Rijeka, Faculty of Mechanical Engineering and Naval Architecture, Croatian Institute for Public Health, Energy and Environmental Protection Institute (EKONERG), Ericsson Nikola Tesla, Končar - Power Transformers, Croatian Lottery and Valamar Riviera showed a progress trend in their data collection. Most of the work undertaken by end-users

was performed during the period of on-site organised meetings (December 2017 till August 2018).

Before December 2017, representatives from the University of Rijeka Faculty of Economics have collected almost all the required data and have inserted majority of it in the Bilan Carbone® model. Correspondingly the carbon footprint calculation for the above-mentioned organization was completed in an early stage. The University of Rijeka Faculty of Economics has considered Scope 1, 2 and 3 which was at first very challenging, but the results appear to be successful. Additionally, an article about their undertaken work and project was published in the local newspapers (<http://www.novolist.hr/Vijesti/Rijeka/Ekonomski-fakultet-postao-prva-visokoskolska-ustanova-s-izracunatim-ugljikovim-otiskom>). In March 2017 the Faculty of Economics from the University of Rijeka has completed its carbon footprint calculation. Even though, completing the carbon footprint calculation previously, the Faculty of Economics from the University of Rijeka has maintained an extremely high level of interest within the voluntary program. Their interest was recognized at the consortium level, which has led to their representative participation at the Final conference, held in June in Paris. The representative from the Faculty of Economics showed a high level of maturity in the carbon footprint calculation. Their results and involvement in the project were disseminated at the local level via local newspapers and other medias. They have expressed their interest in Action plan for carbon footprint reduction development and implementation.

The expert from Croatian Institute for Public Health has been exceptionally active in the data collection since the beginning of the project. Nevertheless, further help was needed because of the comprehensiveness of the national Bilan Carbone model. There were questions from their side concerning the insertion of results gained from the undertaken work in their annual reports, the importance of the carbon footprint calculation on the national levels, and differences between carbon and environmental footprint.

The Faculty of Mechanical Engineering and Naval Architecture, after hosting the on-site visit were in a process of intensive data gathering and have delivered a first draft of the carbon footprint calculation. They have showed high capability in data comprehension giving to the beneficiary additional inputs from an academic perspective. The representative from the Faculty of Mechanical Engineering and Naval Architecture is an active member in the National Technical Committee.

For the representatives of Zagreb Freight Station, due the complexity of their business activities with the purpose to include the most significant ones in the calculation, an on-site visit was organized in December 2017. Even though they showed a low stage in data collection, they emphasized their interest in the project and their willingness to calculate the carbon footprint. The Zagreb Freight Station is particularly interested in energy efficiency and environmental protection projects, and their experts have a good knowledge in those topics.

The experts from the Croatian Employment Service have organized a meeting in their headquarters. The Croatian Employment Service have decided to consider just Scope 1 and Scope 2 because of the complexity for data collection regarding Scope 3 and the lack of time and knowledge to consider Scope 3.

In February 2017, the on-site visit was held in the Croatian Lottery, with three participants representing the key employees involved in the data collection process. Even though they were in a satisfying stage of data collection, they needed additional help and consultations from the beneficiary itself.

As endorsed during the on-site visit, Valamar Riviera experts are very much familiar with the carbon footprint calculation process. They are already using a tool for carbon footprint calculation in the tourist sector from the Hotel Carbon Measurement Initiative, which makes them already aware of the data sets required for the calculation. Valamar Riviera has decided to include all the owned facilities (30 hotels and 12 auto camps) in the calculation, considering having a centralizing system with very comprehensive data sets. The representative from Valamar riviera is considerably active in carbon accounting with high level of knowledge in the topic.

EKONERG experts, besides being part of the voluntary program, have been involved in the development of national database of emission factors which gives them an expert level in scopes comprehension. Besides hosting a meeting in their premises in March 2018, they have delivered a remarkably correct final carbon footprint calculation in the national Bilan Carbone model and appropriate report.

Ericsson Nikola Tesla has disseminated well the acknowledgements obtained within the project in their Company journal. Since they represent one of the largest companies in Croatia, their willingness to participate in the voluntary programme was giving an additional value to the project. They were extremely active in their data collection, trying to comprehend most of their activities and their experts have shown a high level of knowledge in the tops. They have calculated their carbon footprint for all scopes (scopes: 1, 2 and 3) and prepared the report on the results of carbon footprint calculation.

Končar - Power Transformers Ltd. was intensively working on their carbon footprint calculation during the last project months. The lack of emission factor for transformer oil has been pointed out by their experts, which has not been developed in the framework of the project and represents a significant portion of their carbon footprint. They finalised carbon footprint calculation for all three scopes and provided the report in August 2018.

The Croatian Agency for Environment and Nature expert involved in the voluntary programme is also a member of the Advisory board of the project. Since the Agency is national representative for GHG accounting at international level, it has shown interest in the project and involved a lot of staff in carbon footprint calculation. The Agency has delivered good feedback and was actively collecting data since the training sessions. The data collection process resulted with complete carbon footprint calculation for all scopes and very good report on the carbon footprint calculation.

### 2.1.3. Potential inconsistencies and problems

Almost all actively responding organisations come across difficulties in a process of data collection for the carbon footprint calculation. Most problems are related to difficulties in reaching the required data, lack of time of employees' indispensable for the data.

Municipal Utility Company Vukovar encountered into difficulties because of the complexity of data collection and they will implement project activities hardly, because of daily business obligations. One of the involved organizations in the project, Croatian Employment Service wanted to quit because of the complexity of data collection for scope 3. After the communication and in agreement, the beneficiary managed that they will calculate the carbon footprint just for scope 1 and 2. Private company Ledo (food industry) has abandoned the project because of overcrowd in other activities and Municipal Utility Company Vukovar was unable to implement project tasks due daily business obligations.

Scope 3 has shown to be the most challenging for data collection especially for visitors. EIHP has distributed a questionnaire template to be put on the entrance of the building for data gathering of at least a sample of visitors.

Most of the problems have emerged because the data collection process is time consuming for delegated experts, making daily business obligations difficult to arrange with project activities.

#### 2.1.4. Additional comments

Most of the delegated experts from the organisations, as suggested by the beneficiary, have collected the data for the carbon footprint calculation in a separate spreadsheet before entry in the national Bilan Carbone tool. It is also interesting that half of the surveyed experts in the data collection process use the data from the energy audit of the company.

A positive impact of the process of data collection and carbon footprint calculation for involved experts in the organisation is to receive a wider picture, which will allow them to become more familiar with emission structure and recognise activities that mostly contribute to the total GHG emissions. Data collection for the carbon footprint calculation has shown to be a good method for awareness raising of all flows of energy, materials and people, necessary for the functioning of the organisation and related impact to carbon footprint.

## 2.2. Results of the voluntary programme

### 2.2.1. Type of organisations

Twelve organisations have delivered the results of the carbon footprint calculation in the national Bilan Carbone Clim'Foot tool. Most organisations (10) have prepared appropriate report on the carbon footprint calculation. EIHP's end-users are from following type of organisations:

- Number of public organisations: 8
  1. Croatian Agency for Environment and Nature – CAEN (year: 2017)
  2. Faculty of Economics, University of Rijeka – EFRI (year: 2016)
  3. Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb – FSB (year: 2017)
  4. Croatian Institute for Public Health – CIPH (year: 2016)
  5. Croatian Lottery – CL (year: 2017)



6. Zagreb Freight Station, Zagreb Holding – ZFS (year: 2016)
  7. Croatian Employment Service – CES (year: 2016)
  8. Energy Institute Hrvoje Požar – EIHP (years: 2015, 2016 and 2017)
- Number of private organisations: 4
    1. EKONERG - Energy and Environmental Protection Institute (year: 2017)
    2. Ericsson Nikola Tesla – ENT (year: 2017)
    3. Končar - Power Transformers – KPT (year: 2017)
    4. Valamar Riviera – VR (year: 2017)

EIHP's project target is to implement the national Clim'Foot Bilan Carbone model for carbon footprint calculation on at least 10 organisations from private and public sectors, while the final number of organisations is even larger (12). EIHP decided to implement the calculation of own company in order to provide better practical support to the Croatian end-users.

### 2.2.2. Reporting period

EIHP has calculated its own carbon footprint Institute for 2015, 2016 and 2017, while the calculation for other organisations was provided for one year, 2016 or 2017 depending on the available data. The reporting period for carbon footprint calculation of all organisations covered one year.

### 2.2.3. Approach

The carbon footprint of organisations were assessed according to ISO14069 standard and GHG Protocol implemented in the Bilan Carbone tool launched by the French Environment and Energy Agency (ADEME), developed by the Bilan Carbone Association (ABC) and further developed in the framework of Clim'Foot project, translated in the national language and adjusted to a national conditions, which incorporates the emission factors developed in the framework of the LIFE Clim'Foot project.

### 2.2.4. Operational scopes

Most of the organisations in Croatia have prepared their calculation for all three scopes. Nevertheless, in some cases the calculation was not completed for scope 3 activities, because lack of data. Only two organisations have prepared very limited set of data: 1) Zagreb Freight Station - Zagreb Holding (only part of scope 3 activities) and 2) Croatian Employment Service (only part of scope 1 and 2 activities).

### 2.2.5. Problems and solutions encountered during defining perimeters and data collection process

EIHP and end-users have dedicated considerable time to define perimeters and collect data for carbon footprint calculation. Many efforts have been done to perceive which activities should be included into calculation. The main problems encountered in defining perimeters were data collection and emission factors selection are presented below in the list.

- General problems:
  - Long period between the physical trainings and the release of the Croatian Bilan Carbone Clim'Foot tool, hence end-users forgot much necessary information and knowledge,

- Representatives of most organisations did not have enough time for undertaking the web education (online training materials: <https://climfoot-ifc365.talentlms.com/>).
- Data collection:
  - Problems in defining the perimeters needed for carbon footprint calculation, e.g. defining of input materials and services (EIHP delivered to end-users defined set of perimeters for Institute),
  - Difficulties in collecting data, especially for visitors travel and commuting of employees (EIHP prepared questionnaire for data gathering),
  - Problems in estimation or recalculation of input data (e.g. calculation of heat consumption based on share in total heated area of the building, in case of more organisations are hosted in the same building),
  - Calculation of GHG emissions from capital goods and amortisation of emissions for depreciation period (e.g. explanation of differences between the ISO 14069 norm and GHG protocol) etc.
- Emission factors:
  - Difficulties in finding appropriate emission factors (EIHP recommended to use as much as possible Croatian country-specific emission factors),
  - Emission factors were not available for each activity (e.g. EIHP helped Končar to find emission factor for electro-insulating transformer oil).

### 2.2.6. Results of the calculation of the CFO

The overview of carbon footprint calculations for private and public organisations in Croatia are presented in Table 3.

*Table 3. The overview of carbon footprint calculations for private and public organisations in Croatia*

| Organisations   | Carbon footprint calculation |                 |                 |        | Action plan  |
|---|------------------------------|-----------------|-----------------|--------|--------------|
|   | Scope 1                      | Scope 2         | Scope 3         | Report |              |
| Energy Institute Hrvoje Požar (EIHP)                    | Prepared                     | Prepared        | Prepared        | Report | Prepared     |
| Faculty of Economics, University of Rijeka (EFRI)       | Prepared                     | Prepared        | Prepared        | Report | Prepared     |
| Ericsson Nikola Tesla (ENT)                             | Prepared                     | Prepared        | Prepared        | Report | Prepared     |
| Croatian Institute for Public Health (CIPH)             | Prepared                     | Prepared        | Prepared        | Report | Expected     |
| Croatian Agency for Environment and Nature (CAEN)       | Prepared                     | Prepared        | Prepared        | Report | Expected     |
| Končar - Power Transformers (KPT)                       | Prepared                     | Prepared        | Prepared        | Report | Expected     |
| Faculty of Mechanical Engineering and Naval Arch. (FSB) | Prepared                     | Prepared        | Prepared        | Report | Expected     |
| EKONERG - Energy and Environmental Protection Institute | Prepared                     | Prepared        | Prepared        | Report | Not prepared |
| Valamar Riviera (VR)                                    | Prepared                     | Prepared        | Prepared        | Report | Not prepared |
| Croatian Lottery (CL)                                   | Prepared                     | Prepared        | Prepared        | Report | Not prepared |
| Croatian Employment Service (CES)                       | Partly prepared              | Partly prepared | Not prepared    | Report | Not prepared |
| Zagreb Freight Station, Zagreb Holding (ZFS)            | Not prepared                 | Not prepared    | Partly prepared | Report | Not prepared |

**Legend:**  Prepared  Partly prepared  Expected  Not prepared

10 end-users prepared carbon footprint calculation for all three scopes, although for some of them, calculations of GHG emission for Scope 3 activities are not completed. Furthermore, 9 organisations have prepared reports on carbon footprint calculation, while the report for Croatian Lottery has been expected. Calculations of carbon footprint for 2 organisations (Croatian Employment Service and Zagreb Freight Station) are not on a satisfying level. However, carbon footprint calculation for all other organisations could be improved in the future.

The contributions of Scope 1, 2 and 3 activities to the total carbon footprint for 4 private and 6 public organisations (except Croatian Employment Service and Zagreb Freight Station) are presented in Figure 5. Croatian Employment Service and Zagreb Freight Station have also provided calculation in the national Bilan Carbone Clim'Foot tool, but for a limited set of activities (Table 4). It was the main reason for excluding data of these two organisations from Figure 5.

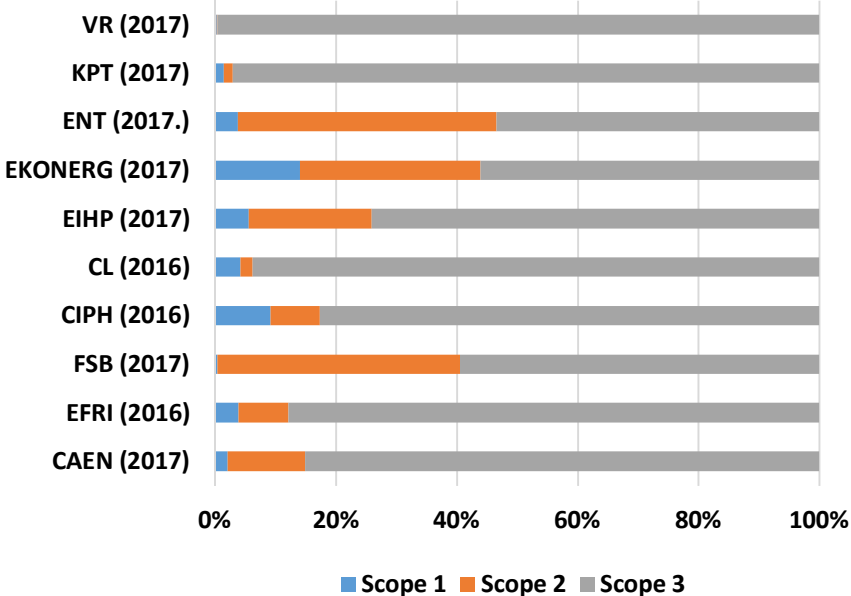


Figure 5. The contributions of Scope 1, 2 and 3 activities to the organisations' carbon footprints

Scope 3 activities contributed to the total carbon footprint of organisations with more than 50% in analysed organisations. The results of the carbon footprint calculation for all 12 organisations in Croatia, in accordance with the ISO 14069 norm, are presented in Table 4.

Table 4. Results of the carbon footprint calculation for private and public organisations in Croatia

| Organisation  | EIHP  | EIHP        | EIHP        | CAEN        | EFRI        | FSB         | ENT          | CL            | CIPH         | CES          | ZFS         | EKONERG     | KPT         | VR             |                  |
|---|---|-------------|-------------|-------------|-------------|-------------|--------------|---------------|--------------|--------------|-------------|-------------|-------------|----------------|------------------|
| Year  | 2015  | 2016        | 2017        | 2017        | 2016        | 2017        | 2017         | 2017          | 2016         | 2016         | 2016        | 2017        | 2017        | 2017           |                  |
| <b>ISO 14069 norm</b>                               |   |             |             |             |             |             |              |               |              |              |             |             |             |                |                  |
| <b>tCO<sub>2</sub>e</b>                             |   |             |             |             |             |             |              |               |              |              |             |             |             |                |                  |
| 1   | Direct emissions from stationary combustion sources | 0           | 0           | 0           | 0           | 39          | 17           | 34            | 0            | 212          | 0           | 0           | 0           | 2,405          | 6,881            |
| 2   | Direct emissions from mobile combustion sources     | 20          | 28          | 29          | 14          | 0           | 4            | 10            | 242          | 28           | 5           | 0           | 60          | 29             | 0                |
| 3   | Direct emissions from processes                     | 0           | 0           | 0           | 0           | 0           | 0            | 0             | 0            | 0            | 0           | 0           | 0           | 0              | 0                |
| 4   | Direct fugitive emissions                           | 7           | 7           | 7           | 2           | 0           | 0            | 659           | 0            | 0            | 0           | 0           | 4           | 3              | 570              |
| 5   | Direct emissions from LULUCF                        | 0           | 0           | 0           | 0           | 0           | 0            | 0             | 0            | 0            | 0           | 0           | 0           | 0              | 0                |
| <b>Scope 1 total</b>                                |   | <b>27</b>   | <b>35</b>   | <b>36</b>   | <b>16</b>   | <b>39</b>   | <b>22</b>    | <b>703</b>    | <b>242</b>   | <b>240</b>   | <b>5</b>    | <b>0</b>    | <b>64</b>   | <b>2,437</b>   | <b>7,451</b>     |
| 6   | Indirect emissions from electricity consumption     | 88          | 82          | 81          | 59          | 82          | 461          | 5,556         | 81           | 214          | 57          | 0           | 53          | 2,363          | 1,548            |
| 7   | Indirect emissions from network energy consumption  | 51          | 59          | 52          | 38          | 0           | 1,579        | 2,454         | 36           | 0            | 0           | 0           | 84          | 0              | 0                |
| <b>Scope 2 total</b>                                |   | <b>140</b>  | <b>141</b>  | <b>133</b>  | <b>96</b>   | <b>82</b>   | <b>2,040</b> | <b>8,010</b>  | <b>118</b>   | <b>214</b>   | <b>57</b>   | <b>0</b>    | <b>137</b>  | <b>2,363</b>   | <b>1,548</b>     |
| 8   | Emissions due to energy not covered by 1 to 7       | 17          | 19          | 18          | 12          | 11          | 203          | 769           | 67           | 46           | 6           | 0           | 25          | 1356           | 1,194            |
| 9   | Purchased goods                                     | 47          | 49          | 45          | 238         | 14          | 761          | 699           | 95           | 67           | 0           | 0           | 49          | 37,312         | 8,151            |
| 10  | Capital goods                                       | 63          | 65          | 61          | 65          | 11          | 545          | 338           | 185          | 11           | 0           | 0           | 34          | 36             | 13,723           |
| 11  | Waste generated                                     | 1           | 1           | 1           | 2           | 4           | 88           | 63            | 4,986        | 1,661        | 0           | 0           | 4           | 326            | 2,618            |
| 12  | Upstream transport and distribution                 | 3           | 4           | 4           | 0           | 0           | 0            | 56            | 0            | 16           | 0           | 0           | 0           | 28,796         | 0                |
| 13  | Business travels                                    | 157         | 173         | 213         | 137         | 49          | 683          | 4,096         | 10           | 358          | 0           | 0           | 45          | 74             | 23               |
| 14  | Upstream leased assets                              | 0           | 0           | 0           | 0           | 0           | 0            | 0             | 0            | 0            | 0           | 0           | 0           | 0              | 0                |
| 15  | Investments   | 0           | 0           | 0           | 0           | 0           | 0            | 0             | 0            | 0            | 0           | 0           | 0           | 0              | 0                |
| 16  | Transportation of clients and visitors              | 73          | 74          | 72          | 22          | 661         | 437          | 2,621         | 0            | 0            | 0           | 0           | 16          | 96             | 182,147          |
| 17  | Downstream transportation of goods and distribution | 0           | 0           | 0           | 0           | 0           | 0            | 0             | 0            | 0            | 0           | 0           | 0           | 0              | 1,979,943        |
| 18  | Use of sold products                                | 0           | 0           | 0           | 0           | 0           | 0            | 0             | 0            | 0            | 0           | 0           | 0           | 86,446         | 1,147            |
| 19  | End-of-life of sold products                        | 0           | 0           | 0           | 2           | 0           | 1            | 10            | 0            | 0            | 0           | 0           | 0           | 892            | 0                |
| 20  | Downstream franchises                               | 0           | 0           | 0           | 0           | 0           | 0            | 0             | 0            | 0            | 0           | 0           | 0           | 0              | 0                |
| 21  | Downstream leased assets                            | 0           | 0           | 0           | 0           | 0           | 0            | 0             | 0            | 0            | 0           | 0           | 0           | 0              | 0                |
| 22  | Employee commuting                                  | 60          | 65          | 67          | 160         | 119         | 308          | 1,333         | 65           | 0            | 0           | 44          | 82          | 3              | 3,553            |
| 23  | Other indirect emissions                            | 0           | 0           | 0           | 0           | 0           | 0            | 0             | 0            | 0            | 0           | 0           | 0           | 2              | 0                |
| <b>Scope 3 total</b>                                |   | <b>422</b>  | <b>450</b>  | <b>482</b>  | <b>637</b>  | <b>871</b>  | <b>3,026</b> | <b>9,986</b>  | <b>5,408</b> | <b>2,159</b> | <b>6</b>    | <b>44</b>   | <b>257</b>  | <b>155,340</b> | <b>2,192,499</b> |
| <b>Total carbon footprint</b>                       |   | <b>589</b>  | <b>626</b>  | <b>651</b>  | <b>749</b>  | <b>992</b>  | <b>5,087</b> | <b>18,699</b> | <b>5,768</b> | <b>2,614</b> | <b>68</b>   | <b>44</b>   | <b>458</b>  | <b>160,140</b> | <b>2,201,498</b> |
| Number of employees                                 |   | <b>79</b>   | <b>86</b>   | <b>89</b>   | <b>114</b>  | <b>102</b>  | <b>423</b>   | <b>2,268</b>  | <b>1,324</b> | <b>259</b>   | <b>134</b>  | <b>70</b>   | <b>120</b>  | <b>570</b>     |                  |
| <b>Carbon footprint (tCO<sub>2</sub>e/employee)</b> |   | <b>7.45</b> | <b>7.28</b> | <b>7.31</b> | <b>6.57</b> | <b>9.72</b> | <b>12.03</b> | <b>8.24</b>   | <b>4.36</b>  | <b>10.09</b> | <b>0.51</b> | <b>0.63</b> | <b>3.81</b> | <b>280.95</b>  |                  |

### 2.2.7. Reduction approach

The main difficulties in development of the action plans for carbon footprint reduction were the late preparation of the instruction and appropriate template. Based on the instructions from ADEME, Energy Institute Hrvoje Požar has prepared its action plan in July 2018 and delivered it to 6 interested organisations (Faculty of Economics in Rijeka, Ericsson Nikola Tesla, Croatian Institute for Public Health, Croatian Agency for Environment and Nature, Končar - Power Transformers and Faculty of Mechanical Engineering and Naval Architecture). In September 2018, two additional organisations provided their action plans: Faculty of Economics in Rijeka and Ericsson Nikola Tesla.

#### Energy Institute Hrvoje Požar

Energy Institute Hrvoje Požar defined cost-effective measures for most significant activities. Eco-driving training and adjustment of official cars size and model are selected measures for Scope 1 activities. Even though most measures related to energy savings have already been implemented (Scope 2 activities), there are still some relevant steps to be taken. Recommended measures are in line with the energy audit: decreasing internal room temperature, installation of thermostatic radiator valves on radiators after room temperature decreasing, replacement of existing air-cooled compression chiller and energy efficiency improvement of the ventilation system. The expected GHG emissions reduction for scope 3 activities should be achieved by: set up of a teleworking program, promotion of video-conferencing, promotion of public transportation for business trips, inclusion of green public procurement criteria in call for tenders, introduction programme of a paperless, installation of water pressure regulators and sending of studies to client by e-mail instead of sending hard copies. Short and long term GHG reduction targets have been set for two target achievements for years 2020 and 2030, for which the EIHP will aim to reduce its GHG emissions by: 3.1 percent below 2017 levels no later than 2020 (20 tCO<sub>2</sub>e) and 13.7 percent below 2017 levels no later than 2030 (89 tCO<sub>2</sub>e).

#### Faculty of Economics in Rijeka

Faculty of Economics in Rijeka (EFRI) constantly analyses its environmental impacts as a part of its business strategy and educational orientation. Reductions regarding GHG emissions in general, including electricity savings, reduction of disposed materials and recycle management are constantly being evaluated. Main GHG impact is related to transport of students and employees and represents an external factor of organization depending on types of transport. Main lines of reductions will continue to be in domain of eco-efficient management of used materials, IT equipment and energy usage. Short and long term GHG reduction targets have been set for two target achievements for years 2020 and 2030, for which the EFRI will aim to reduce its GHG emissions by: 4.1 percent below 2016 levels no later than 2020 (41 tCO<sub>2</sub>e) and 15.0 percent below 2016 levels no later than 2030 (149 tCO<sub>2</sub>e).

#### Ericsson Nikola Tesla

In Ericsson Nikola Tesla, the focus on carbon footprint reduction should be in two main areas: energy sources and passenger travels (business trips and daily travels to work). Reduction of

carbon footprint in the category of energy sources is primarily possible by improving the physical properties of buildings and thermo-technical plants and belonging infrastructure. Reduction of carbon footprint in the category of passenger travels is possible by enhancing employees' environmental awareness and focusing on the use of more environmentally friendly modes of transport (public transport, bicycles, walking, car sharing, etc.). Many business trips can be replaced by usage of ICT tools such as teleconferencing.

### 3. Experiences, feedbacks

The end-users found that the 2 days training were very useful. They learned a lot on carbon footprint calculation and reduction process at the training. The trainings were well-structured, and information was understandable for end-users. Two days on one hand were too long time to be out of work for end-users, but from trainers' perspective two days were very short time to teach everything deeply. Consequently, EIHP tried to give end-users additional logistic support for implementation of the national Bilan Carbone Clim'Foot model.

The voluntary programme has highlighted that the organisations were not able to calculate their carbon footprint by themselves after 2 days training. Even though the end-users already had an expertise on the topic, the initial training was not enough, and they needed to be accompanied with additional support during the experimentation phase.

One of the main issues encountered from the end-users was their willingness to work on the final version of the tool. This issue has been solved with the final Croatian version of Bilan Carbone, prepared in March 2018. In fact, the provision of the final version of the Bilan Carbone tool, translated in the national language, has registered a renewed interest of the end-users, and their commitment in completing the carbon footprint calculation. Another important step in accelerating the data collection process were meetings at the organisation's premises. At these meetings, EIHP would get better acquainted with the organisations and their problems in the carbon footprint calculation process, and consequently provide them with concrete assistance in solving problems.

Establishment of the platform in the framework of LIFE Clim'Foot project (<http://www.climfoot-project.eu/>), with comprehensive information on the practice in the Bilan Carbone Clim'Foot tool (including free online training and onsite training materials), methodology for assessing carbon footprint, methodology for defining a reduction action plan and methodology for building a emission factors database, will help the sustainability of carbon footprint calculation and reduction process in Croatia.