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# 122 Circular Conference Toolkit. Case study ERSCP 2019 conference.

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## Abstract

Conference and fair events are fully integrated into the cities' economic activity. They are highly valued as place marketers, promoting tourism and talent-attraction. Considering sustainability, they can make critical choices to have a positive influence not only on the local environment but also to avoid embodied impacts in the form of CO2 emissions, land, and water use.

The increase of this kind of activity and not taking into consideration the COVID-19 crisis, motivates this article to describe the process to design the "Circular Conference Toolkit" which aims to provide tips for organizing more sustainable conferences. The Circular Conference Toolkit lowers carbon emissions contributing to achieve carbon neutrality, reduces and recirculates waste towards zero waste, and increases sustainability awareness amongst the attendees promoting sustainable consumption to conference and fair events.

Following the Action-Research methodology, the toolkit was piloted in the 19th ERSCP Conference as a case study. Under the research paradigm of pragmatism, the design process was divided into three cycles; the first one implied analysing the state of the art; the second cycle consisted firstly in designing the tools through stakeholders and location analysis, brainstorming, co-creation and co-decision matrix. Secondly, piloting the toolkit in the case study and thirdly involving the post-conference evaluation that presented an assessment of the sustainable initiatives implemented during the ERSCP 19 Conference including a checklist, an environmental impact assessment, surveys and social media analysis. The environmental impact assessment was carried out through the comparison of two material flow analyses represented with Sankey diagrams of the estimation of the conference streams, with and without the implementation of the Circular Conference Toolkit. This analysis showed savings of

GHG emissions due to the use of renewable energies, and the CO2 offset program, which compensated 19% of the attendees' travel emissions (49000kg of 252426,38kg of CO2 eq/kg). Regarding materials, the strategy adopted considered a degrowth and an ecological perspective in the conference purchasing. The use of paper was reduced from around 400kg to 20kg thanks to digitalization. Plastic use also showed a significant reduction, from approximately 500kg to 4kg as a result of the zero plastic approach during the conference. Refusing plastic packaging at the catering in favor of compostable and biodegradable materials and avoiding other plastics by eliminating merchandising gifts to the attendees contributed to reducing the amount of plastic used. After strongly reducing waste streams, ensuring the treatment of the remaining waste through a conscious-chosen circular approach contributed to enhancing the sustainability of the event.

The result of the whole process was the Circular Conference Toolkit, a set of 37 guidelines divided by areas of action consisting of carbon neutrality, towards zero waste and sustainable consumption. The toolkit encompasses an open process of collaboration and reflection where the conference attendees, organisers and service providers are all included.

**Keywords:** Circular Economy, Sustainable development, Research action, Sustainable conference.

## Introduction

A sustainable event is one designed, organized, and implemented in a way that minimizes potential negative impacts and leaves a beneficial legacy for the host community and everyone involved. Event greening or Sustainable event management (SEM) is the merging of event management with sustainability principles and practices, where sustainability awareness, design, and decision making are fully integrated into its management logistics, operations, and production (Katzel, 2007).

This paper describes the design of the Circular Conference Toolkit, which was applied and tested at ERSCP 19 Conference in October 2019 at the Universitat Politècnica de Catalunya (UPC-Barcelona Tech). As sustainability is a cross-cutting discipline that involves environmental, social, and economic spheres, the Circular Conference Toolkit's emphasizes three areas of action defined by the own ERSCP19 organizers: Carbon neutrality (energy usage and transport), Towards Zero Waste (resource use and waste management) and the principles of Sustainable Consumption.

The conference participants were engaged to take part in all the phases of the design process; from asking them ideas and conference expectations, to testing the Circular Conference Toolkit during the conference and making a post-event evaluation. The ultimate goal was being able to develop a toolkit exportable to further conferences, not only at UPC but also abroad.

## Methods

This paper follows the Action-Research (AR) methodology. AR is traditionally described as a research approach based on a collaborative problem-solving relationship between researcher and client aimed at solving a problem and generating new knowledge (Zeichner, 2001). This aspect of problem-solving accurately introduces the research paradigm, which in this case would be pragmatism. This research paradigm is concerned with knowledge of action and change (Goldkuhl, 2011). The purpose of knowledge here is to improve existence through action (Dewey, 1931) and in this specific case study, by the design of a service and its implementation. The similarities between AR methodology and the design process are also noted. According to Cal Swann in his theory about *Action Research and the Practice of Design* (Swann, 2002), AR provides a tried and tested model for immediate translation to design practice where the implicit process becomes explicit. It lets you learn consciously from the project and thus growing empowered through the process.

As mentioned before, AR is a sequence of events or iterative cycles. Following the Cal Swann theory, the design process is described as iterative because it can only be effective if it is a constant process of revisiting the problem, reanalyzing it, and synthesizing a revised solution. This relation between AR and the design process is remarkable since both are integrated into this thesis, structured through the three cycles that allow designing a system as a result; the Circular Conference Toolkit in this case. Figure 1 shows the action research process, it's phases and tools used in this case study.

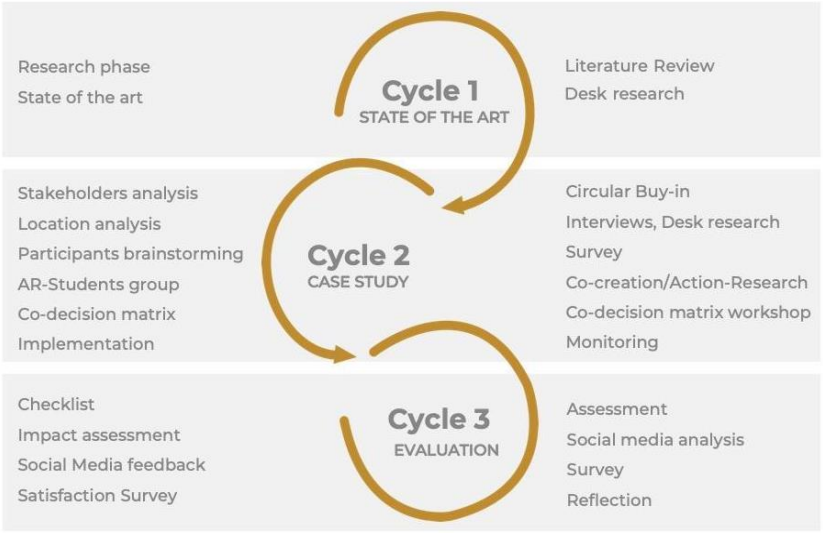


**Figure 1. Action Research cycles, phases (left column) and tools (right column).**

## Cycle 1: State of the art

Even if researching and literature reviewing is inherent to the whole process, the First Cycle (C1) is the research phase. It explores the state of the art of sustainable and "circular" events. This research focuses transversely on the three areas of action of

ERSCP 2019: Carbon neutrality, Towards Zero Waste and Sustainable Consumption. The main methodology to be applied is a literature review and desk research.

## Cycle 2: Case study

The Second Cycle (C2) consists in developing the case study, ERSCP 19. It is composed by different sections and it includes a variety of methodologies depending on each approach:

- **UPC location Analysis:** It is an overview of UPC's current status about the three areas and conference celebration and it highlights the UPC policies that could promote sustainability in conferences among the UPC campuses. The methodology applied is desk research to analyze the UPC's current status and interviews to complement the information obtained.
- **Participants brainstorming:** Six months before the conference, 19 participants of the ERSCP answered a survey aimed at gathering ideas regarding the three areas of action. The survey allowed knowing their expectations and sustainable awareness. The methodologies applied were brainstorming, survey and their corresponding analyses
- **Action Research. Co-creation with students´ group:** This section consisted in a co-creation session with the master student's group from the course "Research-Action Workshop on Sustainability Science and Technologies" of the Master's Degree in Sustainability Science and Technologies. This collaboration provides new ideas for the conference and engages master students in its organization. The methodologies applied are Action-Research and co-creation.
- **Co-Decision Matrix Workshop:** This matrix is formed by the conclusions from the different sections along C1 and C2. The objective is evaluating and deciding which initiatives are going to compose the Circular Conference Toolkit according to an experts committee criteria. The methodology applied is decision matrix, and the evaluation criteria is: impact, viability, and desirability.

## Cycle 3: Evaluation

The third Cycle (C3) is the post-conference evaluation. It presents an assessment of the sustainable initiatives applied during the ERSCP 19 Conference. The objective is to know which of the initiatives worked properly and which did not. Firstly, we will do a checklist and secondly a brief impact assessment. To know the conference' participants feedback, we will do a social media analysis based on twitter and a feedback survey:

- **Checklist:** The checklist is designed to check which initiatives were implemented and succeeded, which ones were implemented but did not

succeed, and which ones could not be implemented. This enables us to do a reflection of the implemented initiatives and investigate ways of improving.

- **Environmental Impact assessment:** This is a qualitative analysis that shows the environmental impacts that could not be avoided at the ERSCP 19 Conference.
- **Satisfaction Survey:** This survey is intended to be sent after the conference to know the satisfaction of the participants and their opinion about the Circular Conference Toolkit test. It enables us to identify gaps and opportunities to improve in future ERSCP Conferences.

# Results

## Results of Cycle 1: State of the art

The development of the state of the art revealed that ISO1400, ISO20121 and EMAS (Environmental Management Auditing Scheme) are three standards related to sustainable events. The first one is related to environmental management, the second one is applied explicitly to sustainable event management, which makes it a feasible option to be applied in this industry and the third one belongs to the European system and works towards the continuous improvement cycle and an increase in environmental performance.

In relation to the 3 areas of action of the ERSCP 2019, Carbon neutrality in conferences and events have shown to be directly related to mobility, energy consumption, location and infrastructure and indirectly related to product consumption, food and waste. Zero waste applied to events has shown to be related to waste management, merchandising and products purchasing and catering. Research showed how sustainable consumption in conferences and events is related to water consumption, products consumption, food and employment.

In terms of general impacts in conferences and events, literature points out that those have a significant global ecological impact. Attracting a large number of people into a limited geographic space for a relatively short period of time inevitably comes with undesirable impacts (Nguyen, 2018). The most significant impacts that have been identified are: visitor travel (carbon pollution), food and drink consumption, and waste (Dickson & Arcodia, 2010). In contrast to negative impacts, significant events can stimulate the development of infrastructure for waste management and long-term conservation of natural areas to protect against influxes of large crowds (Musgrave & Raj, 2009). Thus, they can serve as a platform to raise awareness of local environmental issues (Porter & Kaufman, 2012), but this is not always the general trend. While financial gains may allow for many benefits, events that do not pay sufficient attention to the local social and environmental concerns may ultimately result

in long term costs for the hosting community (Cashman, 2003). Table 1 synthetases the impacts of events by the three pillars of sustainability.

**Table 1. Impacts of events by the three pillars of sustainability based on literature: Dwyer et al. (2000), Fredline & Faulkner (2000), Cashman (2003), Gursoy and Kendall (2006), Bowdin et al, (2006), Da´vid (2006), Wait (2008), Musgrave and Raj (2009), Pernecky & Lucky (2015).**

| Impacts | Economic | Social | Environmental |
|---|---|---|---|
| Positive | Direct / Indirect expenditure.<br><br>Additional trade and business development.<br><br>Event product extensions.<br><br>Impacts related to tourism (destination promotion, commercial activity and job creation). | Induced development.<br><br>Job creation.<br><br>Revitalizing traditions.<br><br>Expanding cultural perspectives.<br><br>International prestige.<br><br>Development of administrative skills.<br><br>Talent attraction. | Providing models for best practice.<br><br>Raising awareness of environmental issues.<br><br>Urban transformation renewal.<br><br>Improved public transport.<br><br>Development of wasteland. |
| Negative | Cost of event failure to the local economy and financial loss.<br><br>Inflated price of products, services and housing (Gentrification).<br><br>Unequal distribution of wealth.<br><br>Community resistance to tourism.<br><br>Loss of local identity.<br><br>Exploitation. | Exploitation of local human resources.<br><br>Unequal distribution of wealth.<br><br>Disruption of local lifestyle and normal business.<br><br>Community manipulation.<br><br>Social dislocation.<br><br>Increased risk of security issues.<br><br>Future use of new events infrastructure not maximized.<br><br>Community apathy and rejection. | Location damage in the short and long term.<br><br>Waste pollution.<br><br>Noise pollution.<br><br>Traffic disruption and congestion.<br><br>Increase in energy demands and other natural resources.<br><br>Destruction of heritage.<br><br>Carbon emission from travel.<br><br>Food waste. |

To facilitate the design of the Circular Conference Toolkit, specific potential impacts of the ERSCP 19 Conference were detected and divided in the three areas (carbon neutrality, towards zero waste and sustainable consumption). Figure 2 presents the

prevention of potential impacts of the ERSCP 19, considering the context of location, time, and own organization resources. These impacts were considered during the design of the Circular Conference Toolkit to avoid or reduce them.

| 3 AREAS | ACTIVITY | IMPACTS |
|---|---|---|
| $CO_2$ | TRANSPORT | · Emissions: enhanced greenhouse effect, acidification, health problems |
| | ENERGY<br>Electricity use and gas consumption | · Energy use from natural resources: depletion of natural resources,<br>· Carbon emissions |
| | CATERING | · Food production and transport: air pollution and carbon emissions, greenhouse effect |
| | CATERING | · Food waste: food shortages, water consumption, agricultural land use<br>· Plastic packaging: plastic pollution |
| | WASTE GENERATION | · GHG emissions<br>· Overfilling of landfills<br>· Pollution of air, soil and water<br>· Harm towards animal and marine life<br>· Wasting of resources |
| | WATER CONSUMPTION | · Waste loss from food waste: fresh water scarcity<br>· Water pollution from waste and toilet use |
| | CONSUMPTION | · Packaging and one-use products waste<br>· Unequal income distribution<br>· Manufacturing effects: pollution and GHG emissions |
| | TOURISM | · Gentrification<br>· Local entity loss<br>· Addition environmetal effects: GHG, waste, waster consumption<br>· Temporal and low-paid working conditions |

**Figure 2. Impacts prevention of the ERSCP 19 Conference.**

## Results of Cycle 2: Case study

### Results of the UPC location analysis:

ERSCP 19 takes place at Vertex Building (Campus Nord) at the Universitat Politècnica de Catalunya - BarcelonaTech. Since the location is part of the university infrastructure, the ERSCP 19 conference is conditioned by UPC resources. Figure 3 shows the UPC and ERSCP 19 contributions to the three areas of action (carbon neutrality, towards zero waste and sustainable consumption, in order of appearance in the figure).


**Figure 3. UPC and ERSCP 19 contribution to the three areas of action.**

**Results of the participants brainstorming:**

The survey was answered by 126 people, from 35 different countries, most of them from Europe. The professional status of the contestants was essentially related to the academic field (researcher, academic, Ph.D. or master student) while there was a little proportion, 5.6%, with a different background such as policymaker, business, manager and previous students from the Master in Sustainability Science and Technology. 70 suggestions were gathered in relation to the Zero Waste area of action, 65 for Sustainable consumption, 54 for Carbon neutrality and 23 as additional ideas or comments. Answers were filtered, eliminating those which were not considered valid, i.e., "no" or "nothing". Repeated answers were classified as "popular suggestions" and "expectations of the participants". Suggestions that were interesting according to the authors criteria were used as a source of ideas. Table 2 gathers the most popular suggestions to achieve carbon neutrality, zero waste and to promote sustainable consumption during the conference.

**Table 2. Results of the survey brainstorming. Popular suggestions to achieve carbon neutrality, zero waste and promoting sustainable consumption at ERSCP 2019.**

| Areas of action | Ideas | Popularity (times of appearance) |
|---|---|---|
| Carbon neutrality | Compensation project of carbon emissions | 12 |
| | Encourage sustainable mobility | 7 |
| | Vegan or vegetarian menu | 4 |
| | Calculate carbon footprint | 4 |
| Towards zero waste | Do not offer single-use articles | 16 |
| | Reusable bottles and cutlery | 15 |
| | Digitalization and APP | 13 |
| | Avoid printed materials | 13 |
| | To bring own mugs, bottles and bags | 7 |
| | Zero waste catering service | 7 |
| Sustainable consumption | To provide local and organic food | 12 |
| | Vegan or vegetarian menu | 12 |
| | No plastic and single-use articles, paper-free | 12 |
| | Offer tap water | 5 |
| | Reusable mugs and bottles | 4 |
| | Zero waste catering service | 7 |
| | Share information about best practice businesses | 4 |

**Results of the Action Research. Co-creation with student's group:**

This section shows the results of co-creation with a master student's group from the course "Research-Action Workshop on Sustainability Science and Technology". Main results involved a carbon footprint estimation of the event, a CO2 compensation program and an estimation of a Material flow analysis.

The calculation of the Carbon Footprint Estimation is based on the practical guide to calculate greenhouse gas emissions of the *Oficina Catalana del Canvi Climàtic* (2019). The carbon footprint of the conference is divided in two parts; Fixed and variable and it is calculated considering 250 assistants.

Fixed part includes Energy supply (electricity and gas), water consumption, Food consumption and catering transport and waste carbon footprint. The Variable part includes an estimation of the mobility (travel mode) of each participant.

Figure 4 shows the carbon emission percentages with the different proportions of the ERSCP 19 carbon footprint estimation. Most of the carbon footprint comes from air travel (98,16 %). The Fixed part only represents less than 2% thanks to the ERSCP 19 organization committee in developing the conference as sustainable as possible.

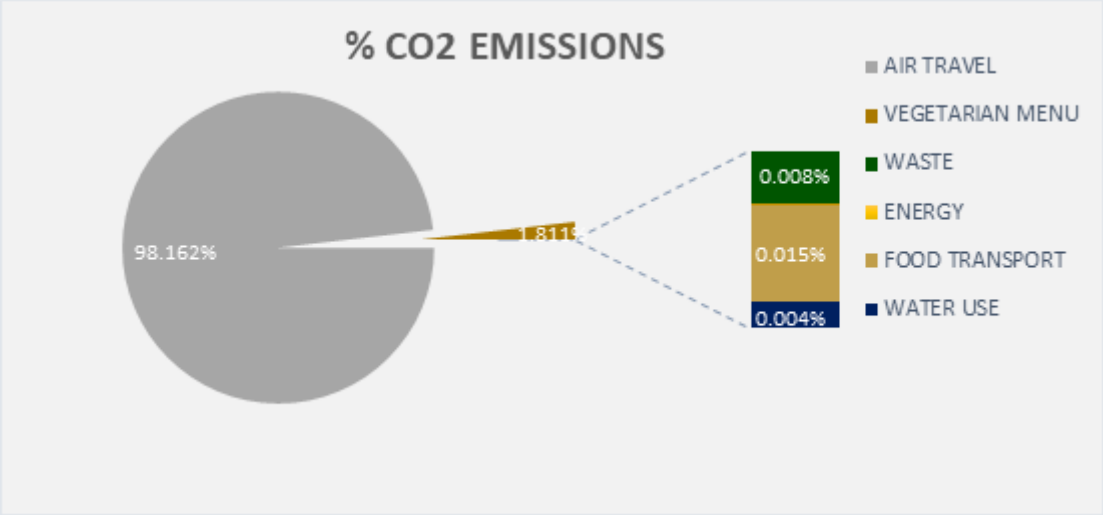


**Figure 4. Carbon footprint percentages by categories.**

To tackle the issue of the carbon footprint from air travel, we have designed a carbon $CO_2$ compensation program. There are some existing companies that offer as a service the calculation and the compensation of the event's carbon footprint. From the point of view of the ERSCP 19 organization committee, these mentioned companies are not transparent at all, and people are getting used to paying and forget about the impacts they are generating. For this reason, we have created a program where the participants take action during the process. During the online registration, there was the option to participate in the $CO_2$ compensation program. Participating was voluntary because there were some identities/universities that already had their own compensation programmes. Also, some people choose alternative travel modes like the train instead

of the plane to reduce their carbon footprint. To get involved in the $CO_2$ Compensation Program, during the online registration the participants had to choose their option depending on the country they came from. Regarding the $CO_2$ Compensation projects, we explored some options such as reforestation projects in Spain, research projects at the UPC and UB (Universitat de Barcelona) and funding students projects. Finally, we selected two projects to be voted on by the participants during the ERSCP 19 Conference. The project UPC, Biodiversity Conservation at Torre Girona and the project ADENC, Biodiversity Conservation Parc Gripia Ribatallada at Sabadell-Terrassa. A further idea for the Carbon Compensation program was adding a $CO_2$ icon in the badges. The number of icons depended on each participant's performance about their mobility, as Figure 5 illustrates.

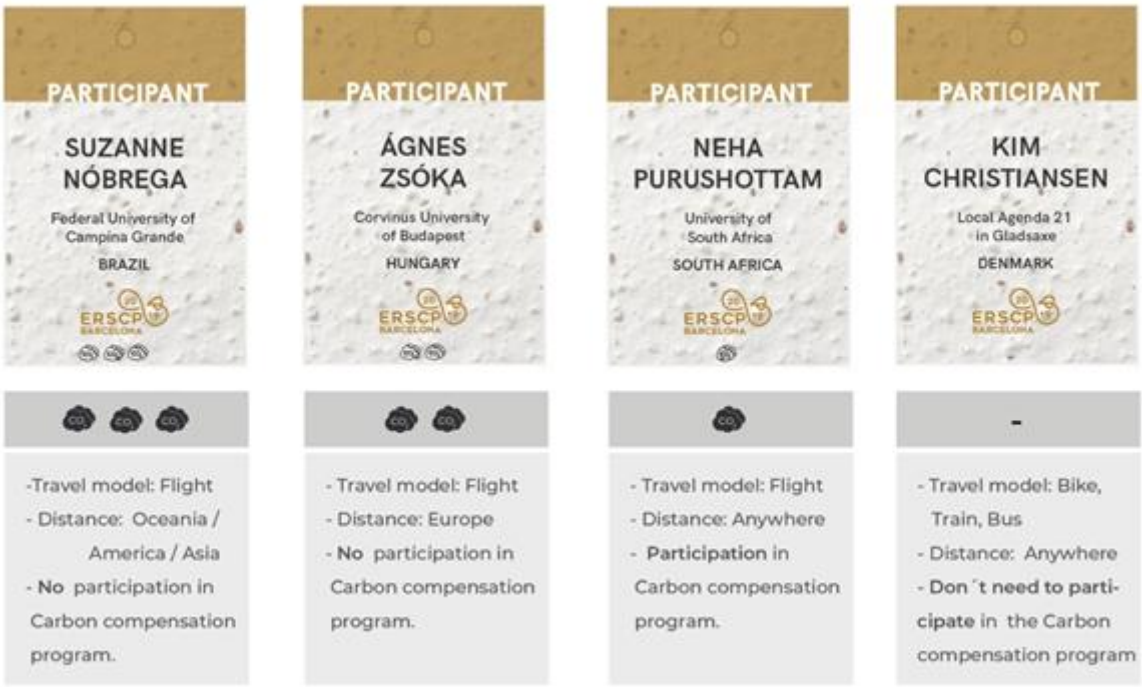


**Figure 5. Participants badges showing their Carbon footprint performance through icons.**

Figure 6 shows an estimation of a general conference material flow, which does not consider sustainability. The graph maps all the potential wastes and impacts. The Material Flow Analysis of DGTL Festival 2018 by Metabolic (Cycle 1) has been taken as a reference.

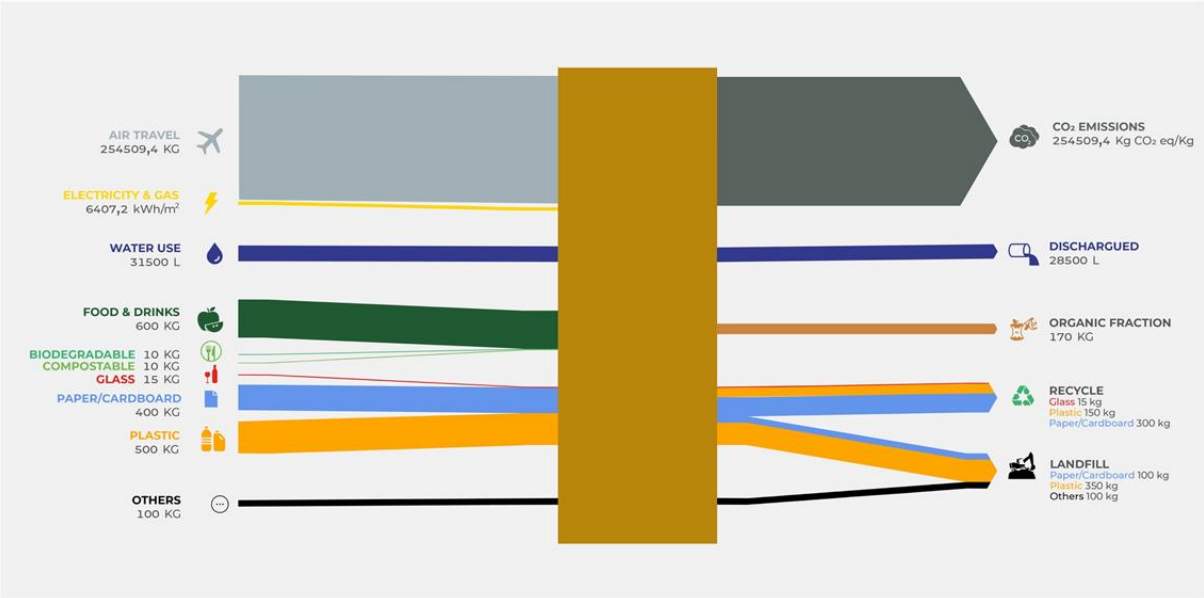


**Figure 6. Material flow analysis of the ERSCP 19 without the Circular Conference Toolkit.**

### Co-decision matrix workshop

A co-decision matrix workshop was conducted with an expert committee. The objective consisted on choosing adequate existing ideas and actions to reach Carbon neutrality, Towards zero waste and Sustainable consumption at the ERSCP 19. As an outcome, we created a list that contained selected actions related to the three areas of action to implement during the ERSCP 19. This list is the Circular Conference Toolkit applied at the conference of this case study.

**Table 3. Circular Conference Toolkit applied at ERSCP 19.**

| **The Circular Conference Toolkit** | |
|---|---|
| **Areas of action** | **Actions to be implemented** |
| Carbon neutrality | Location: accomplishment with sustainability standards |
| | To calculate the carbon footprint |
| | An adequate use of air conditioning |
| | Compensation program of Carbon footprint |
| | To incorporate renewable energy in the supply contract |
| | To maximize the use of natural lighting |

| | |
|---|---|
| | To provide reusable infrastructures (In case of use) |
| | Lowering fees for people who travels by train instead of aviation |
| Towards zero waste | Promote a selective collection of waste |
| | To scale the purchasing based on the conference needs (event typology, location, number of assistants, schedule, duration…) |
| | To eliminate or reduce printed materials. To prioritize recycled paper. |
| | Digitalization: to provide information by mail, website, apps... |
| | Avoiding the use of single-use plastic plates, glasses and cutlery. |
| | To choose a provider which ensures the correct waste management |
| | To inform participants to bring their own mugs, bottles and bags and badges lanyards. |
| | Zero waste catering service |
| | Avoiding Conference merchandising gifts |
| | To ensure an adequate Waste management system |
| | To avoid and reduce the source waste generations: product packaging. |
| | The possibility to give away the food leftovers |
| | To scale the need of food to minimize food waste |
| | Material Flow Analysis: qualitative (previous) and quantitative (after). |
| | To establish a local system of composting |
| Sustainable consumption | To provide water refill stations |
| | To promote social inclusion through the conference services and providers |
| | To promote and inform about sustainable and ethical accommodation, restaurant, and other activities for the assistant's |

| | |
|---|---|
| | free time. |
| | Vegan or vegetarian (at least) menu |
| | To establish green purchasing policies and criteria |
| | To prioritize green / local food and drinks |
| | To ensure positive impact on local community |
| | Joint collaboration project among participants. To facilitate networking and meeting spaces. |
| | Swap corner (Rent corner: charge cables, pen drives…) |
| | To allow virtual participation to limit travel |

## Results of Cycle 3: Evaluation

### Results of the Checklist

Figure 7 shows the checklist of tasks divided by the three areas of action of the ERSCP 2019. In general terms, most of the tasks that were implemented did succeed. Specifically the plantable badge had a good reception by the participants; the development of an app contributed to save a very high amount of paper; informing participants about bringing their own reusable bottles allowed to reduce drastically the use of plastic bottles during the sessions; merchandising gifts were not missed by the participants and the vegetarian and “Zero km” menu showed a good acceptance.

In relation to those tasks that were implemented but did not succeed, the Zero Waste catering turned out to be a “Zero Plastic” catering. The use of compostable and biodegradable plates and cutlery was prioritized over the option of reusing. For future conferences, a clear and consistent communication with providers is essential to avoid misunderstandings about different views of sustainability. The $CO_2$ Compensation program counted with the economical contribution of 34% of the participants (85 of 250). Even so, participation during the voting session gathered only 3 members of the 85 contributors. This low participation could be caused by various reasons:

- Misunderstanding or lack of communication of the second phase of the CO2 compensation program
- Voting was not a priority, parallel sessions were being held at the same time.
- The voting session took place on the last day of the conference and a significant part of the participants had already left the conference.

- Lack of interest or information. $CO_2$ compensation programs usually consist of paying and do not require more implication afterwards. The ERSCP 19 compensation program was innovative and symbolic. People did not expect the voting phase. Even if it was explained during the opening session and at the webpage, it probably failed to be understandable or motivational enough.

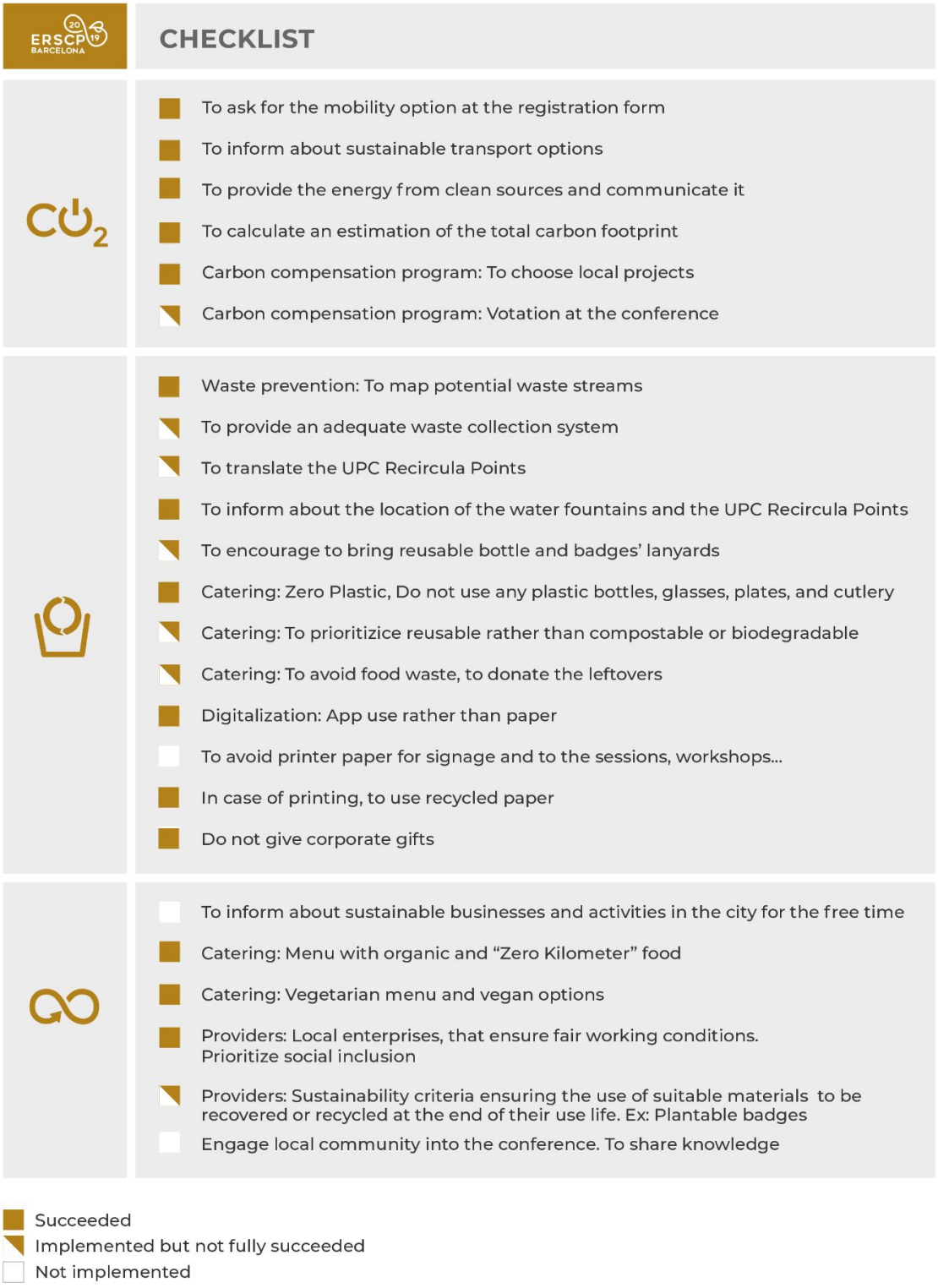


**Figure 7. Checklist of tasks divided by the three areas.**

### Results of the Environmental Impact assessment

Figure 8 shows the environmental impact that could not be avoided at the ERSCP 19 Conference. The analysis is separated by the three areas and shows how the "Sustainable Consumption" area is missing due to the lack of significant environmental impacts in this area.


**Figure 8. Environmental impacts that could not be avoided at the ERSCP 19 Conference separated by areas of action.**

The major environmental impact is related to the emissions caused by mobility, specially air travelling. The variability of this impact depends on the location and the participants' traveling options. The ERSCP 19 organization promoted sustainable alternatives and developed the $CO_2$ Compensation Program. As expected, these measures are not enough to mitigate this impact since they do not address the root of the problem. To truly end the mobility environmental impact it is necessary to celebrate the conference remotely or conduct a significant change in the mobility system, which means a transition in the energy and transport technology system, that is far from the scope of the Circular Conference Toolkit.

"Towards Zero Waste" environmental impacts are caused by waste generation. It comes specially from the catering and some paper used during the sessions. The waste from the catering is organic since the cutlery and plates were biodegradable and compostable. The glass from the wine and water bottles is recyclable, the same as the paper used during the sessions. As a result, impacts are not very high but they could be improved by changing compostable and biodegradable materials to reusable ones in the catering service.

Figure 9 shows a Sankey diagram about the Material's Flow Analysis of the ERSCP 19 Conference with the implementation of the Circular Conference Toolkit. The figure shows an estimation of the material's flow of the ERSCP 19 Conference. The major impact is mobility by aircraft, and the $CO_2$ Compensation Program approaches to compensate the 19% of the total mobility emissions. Another source of emissions is

the energy used during the conference, but it is not appreciated since it comes from renewable sources. The big majority of materials are recirculated since they are composted, recovered by *UPC Recircula*, recycled, and reused. The use of water has not been clarified so the diagram indicates that it ends up discharged. The higher quantity of the ERSCP 19 materials fraction is organic. It is composed of all the food of the conference and the plates and cutlery made from biodegradable and compostable materials. Their treatment consists of composting by the catering provider, so it can be considered circular. Glass fraction comes from wine and water bottles. It is recycled by the local waste management system. Paper and plastic are almost absent and recovered and recycled by the *UPC Recircula* waste system. Plastic comes from packaging of office materials that we could not avoid (pens, markers…) and paper comes from post-it's, printed signage and paper resources used during workshops at the sessions. All paper used was recycled to reduce its impact, and a part of the used paper is being reused as draft paper. The fraction "others" represents the materials that are not identified and are components of objects used during the conference. It embraces elements that are out of the focus but the amount is an indicative figure.

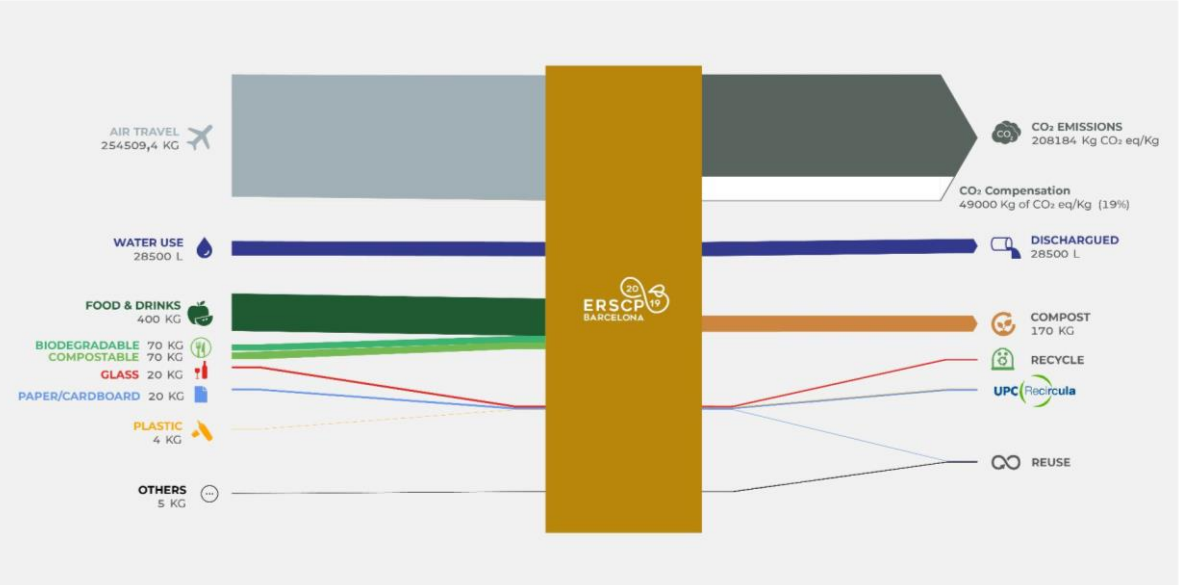


**Figure 9. Sankey diagram showing the Materials Flow Analysis of the ERSCP 19 Conference with the implementation of the Circular Conference Toolkit.**

Figure 10 shows a comparison of the materials flow when the Circular Conference Toolkit is implemented or not by overlapping Figures 6 and 9. Lighter colors are overlapped to appreciate the differences of the materials flow. The main differences are the following:

- The energy only affects without the Circular Conference Toolkit because during the conference, it came from renewable sources.

- The $CO_2$ compensation program allows to compensate the 19% of the Kg eq. of $CO_2$ emissions, that represents 49000 kg of $CO_2$ eq/kg.
- The water use has decreased from 31500 L to 28500 L thanks to the choice of the vegetarian menu and the sustainable behavior of participants.
- The amount of food (from 600 to 400 kg) has decreased too to avoid food waste but the use of biodegradable and compostable materials is new. So the compost made is much more than before.
- The compost was born as an alternative to avoid plastic and paper waste. In fact, it can be seen the great reductions of these two materials.
- In the case of paper from around 400 kg to 20 kg thanks to the digitalization (app and web page use) and the reduction in purchasing and packaging.
- Regarding plastic, there is a significant reduction, from 500 kg to 4 kg thanks to the zero plastic approach during the conference. The typical plastic packaging at the catering has been refused in favor of compostable and biodegradable materials, and we avoided other plastic from not giving merchandising gifts to using a degrowth and ecological perspective in the conference purchasing.
- Another significant difference that makes the conference circular is the waste treatment. Since in Figure 22 (Section C2.4), some materials end up at landfill or leave the responsibility to the local waste management system and its inefficiencies, the Circular Conference Toolkit approaches circularity.

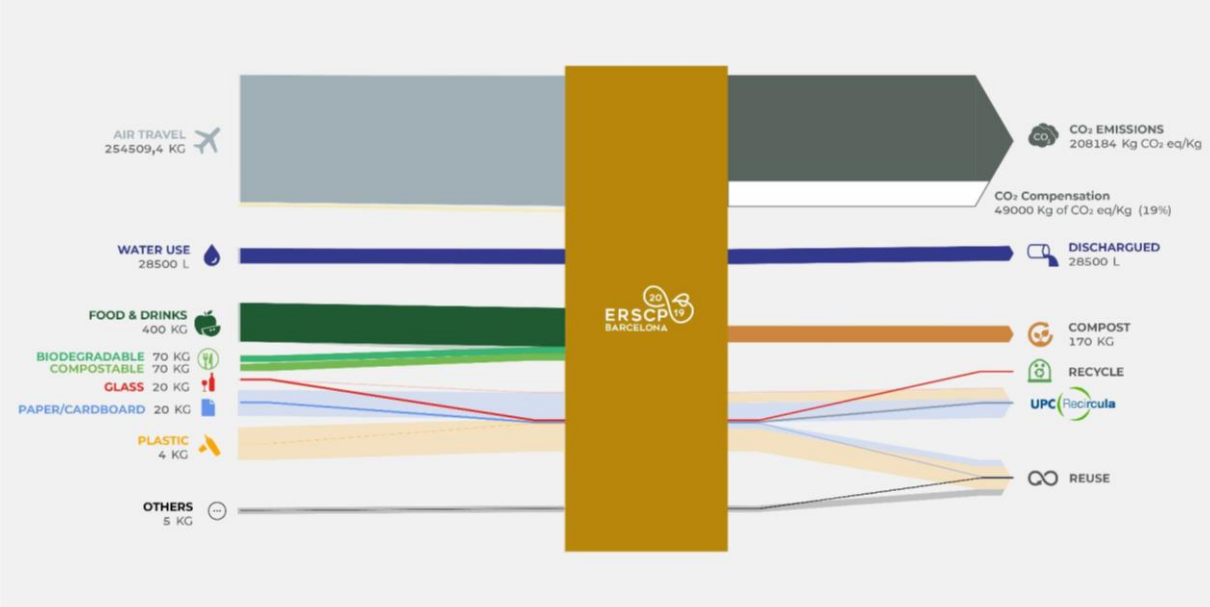


**Figure 10. Sankey diagram about the Material's Flow Analysis of the ERSCP 19 Conference with the implementation of the Circular Conference Toolkit.**

**Results of the Satisfaction survey:**

The survey was sent to 250 participants and it was answered by 16%, 40 participants. Even considering the low participation in this survey, it is significant that 30% of the participants were not sure if they paid the $CO_2$ Compensation Program or not. In relation to the selection of $CO_2$ compensation projects, the participation was extremely low since only 3 participants of the 85 who paid the $CO_2$ Compensation Program participated. Only one of the participants answered that he or she participated in the selection of the $CO_2$ Compensation Program. The poor participation in the selection of the $CO_2$ Compensation Program may be caused by various reasons:

- Misunderstood or lack of clear communication. The process of this $CO_2$ compensation program is new. It is an option that most of the contributors did not expect to vote for the project and misunderstood the process even though it was communicated in the welcome session, the website and the schedule.
- Lack of interest: As people are already used to the traditional offset programs where you pay and forget about it, following our process may require a new effort. Also, in the cases that the registration has been paid by their work identities, the money spent used to has less consideration.
- Parallel sessions: While the session of the Project's selection, there were other sessions that also were interesting to the participants.
- Current Context: Some participants left the conference before that they had planned because of the socio-political situation during that week.

The initiatives implemented were also rated through the survey. Participants had to rate from 1 (very poor) to 5 (excellent). Table X shows the average scoring of the initiatives.

**Table 2. Results of the survey brainstorming. Popular suggestions to achieve carbon neutrality, zero waste and promoting sustainable consumption at ERSCP 2019.**

| Initiative | Score |
|---|---|
| $CO_2$ Pre-Estimation | 3.9 |
| $CO_2$ Compensation Program | 3.9 |
| Ease of Conference accessibility by public transport | 3.5 |
| Vegetarian menu | 3.9 |
| Local and organic food choices | 3.9 |
| Zero waste catering service, mainly focused on zero plastic | 3.9 |
| The decision of not giving merchandising gifts | 4.5 |

| | |
|---|---|
| UPC Recircula Waste System | 4.1 |
| To encourage to bring reusable bottles and badges lanyards | 4.3 |
| Ease to access to drinking water fountains | 3.9 |
| The use of the ERSCP-19 App instead of paper | 4.6 |
| “Plantable” badges and recycled cotton lanyard | 4.5 |

To conclude, when participants were asked about the sustainable achievement of the 19th ERSCP Conference, almost all rates were between an interval from 3,9 to 4,3. Thus, we could say that the sustainability initiatives succeeded enough according to the participants' opinion.

## Conclusions

As a general point, the testing of the Circular Conference Toolkit during the organization of the ERSCP 19 have succeeded. The aspects that did not work as expected have been evaluated, analyzed and justified along the Cycle 3. It should also be pointed that the ERSCP 19’s budget ended with a significant economic gain, which demonstrates that the Circular Conference Toolkit is not only environmentally and socially sustainable but also economically, in compliance with the three pillars of sustainability paradigm. The lessons obtained by the ERSCP 19 Conference experience are:

***Less is more:*** The simplest ideas were the ones that worked the best. To make a circular conference comes down to minimizing waste as much as possible. “Reducing” and “reusing” were the Circular Conference Toolkit mantra since it allowed to avoid a high amount of waste and reduce greenhouse gasses emissions, as well as to result in cost saving.

***Communication:*** The importance of communication is crucial, both with the conference participants and the service providers. The aspects that did not work as expected were - in part – a symptom of a lack of communication: translated in misunderstanding or not emphasizing enough. And on the contrary, the communication with the conference participants during the process of design of the Circular Conference Toolkit have resulted very grateful.

***Location, location, location:*** To celebrate the ERSCP 19 in the UPC campus and specially, at the Vertex building facilitated the aim of the Circular Conference Toolkit, since there are some UPC’ policies that foster sustainability. However, the extended location analysis made in the Cycle 2 has been crucial, because the location conditions represent the basis to make a circular conference and its own success.

Some conclusions regarding the three areas:

***Carbon neutrality:*** Even the advantage of the renewable energy consumption provided by the location, and other efforts made by the conference organization. The carbon neutrality area has been the most difficult to accomplish because of the carbon footprint of the participants' mobility (flights). The palliative solution presented is the CO2 Compensation program, but this is not enough because it is inexact and takes a long time to work.

***Towards zero waste:*** It has been implemented a lot of efforts to make the conference zero waste and circular, and the results are rewarding. The only critical aspect is a misunderstanding with the catering service, who understood zero waste by the use of compostable and biodegradable materials, when from the conference organization we were demanding a step forward (reusable materials). Nevertheless, they adapted good enough to our demand. This experience demonstrates one of the lessons mentioned above: The importance of communication.

***Sustainable consumption:*** The sustainable consumption was practically the rationale of the conference (SDG 12). In the context of the ERSCP 19, this area has been transversal and have accompanied the others two. The sustainable consumption has been specially reflected by the great reduction on purchasing (it could be considered degrowth), and the choosing of providers that accomplished our sustainable criteria.

Once the Circular Conference Toolkit have been tested and evaluated, it is time to promote it in other contexts in order to take a step forward and challenge it in more conferences. The Circular Conference Toolkit can be considered as an iterative process of improving though its implementation in future conferences and events.

Another next step is to transform the Circular Conference Toolkit into a circular business model, since the great quantity of events celebrated around the world, it can be very useful and profitable.

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