D7.10-Development of web-based footprinter

Project Acronym	BioCatPolymers
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Deliverable No & Title:	**D7.10**	**Development of web-based footprinter**	
Work Package	7	Promotional activities and dissemination	
Task No & Title:	7.10	Development of web-based footprinter	
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1 Introduction

The overall objective of BioCatPolymers is to demonstrate a sustainable and efficient cascade technological route to convert low quality residual biomass to high added-value biopolymers. The technology is based on an integrated hybrid bio-thermochemical process combining the best features of both.

In particular, the goal of Task 7.5., as part of the WP7, is to develop and maintain a user-friendly, web-based footprinter, based on the results of WP5. The aim of the tool is to allow the public to visualize in a user friendly way the results obtained from the Life Cycle Assessment performed in Task 5.3. Moreover, the tool allows the user to assess how different parameters can influence the final footprint results and to compare products and technologies based on the selected scenario.

The ultimate goals are to provide relevant information on the BioCatPolymers technology, to educate the public about LCA, sustainability in general and to support the dissemination of the results obtained during the project.

2 Materials and methods

2.1 Reason for developing the web-based footprinter

Sustainability is a key element in the design of the BioCatPolymers technology and associated novel bio-based polymers, putting emphasis on reducing carbon emissions, promoting circularity and the usage of bio-waste as feedstock. In this context, not only it important to assess and evaluate the performances of the technology, aiming at understanding environmental hotspots and possible future leverage for improvements, but also to communicate, educate and engage the public with sustainability related concepts and the environmental footprint, with the final goal of increasing the understanding of these concepts and disseminating the BioCatPolymers project and results.

2.2 Methodology and key steps

For these reasons, it was decided to develop a web-based *Footprinter* to further support the dissemination. The main steps that were carried out to develop the tool have been the following:

1. Research and definition of audience scope and communications goals of the tool;

2. Development of a tool map and wireframe based on the goals of the tool: the team brainstormed and sketched the journey of the user when using the tool and defined the information needed for the user experience;
3. Content copywriting and assembly;
4. UX design of the tool considering all the interactions with the users: Creation of the web based tool with initial draft of the graphic design and visual elements to recreate the experience and complete journey and interaction with the audience;
5. Design of tool page layouts, review, and approval cycles;
6. Design of graphic elements like illustration, backgrounds, icons, charts, etc.;
7. UX prototype development: Integration of functionality of the interactive elements like buttons, menus, variables, etc to validate the right functionality and flow of the experience;
8. Frontend development;
9. Back-end coding and development: development of all the coding of the tool to calculate the different possible results and make the tool fully automated and functional;
10. Testing and review cycles;
11. Integration of the two routes: ISOPRENE and 3MPD;
12. Integration of the final results of the Life Cycle Assessment into the tool and approval cycles to validate final numbers;
13. Finalization of the tool and deployment.

The development of a web-based tool is an iterative process, therefore most of the described activities have been iterated different times in order to integrate modifications and new emerging aspects into the *Footprinter*.

For additional details on the results and the methodology to perform the Life Cycle Assessment analysis please refer to Deliverable D5.6 of WP5.

2.3 Parameters assessed

The Footprinter displays the 4 life cycle stages of the bio-based polymer production process: use phase, distribution and end-of-life are not included as they are the same for all other fossil-based polymers considered. For the same reason, they were excluded from the Life Cycle assessment as well.

The baseline scenario considers the parameters currently being used in the modelling of the bio-based polymer production. The footprinter allows the user to make variations of some parameters to explore how different variables affect the overall environmental footprint of the bio-based polymer. The baseline scenario considers the following characteristics:

- Biomass origin: Sweden
- Type of biomass: wood chips
- Lignin co-product treatment: incineration with energy recuperation
- Electricity: Average European Mix
- Heat source: Natural Gas

The stages *From Biomass to Sugar*, *From Sugar to Plastic* and *Polymerization* include the impacts the following fixed parameters in the calculations:

- Chemicals
- Enzymes and water inputs
- Energy efficiency
- Waste production

3 Results

The results displayed in the tool are derived from the results of the Life Cycle Assessment (LCA) performed within WP5. In order to facilitate the understating of the results and process to the external public, it was decided to display only the most promising pathway for 3MPD and Isoprene, and to show the results related to three environmental indicators, being them Climate Change, Water Consumption and Land Occupation. Even if in the LCA additional scenarios and indicators have been analysed, only a selection of those was included in the footprinter, due to non-technical target audience of the web-based footprinter.

The tool is divided into the following 3 main sections:

1. Introduction and project description
2. Interactive Biocatpolymers Life Cycle Stages
3. Results of the Life Cycle Assessment with comparative assertions

3.1 Introduction and project description

The first page of the footprinter shows a description of the project, the different life cycle stages considered in the study and the two possible scenarios routes: 3MPD and Isoprene (Figure 1).

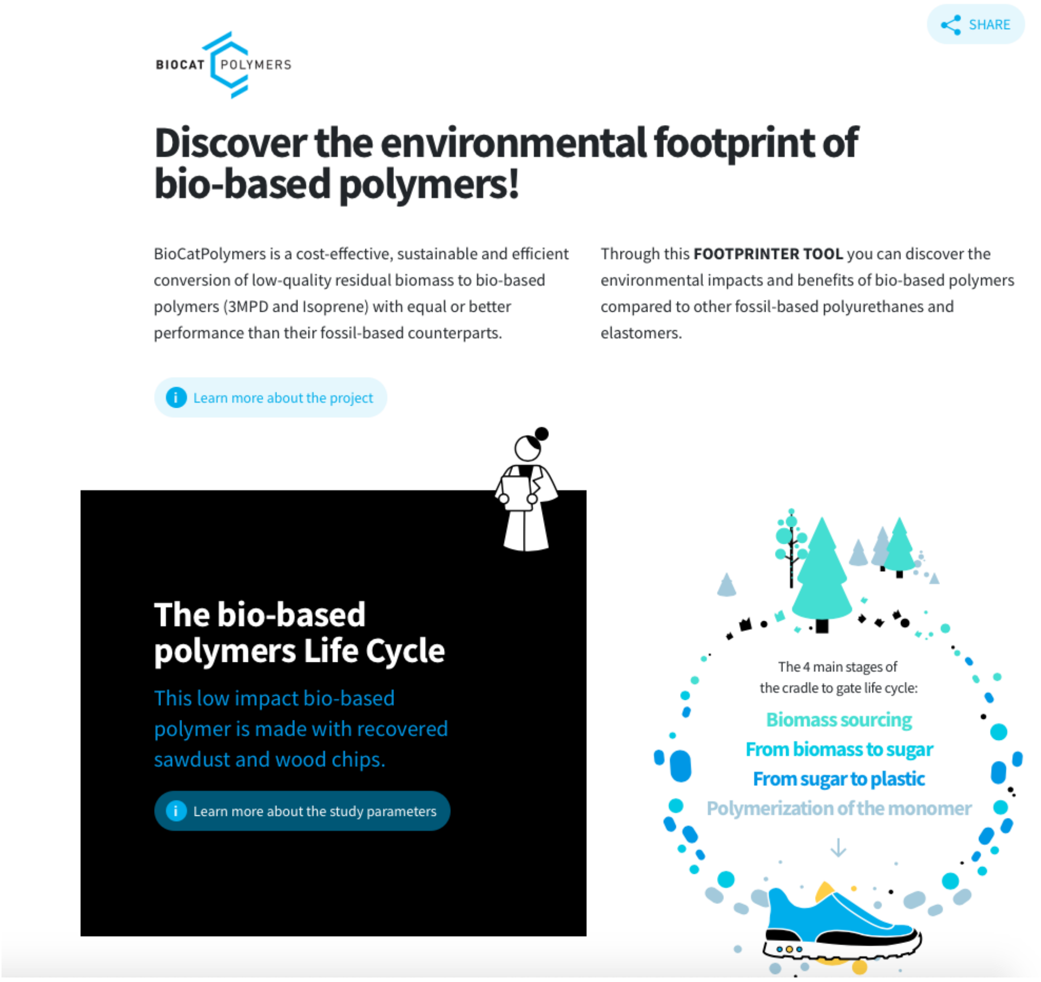

Figure 1: Web-based Footprinter *Introduction and project description* section.

Moreover, the interactive lines *learn more about the project*, and *learn more about the study parameters*, open separate windows with description pages providing additional information about the methodology used to carry out the environmental assessment and the default parameters considered.

3.2 Biocatpolymers Life Cycle Stages

The second section of the tool allows the user to interact with different variables of the life cycle of the technology and build its own scenario, choosing different parameters on each of the four life cycle stages, being them: *Biomass sourcing*, *From biomass to sugar*, *From sugar to plastic* and *Polymerisation of the monomer*. The tool shows a description of each life cycle stage and the parameters that can be selected by the user. The upper box of the tool automatically displays the updated results every time the user makes a selection or changes between the variables (Figure 2, Figure 3 and Figure 4).

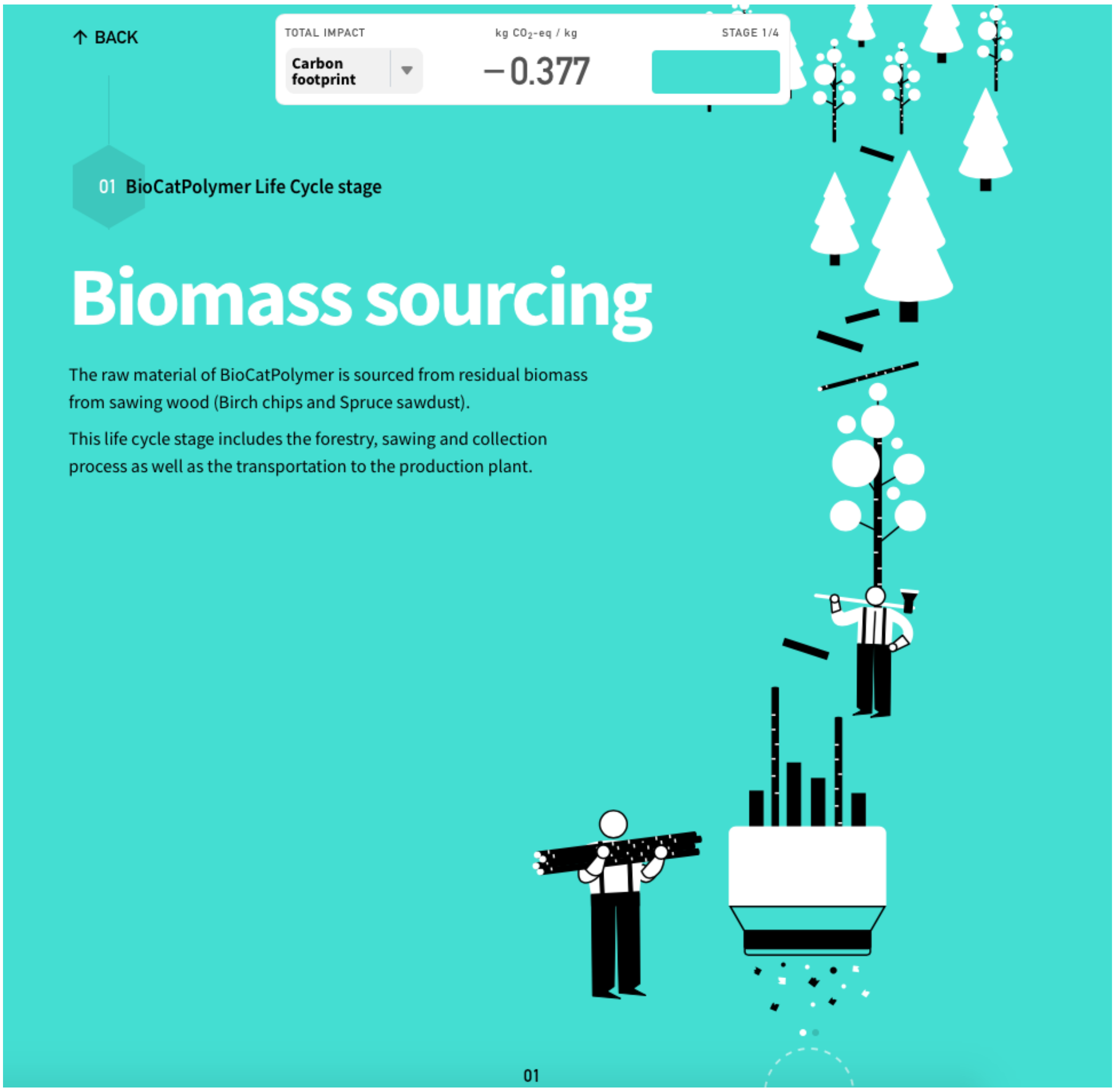

Figure 2: Web-based Footprinter *Biocatpolymers Life Cycle Stages* section. Biomass sourcing description.

Figure 3: Web-based Footprinter *Biocatpolymers Life Cycle Stages* section. Biomass origin

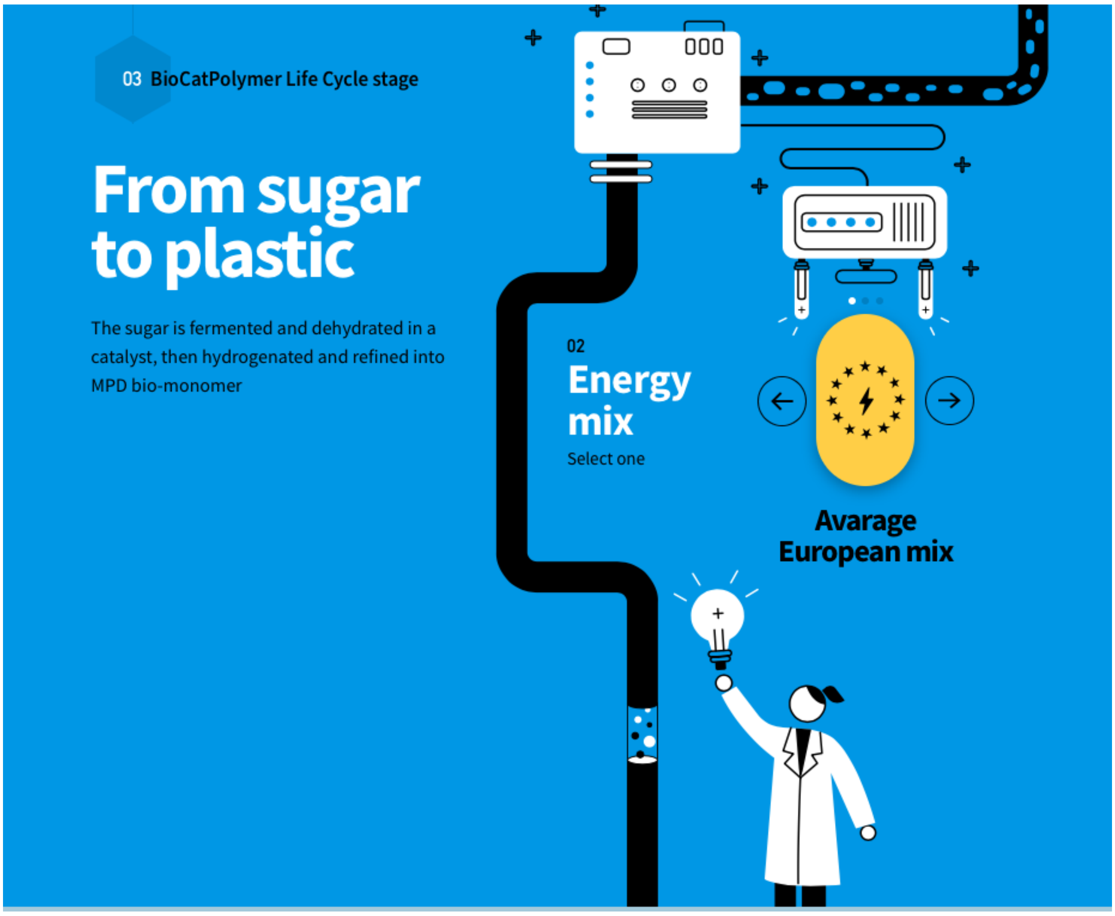

Figure 4: Web-based Footprinter *Biocatpolymers Life Cycle Stages* section. From sugar to plastic, illustration of electricity mix choice.

3.3 Results of the Life Cycle Assessment

Once the user has selected all the parameters for all the life cycle stages, it brings the user into the last section of the tool, called *Results of the Life Cycle Assessment*.

Within this page, the results of the assessment are shown, allowing the user to visualize and interact with 3 main aspects of the footprint:

1. **Environmental indicators**: it is possible to select the preferred environmental indicator, among Carbon Footprint, Water Consumption and Land Use.
2. **Comparison with the Baseline**: the user can see the footprint of the polymer built based on the selected parameters, compared to the "Baseline" of the project.
3. **Comparison with Fossil-based polymer**: the results are also compared with a reference fossil-based polymer, aiming at benchmarking the results with another fossil-based technology already in the market, from an environmental perspective (Figure 5).

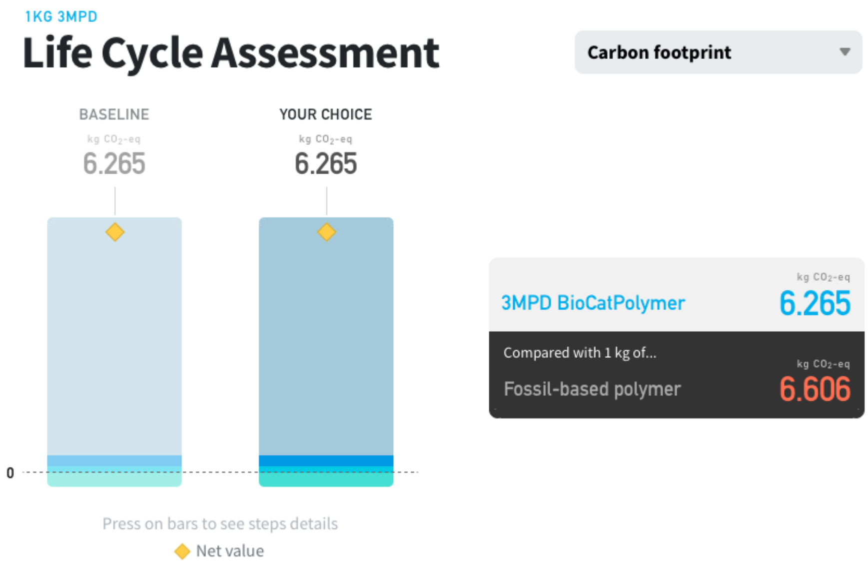

Figure 5: Web-based Footprinter *Results of the Life Cycle Assessment* section. Illustration of the results for Carbon Footprint indicator.

Finally, at the bottom of the page, the logos of the partners and the project are disclosed. At the end of the experience the user can click on the *Restart Experience* button to return to the first section and restart the experience (Figure 6).

Figure 6: Web-based Footprinter *Results of the Life Cycle Assessment* section.

4 Conclusions

In conclusion, the web-based footprinter can be considered as an interesting, educational and engaging tool to communicate to the external public the results of the project, providing a snapshot of the most important results, the environmental benefits of the technology and some key aspects to keep in mind.