

Impact Strategy Mission

Cigarette butts' pollution

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Group 6

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I. Abstract

For the purpose of this mission, we were asked to analyse a problem in its whole ecosystem before thinking about concrete solutions. When we were given the theme of urban pollution, a few different topics presented themselves to us: we thought about air pollution, single use recipients thrown in the streets, and of course pollution caused by cigarette butts. All things considered, we did not hesitate much for two simple reasons: first, we had to choose a problematic that was not too difficult to observe. Secondly, we picked which option felt the most urgent to us.

At first, we conducted some desk research that enlightened us about the scope of the issue and the growing interest of many international instances such as the EU with regard to cigarette butts. This toxic waste has indeed a tremendous harmful impact on our environment at large as one cigarette butt, composed of no less than 4.000 chemicals and heavy metals, pollutes approximately 500 litres of water. As 137 million of these toxic wastes are dumped every day throughout the world, one can thus easily imagine that cigarette butts have a tremendous impact on the environment, especially regarding water pollution and the marine ecosystem. This first step allowed us to identify four axes that were playing a key role in the ecosystem of the problem: tobacco industries, public services, pedestrian smokers, and startups that were already dealing with the issue.

After having identified those main actors, we exchanged knowledge and experience with them to put together the pieces of the puzzle. What these interviews taught us is that all actors are connected, and that this is in everyone's interests to find a solution for every stakeholder. The deep analysis of this matter and the different perspectives allowed us to obtain key information and draw some conclusions that we would not have thought about when initiating this mission. First, we discovered how complex the collaboration between public services and start-ups is for the moment, and how the current costs restrain Liege administration's field of action. Start-ups work to both improve the methods of collection of cigarette butts and find innovative ways to recycle this waste that is *still not* recycled properly. Pedestrian smokers who throw their cigarette butts in the streets or in the sewers do not do it with the sole purpose of polluting, but face "pains" that are still not addressed in an efficient manner. We learned as well that the tobacco industry blamed mostly the bad habits of the smoker, and did not feel accountable for the pollution of cigarette butts in nature. If anything, we have the certitude that improving awareness of smokers must be a priority. But the most unexpected lesson we learned is that there is a great number of actors in the sector that use greenwashing as their main marketing tool, as one can make money easily if entering the recycling industry without caring about the environment.

We came up with some ideas to apply locally. We decided to focus on the collection of cigarette butts, thus helping the fight against filthiness in our streets and preventing the cigarette butts to end up in water channels by focussing on the first actor, the smoker who throws his cigarette. Our three main ideas are : the installation of voting ashtrays in the city, which is not something new but could motivate the smoker to walk a longer distance to dispose of his cigarette butt ; the sale of customised pocket ashtrays at relevant sale points ; and finally, the installation of sewer ashtrays that would gather the cigarette butt *before* it enters the water channels.

Overall, we have witnessed a growing interest for the pollution caused by cigarette butts, so we feel there are good reasons to be optimistic that efficient solutions can be found.

II. Introduction

When we were asked to analyse a problem under the scope of urban pollution, a few different themes presented themselves to us: we thought about air pollution, single-use recipients thrown in the streets, and, of course, pollution caused by cigarette butts. All things considered, we did not hesitate much for two simple reasons: first, we had to choose a problematic that was not too difficult to observe. Secondly, we picked which option felt the most urgent to us. Given the fact that air pollution would have required more specific data and information that would be difficult to work with, we ruled out this option. We felt like cigarette butts' pollution was the one to give priority to because it is in everyone's reach to do his/her bit, and because it is the most blatant one's eyes can see when walking down the streets.

But we did not stop at what was visible to make our decision. Indeed, as we dug information, we discovered that cigarette butts were the number one single-use product thrown in the environment, and that they were literally everywhere, polluting our ecosystem on various scales. Given that no efficient solution was found locally nor globally, we chose to tackle this problematic to better understand how and why this pollution is so hard to fight, and to identify what could be the missing piece for every protagonist.

III. Issue at stake: Cigarette butts

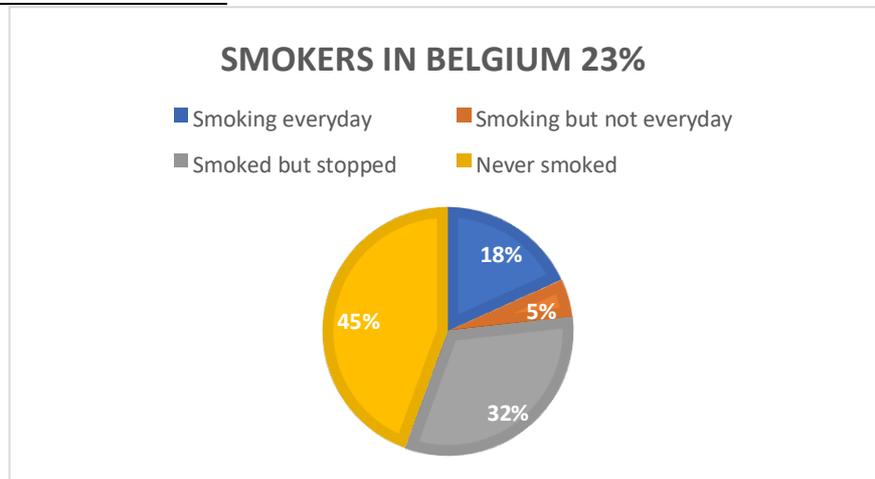
A. Relevant numbers

There are nearly 1 billion smokers on Earth and in 2016, 5.505 trillion cigarettes were consumed worldwide.¹ It is striking to notice that although the percentage of people who smoke has declined over the years all over the world, the overall number of smokers has actually increased because of population growth.² When analysing this phenomenon from a more local point of view, according to the *Belgian Foundation against Cancer*, smokers represent 23% of the overall population of Belgians (see chart *below*), thus equivalent to 2.63 million people. If we apply this ratio to the population of Liège, it means that this city comprises no fewer than 44.000 active smokers. The percentage is slightly lower when considering regular smokers, who smoke at least one cigarette a day, as they represent only 18% of the population. In Belgium, daily smokers smoke approximately 15 cigarettes a day. It is possible to use this data for the city of Liège in order to get an idea of the extent of the issue of cigarette butts. This leads to the following result that approximately 35.100 people smoke 15 cigarettes every day in Liège, representing 526.500 cigarettes for the entire city. The Report of *the Foundation against Cancer* also found out that young people tend to smoke more occasionally than older smokers. Moreover, it came out that Walloons and inhabitants of Brussels smoke more often than

¹ Maria Christina Barbosa de Araujo, Monica F Costa, A critical review of the issue of cigarette butt pollution in coastal environments *in* Environmental Research, February 2019.

² The Lancet, Smoking prevalence and attributable disease burden in 195 countries and territories 1990-2015: a systematic analysis from the Global Burden of Disease Study 2015, [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(17\)30819-X/fulltext?elsca1=tlpr](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(17)30819-X/fulltext?elsca1=tlpr)

Flemings. Finally, the report showed that the most frequent smokers were men, between 35 and 64 years old, and from lower social classes.³



Data collected from *the Foundation against Cancer* - 2019 tobacco survey

Cigarette butts are considered as the most common form of personal litter in the world.⁴ These residues are really small but are generated in large amounts. Yearly, 6 trillion cigarettes are smoked worldwide, and 4.5 trillion cigarettes are littered in the environment.⁵ This means that 75% of the cigarettes smoked each year end up polluting the environment. The first striking impact of cigarette butts is visual pollution. In many industrialised cities, not noticing the presence of this waste in the streets has become an exception. For instance, during international clean-up campaigns, cigarette butts account for 40% of the total waste recovered.⁶ To take an example closer to us, 30% of the litter in the streets of Brussels consists of cigarette butts. They make the public space look dirty and that is one of the reasons why many cities are gradually starting to take an interest in this issue.⁷

They are also the most frequent form of personal items found on beaches. Around 60 million cigarette butts have been collected from coastal environments over 32 years.⁸ As one cigarette butt is able to pollute up to 500 litres of water, their impact on water resources is catastrophic.⁹ A report of the Imperial College of London gives an interesting perspective concerning the matter of cigarettes. It finds that the impact of a single smoker over their lifetime

³ Enquête tabac 2019, Fondation contre le Cancer, https://www.cancer.be/sites/default/files/enquete_tabac_version_2.pdf

⁴ Curtis, C., Novotny, T.E., Lee, K., Freiberg, M., McLaughlin, I., 2017. Tobacco industry responsibility for butts: a Model Tobacco Waste Act. *Tob. Control* 26, 113–117, <https://doi.org/10.1136/tobaccocontrol-2015-052737>

⁵ Maria Christina B. Araújo, Monica F. Costa, A critical review of the issue of cigarette butt pollution in coastal environments *n Environmental Research* · February 2019 and <https://www.cigwaste.org/butt-faqs>

⁶ Le centre d'information sur l'eau, L'impact des mégots de cigarette sur les ressources en eau, <https://www.cieau.com/connaitre-leau/lapollution-de-leau/impact-megots-cigarette-ressources-eau/>

⁷ Stop throwing butts on the streets, City of Brussels, <https://www.brussels.be/stop-throwing-butts-street>

⁸ NBC News, Plastic straw ban? Cigarette butts are the single greatest source of ocean trash, <https://www.nbcnews.com/news/us-news/plasticstraw-ban-cigarette-butts-are-single-greatest-source-ocean-n903661>

⁹ Le centre d'information sur l'eau, L'impact des mégots de cigarette sur les ressources en eau, <https://www.cieau.com/connaitre-leau/lapollution-de-leau/impact-megots-cigarette-ressources-eau/>

can be gigantic with regard to the pollution of our environment as one a person smoking a pack of 20 cigarettes per day for 50 years is responsible for 1.4 million liter of water depletion.¹⁰

B. Composition of cigarette butts

A cigarette butt contains four main components: a filter; burned and unburned tobacco; ashes; and paper.¹¹ Cellulose acetate, a synthetic polymer made from cellulose, is the primary component in the filter of a cigarette butt and constitutes a type of slow-biodegrading toxic plastic.¹² Cigarettes take approximately 12 years in order to degrade completely and cellulose acetate requires nearly 10 years to biodegrade.¹³ Moreover, a study conducted in 2018 found out that while cellulose acetate is photodegradable, it is not biodegradable as stated earlier. According to this study, although ultraviolet rays from the sun eventually break the filter into smaller pieces under ideal environmental conditions, the source material never disappears and essentially becomes diluted in water or soil. The scientists deduced from their data that the best sustainable solution for these cigarette butts was to be recycled in order to use them for the manufacture of some useable products.¹³

When cigarette butts are littered into the environment, important amounts of toxic chemicals and heavy metals – more than 4.000 – are leached and potentially accumulated in water channels, streets, nature strips, and footpaths, thus posing a serious threat to local organisms and aquatic species.¹⁴ No fewer than 137 million of these toxic wastes are dumped every day throughout the world, 40% of which inevitably end up in the oceans, causing water pollution and danger to the marine ecosystem.¹⁵ One can thus easily imagine that cigarette butts have a tremendous impact on the environment at large.

IV. Methodology used

¹⁰ Imperial College London, Cigarettes have a significant impact on the environment, not just health, <http://www.imperial.ac.uk/news/188406/cigarettes-have-significant-impact-environment-just/>

¹¹ Maria Christina Barbosa de Araujo, Monica F Costa, A critical review of the issue of cigarette butt pollution in coastal environments *in* Environmental Research, February 2019.

¹² Halenur Kurmus, Abbas Mohajerani, The toxicity and valorization options of cigarette butts *in* Waste Management, March 2020. ¹³ Le centre d'information sur l'eau, L'impact des mégots de cigarette sur les ressources en eau, <https://www.cicau.com/connaitre-leau/lapollution-de-leau/impact-megots-cigarette-ressources-eau/>

¹³ Jemal Assres, Bademaw Abate, Reprocessing Waste Cigarette Butts into Usable Materials, International Journal on Textile Engineering and Processes, Vol. 4, Issue 3, July 2018.

¹⁴ Novotny, T.E., Lum, K., Smith, E., Wang, V., Barnes, R., 2009. Cigarettes butts and the case for an environmental policy on hazardous cigarette waste. *Int. J. Environ. Res. Public Health* 6 (5), 1691–1705.

¹⁵ Le centre d'information sur l'eau, L'impact des mégots de cigarette sur les ressources en eau, <https://www.cicau.com/connaitre-leau/lapollution-de-leau/impact-megots-cigarette-ressources-eau/>

Since impact strategy is a problem-driven strategy, we naturally decided to analyse the problem in its whole and tried to have a complete understanding of all the ins and outs of cigarette butts' pollution.

First, we began by doing some desk research in order to have quantitative pieces of information about both smokers, cigarette butts and their repercussions on an ecological perspective (see those numbers in Chapter III). Desk research also allowed us to understand the problem in a more global way since we have learnt what was currently happening regarding European directives about cigarette butts' littering in the street and tobacco companies' responsibility in their collecting (read more about that in Chapter V). Desk research was a way for us to get a first look at the problem and to know how to deepen our research and where to look at.

Second, now that we had some knowledge on the subject, we decided to divide the problem into four axes that were playing a role in the ecosystem of the problem. These four axes are: tobacco industries, public services, pedestrian smokers, and start-ups that were already dealing with that problem. Then, we tried to tackle all these axes through interviews with people playing a role in each of these axes. Our interview guides were unique and focused on the answer we were trying to get from each actor and striving to understand what the problem of cigarette butts was according to them. Having their perspective on the subject was a key-point, thus it was primordial to adopt a neutral point of view and asking open questions in order to make them talk and express their opinions without feeling judged or criticised. Our interviews were done through video conferences when we communicated with people working for the public services, in the tobacco industry or within start-ups, but we also did street interviews to directly observe smokers' behaviour and having them tell us their view about the problem in the city centre of Liège. Through these interviews, we managed to analyse the ecosystem of the problem.

V. Analysis of the ecosystem

A. Legislative developments

The interest in the issue of cigarette butts is currently on the rise. It is indeed possible to notice innovative initiatives and increased awareness, both at supranational and national levels. Analysing such developments is essential as they may have a crucial impact on future solutions regarding cigarette butts.

At a supranational level, the European Union has published *the Single-Use Plastics Directive* on the 19th of June 2019 which prohibits the placing on the market of several single-use plastic products.¹⁶ This directive states that tobacco companies will have to finance the collection and cleaning of cigarette butts discarded on the streets. Moreover, the filters of cigarettes will also need to be labelled by July 2021 and tobacco industry will have to inform

¹⁶ DIRECTIVE (EU) 2019/904 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 June 2019 on the reduction of the impact of certain plastic products on the environment, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0904>.

consumers about the presence of plastics in cigarette butts, on appropriate waste management solutions for these products, and on the “*adverse environmental impact resulting from littering or other inappropriate means of disposal (of these products)*”.¹⁷

The harmful impact of cigarette butts on our environment cannot be discarded, even more so when one keeps in mind that this issue is linked with several Sustainable Development Goals (SDGs) set up by the United Nations¹⁸ such as cleaner water and sanitation (SDG 6), sustainable cities and communities (SDG 11), responsible consumption, and production (SDG 12), and life below water (SDG 14). In this regard, Dr. Vera Luiza da Costa e Silva, the Head of the WHO FCTC Secretariat, rightly stated that “*people often immediately think of the health impact that tobacco has, but there is not enough awareness of how tremendously destructive it is for the environment too, on land, underwater and in the air*”.¹⁹

Meanwhile, at a national level, some countries are showing a growing interest with regard to cigarette butts and the environment at large. For instance, France has adopted an *Anti-*

Waste law for a Circular Economy. It is creating new obligations regarding cigarette butts such as new polluter-pay channels and requirements for transparency on the health and environmental impacts of products and on waste management.²⁰ From our national perspective, the Belgian Commission on Energy, Environment and Climate approved in July 2020 a PS bill to ban the use of single-use plastic. This bill aims to incorporate into Belgian law the European directive on the marketing of single-use plastic products.²¹ As explained above, it is essential to take into account the likely future developments concerning cigarette butts in order to be able to analyse the issue in all its components.

B. Tobacco industry- *Japan Tobacco*

In our quest for understanding all parts at play in the issue, we began by interviewing Diego Chantrain, who used to work in the marketing team of *Japan Tobacco*. Our interview guide was trying to understand how much big tobacco companies cared about ecology, about the end of life of their products, if the ecological impact of their product was important for their customers, and if they would be inclined to work in collaboration with the state or some businesses in order to help cleaning up the streets.

First, we tried to see if ecology could have been a marketing strategy at play for big tobacco companies, because we had not seen any ads nor declarations from them going in that direction. For our spokesperson, ecology was not the centre of attention of any marketing strategies when he was still working there for two reasons. The first one being that marketing is really difficult for that industry since the very bad image they have. Any tentative to go

¹⁷ Interdiction des plastiques en 2021 : la nouvelle directive européenne est publiée, https://www.actu-environnement.com/ae/news/publicationdirective-europe-produits-plastiques-interdiction-juillet-2021-33596.php4?fbclid=IwAR2K318aSok0allJAUEna-9kFpC9PbtYQ5OI_qyJktO4nmr4me1UTHFsWmY#:~:text=Ce%20mercredi%2012%20juin%2C%20la,officiel%20de%2

¹⁸ The 17 Sustainable Development Goals, The United Nations, <https://sdgs.un.org/goals>

¹⁹ Tobacco control, a ‘major component’ of environmental protection efforts, UN News, <https://news.un.org/en/story/2018/09/1018302>

²⁰ La loi Anti-Gaspillage dans le quotidien des Français : concrètement ça donne quoi ?, Ministère de la transition écologique, Janvier 2020, https://www.ecologie.gouv.fr/sites/default/files/Document_LoiAntiGaspillage.pdf

²¹ Une proposition de loi pour interdire le plastique à usage unique approuvée en Commission, RTBF info, https://www.rtbf.be/info/belgique/detail_une-proposition-de-loi-pour-interdire-le-plastique-a-usage-unique-approuvee-encommission?id=10538504

greener would be perceived as a greenwashing strategy. The second reason was that, quite surprisingly, the Research and Development team mostly works on how to make cigarettes healthier. They are more concerned with their health impact than their ecological impact. Their goal is to finally have cigarette packets with “*smoking these cigarettes is not deadly*” written on them. Furthermore, the tobacco industry does not feel accountable regarding smokers’ behaviour and lack of civility when they are done with their cigarette. Nonetheless, even though the end of life of their product is not taken into account, the tobacco industry was one of the first industries to have Corporate Social Responsibility departments and often tries to help farmers they work with to have a better life and get an education for their children.

Due to the very same issue related to the image of the tobacco industry, he also advised us not to make collaborations with big names in the industry if we wanted to launch a start-up specialised in the treatment of cigarette butts. Indeed, any businesses would suffer from such a collaboration by being labelled as a green tool from the industry, even animated by the best intentions.

Finally, he talked about the future of the industry, explaining to us that *e-cigarettes* would probably totally replace cigarettes in the near future. Still, while being better for smokers’ health, it would not be better for the environment since a lot of plastic has to be made in order to commercialize *e-cigarettes*.

C. Public services - *city of Liège*

Being every day on the front of the fight against cigarette butts or any other type of urban pollution, the city of Liège and its services are one of the most important actors in this problematic. This is why we interviewed Ricardo Di Barbora, executive agent for Gilles Foret, alderman for public cleanliness and ecological transition.

First and foremost, it is important to point out that Liège considers itself as exemplary in the matter of public services. Indeed, compared to other cities, the Liège administration stands by the quality of its garbage collection and talks about “five-star services” offered to its citizens. In an attempt to collect cigarette butts in a more efficient way, the city installed 220 pink ashtrays in different strategic positions where it was found that smokers were particularly prone to light up a cigarette and where a lot of cigarette butts were found on the ground. This project was also the first step to potentially recycle the cigarette butt, something that is impossible for now as the price asked by businesses specialized in the recycling of cigarette butts are way out of the city’s budget. This leads to one of the sad truths regarding the issue: cigarette butts collected by ashtrays or city workers in the streets are gathered with the rest of the garbage, so it means that cigarette butts are collected separately only to end up in an incinerator like a common waste.

Conscientization is another important point on which the public services would like to gather attention, and they identify three main fields of action:

- the pedestrian,
- the driver, and
- the smoker in parks and other leisure spaces.

Each and every one of these smokers is facing different “pains” which are difficult to address collectively. Smokers walking down the street always throw out their cigarette butt as soon as they are done with it, so they would need an easy alternative to simply dump it on the ground; for them the public administration has tested the installation of low ashtrays, really close to the ground, but got confronted with little fires starting in them and floods leading the cigarette butts to escape in the streets. Despite these problems, the ashtrays close to the ground proved to be very efficient, as 90% of the area where they were presented were cigarette butts free. This efficiency can be explained by the fact that it does not change the bad habit of the smoker of throwing it but uses it to its advantage. Another solution that would lead to a conscientization would be the distribution of pocket ashtrays, something that has not been tested yet, and is quite difficult to put in place, as the smoker would have to change radically his behaviour.

The driver is more complicated to reach, as the person behind the wheel does not want to bother with an ashtray that would cause bad smells but prefers to throw it off the window. Those cigarette butts are then lost in the streets or in the environment.

As for the smokers in parks, they often throw their cigarette butts on the ground because they spend some quality time with friends or relatives and are often seated, preferring to dispose of it right now where they are than having to walk to throw their waste in a designated bin. Here again, a pocket ashtray would be, according to the public services, the best option.

As much as conscientization is complicated to put in place, Liège’s public services are about to launch a specific campaign to raise public awareness on the matter of pollution by cigarette butts, one similar to the campaign from a few years back on dog mess. This campaign bore fruit, so there are reasons to be optimistic.

To sum up the perspective of the public services regarding the pollution by cigarette butts, the problem can be separated in two main issues:

- the visual pollution and this never-ending feeling of filthiness which both hide the true efficiency of the public services. Indeed, the incivilities make it hard for the public services in charge of keeping the city clean to do an efficient work;
- the water pollution, which is a direct consequence of the filthiness of the streets and the smokers’ bad habits.

D. Pedestrian smokers

The last actor on our shortlist is obviously the smoker. To better understand how the cigarette butt ends up on the ground, in the sewers or in our parks, we have to know why it leaves the hand of the smoker in the first place. From what information we were able to gather by interviewing and observing smokers in the streets and nearby bus stops, here are the conclusions we came to:

First, there is no direct intention of polluting from the smoker. This might not come as a shocker, but it was the first argument pretty much every single one of them presented to us, at least for the people under 50. Indeed, for a lot of them it just represents a pain to keep their cigarette butt in their hand for more than five seconds, in other words, they do not want to keep

litter on them. Here lies the heart of the problem: a lot of them would prefer to throw it in an ashtray or in a bin (as long as the cigarette is no longer burning), but in the same time they prefer this solution than walking fifty or one hundred metres with the cigarette butt in their hand to dispose of it properly. To that some of them come with the easiest solution: install more ashtrays in the city. But when confronted to the fact that a lot of cigarette butts are thrown on the ground literally in front of an ashtray, they define the behaviour as a lack of respect, and a direct consequence of a bad habit/reflex. For the older segment of the population, people tend to be less receptive to what the issue really is. On the matter of public filthiness, some older people claim that public services are the key answer to the issue. There does not seem to be a problem if they throw their waste on the ground given that their mess is going to be collected a bit later. But from a more logical perspective, bad habits are just more embedded in an older person's behaviour. This explains why some people might be less or more eager to change their behaviour and act for the better good than other people. We want to be crystal clear: we do not make a value judgement on how they think, but we simply came to the conclusion that for the older generations there is simply nothing wrong with the fact of throwing their own cigarette butts, because they have not been educated on the matter, which leads us to our second point.

Maybe the most concerning conclusion we came to during our interviews with smokers on the streets was that people are simply not informed enough. And this very point is relatable to *all* generations. Indeed, people who tend to know something is not right with throwing cigarette butts on the ground or from their window's car are just limited in terms of information presented to them. When we asked smokers what they thought to be the biggest issue with cigarette butts being thrown on the ground, a vast majority of them told us that it was sad for the overall image of the town they were living in, and that it was a clear lack of respect to those who work to clean these same streets and for non-smokers who have to live with it every day despite not being the ones at fault. But a very few of them knew the devastating consequences of these incivilities on water treatment or the chemicals that composed cigarettes. Worse, a lot of people thought cigarette butts were made of cotton. This means that some smokers may think they just throw the industrial equivalent of an apple core, when they clearly throw single-use plastic waste. Finally, to those who know a bit about the harsh consequences of their cigarette habits, they just do not know how critical the situation is. Without pointing our finger at their behaviour or being moralistic, we tried to bring up some numbers into the conversation just to see how they reacted, and their typical reaction was an utter stupefaction. We then asked them what could be done in order to change how smokers see this issue, and a lot of them would just want to be informed more. There is room for improvement on the matter of conscientisation, especially with people who show clear signs of interest in being informed.

Finally, contrary to smokers who throw their waste on the ground, we were pleasantly surprised to see that some smokers go out of their way in order not to throw their cigarette butt on the ground. Some smokers use pocket ashtrays, some use an empty bottle or a tissue to keep it inside until they find a public ashtray or bin. This gives us great hope that a solution can be found, because if some people manage to change their bad habits into concrete solutions, so can other smokers. In order to find a suitable solution to this issue, we analysed already existing start-ups working on the matter of cigarette butts.

VI. Results of the benchmarking

A. *WeCircular* (Belgium)

When one considers the problem of cigarette butts, it is clear that a certain number of start-ups are already taking fine initiatives, perhaps slowly beginning to change the mentality regarding this harmful waste. *WeCircular*, a young Belgian start-up created by Guillaume Berlemont, fits perfectly with this new movement as its ambition is to conceive an enterprise based on a circular economy around cigarette butts. He wishes to work with life cycle assessments in order to ensure that projects brought to the market have a real positive environmental impact. The business plan of this start-up is based on B2B activities consisting of the collection of cigarette butts and the rental or sale of ashtrays to other businesses. In his opinion, targeting enterprises and public authorities (cities, municipalities, etc.) is easier to set up and provides a source of income more quickly, as enterprises are more reliable than regular smokers. On the other hand, solutions aimed directly at smokers would turn out to be much more expensive and complicated from a logistical perspective, thus explaining its interest in businesses as such. *WeCircular* also carries out awareness campaigns on the field, such as clean-ups during which they distribute free pocket ashtrays. However, their only source of income is the rental and subscription to their services by companies.

Guillaume Berlemont insisted on the fact that some locations were harder to target than others, such as festivals and football games, because people are not going there to watch out for their cigarette butts. Whether at festivals or sporting events, it is always impressive to see all the pollution that can be generated at the end. Nevertheless, these embedded habits should be considered as an incentive or challenge for young start-ups to act in order to improve people's behaviour and mentalities regarding cigarette butts. *WeCircular* is taking such initiatives as they are currently working with the *Standard de Liège*, where they installed voting ashtrays.

According to him, most of the companies that require his services do it in order to claim that they promote "green" initiatives, and by doing so contributing to the protection of the environment and restoring their image. From the point of view of municipalities, the services that they offer are seen as an opportunity to make their life easier, as collecting cigarette butts and emptying ashtrays can quickly become gruelling for such entities.

Concerning the end of life treatment of cigarette butts, *WeCircular* subcontracts this aspect to a non-profit organisation based in Cologne, thus assuring them that their primary goal is not to make a profit at all costs but to have a positive impact on the environment. At the subcontractor's factory, the cigarette butts will be mixed with other materials in order to form a plastic alloy in the form of pellets that will be used as raw material to produce pocket ashtrays (which are distributed freely during clean-up campaigns).

B. *Recyclop* (France, Marseille)

Afterwards, we interviewed Paola Srgo who works at *Recyclop*, a start-up located in Marseille. The idea emerged in their CEO's head while walking with his children on Marseille's beach and seeing how much cigarette butts were there. A bit like *WeCircular*, *Recyclop* decided to focus on a B2B business, especially in collaboration with bars and restaurants. They are planning to soon create a subscription model with those businesses to facilitate their

collaboration. They aim to make smokers aware of their responsibilities in the problem by giving away pocket ashtrays to raise awareness. In order to keep it green and circular, those ashtrays are old film boxes from analogue cameras that are no longer used.

During the interview, we understood that the creator of *Recyclop* had a similar approach to ours, by trying to understand all the ins and outs of the problem and analysing smokers in Marseille. That is why they decided to focus on a B2B model, because they thought that street smokers would not want to change their habits but working with restaurants and bars to collect cigarette butts and using this collaboration as an awareness tool would be more useful in their opinion. In their experience, they also saw that smokers from a younger age are more easily receptive to their cause and responsive to their campaign based on pocket ashtrays. They even worked with a college to give it the “0 cigarette butt” label.

Another point really clear during the interview is, just like *WeCircular*, how committed they are to their ideal. The whole point of their business is to be as green as possible. They did not want to move cigarette butts to the north of France and recycle them in plastic boards, because it would not make sense for them to have a big carbon footprint while trying to solve a pollution problem. Thus, they decided to collaborate with a factory only 20 kilometres away from Marseille that specializes in the upcycling of wastes that do not use fossil fuel to burn them, and that uses their steam to create energy.

C. *TchaoMegot* (France, Berthecourt)

Whereas the first entrepreneurs we discussed with focussed on the collection part of the issue, *TchaoMegot* innovates by its recycling method. This young start-up created by Julien Paque concentrates its effort in the transformation of a toxic waste (cigarette butts) into a completely safe raw material that can then be used as a textile or as insulation in the construction industry. His method has already gathered three different patents: one patent for the extraction of the material, one for the shaping of the raw material (the final product comes out as a patch), and the last patent related to the components of the raw material.

Needless to say that Julien Paque is inspiring on many levels. He is our age and has already managed to gather hundreds of thousands of euros to put his solutions to tests in laboratory. His solution comes full circle and prevents customers from asking themselves questions about the origin of their product or their investment. Indeed, the main word for *TchaoMegot* is transparency. He wants to be crystal clear about how perfectly safe for the environment his solution is, and how the essence of the start-up is built on a circular economy.

The project, still incubated, is growing very fast. First initiated in Julien’s garage, it is set to develop in a 300 square metres warehouse in order to contain the future machinery. By January 2021, *TchaoMegot* will work with a “mini” device that will be able to treat 3 tonnes of cigarette butts per year. In February will begin a 1.500.000 euros fund raise to make the acquisition of a bigger machine. The business model of the start-up is based on the sale of its raw material to companies. The only uncertainty for the company lies in the collection process. Indeed, in order to be coherent with its ecological values, *TchaoMegot* does not want to bring cigarette butts from all over France by trucks. This part of the process is still being studied, but Julien Paque told us one thing he was sure of: he wants to work, at some level, with disabled people in order to bring reintegration into society in the process.

Whether on the ecological or social aspect, *TchaoMegot* has big plans for the future, and benefits from big publicity. Indeed, *TchaoMegot* received publicity from TF1, Konbini, NRJ Radio, etc. Brands like Lonsdale in the textile industry or Vinci in the construction sector have already shown great interest in a future collaboration. And while Julien Paque told us there was still a lot of work to do, it is fair to say that are reasons to be optimistic for this world-changing company.

VII. Impact Gap Canvas

A. Challenge Mapping

The issue of cigarette butts is complex as the pollution they produce, both visible and environmental, is huge compared to the size of this very special waste. Moreover, many smokers do not realise that the small incivilities they commit on a daily basis, consisting of throwing their cigarette butt on the ground, can have such a major impact on our planet.

Description of the challenge

According to public services, such as the city of Liège, the main issues regarding this topic are visual pollution and water pollution. Smokers, however, are not always aware of the effects of their bad habits from a global perspective. The cigarette butt's issue is linked with many international and national initiatives, such as, for instance, the sustainable development goals or even *the Single-Use Plastics Directive* published by the EU.

Impact of the challenge

The scope of the problematic is gigantic as 4.5 trillion cigarettes are littered in the environment yearly. From a local perspective, the city of Liège is composed of approximately 44.000 smokers, most of whom do not dispose of their cigarette butts in an ecologically friendly way. Furthermore, cigarette butts contain no less than 4.000 chemicals and heavy metals, thus posing a serious threat to oceans, causing water pollution and endangering the marine ecosystem whenever they end up in water systems all over the world.

Cause of the challenge

Since the cause of this problem is linked to the behaviour of smokers, it does not seem to diminish over time as their habits are deeply ingrained in them. In this way, raising awareness is more than necessary for many actors concerned by this issue in order to change mentalities. Despite the multiplication of initiatives taken by start-ups in the field of cigarette butts, their efficiency remains doubtful as most of them are considered too costly for public authorities (such as mentioned by the city of Liège).

History and future of the challenge

Since the creation of cigarette filters, pollution caused by cigarette butts has been a major problem for our environment at large. However, the city of Liège remains optimistic with regard to future solutions related to the recycling process of cigarette butts in Belgium. It is indeed planning to start awareness campaigns as early as next year on this issue. Among smokers themselves, we observe that some are ready to make changes while redoubling their efforts, and that others will find it much more difficult to change their habits. The Tobacco industry will

soon have an increased pressure regarding cigarette butts as *the EU Single-Use Plastics Directive* will encourage many countries to legislate in this area. From a start-up's point of view, however, the issue of cigarette butts is quite complex. On the one hand, they would like to see this issue completely stopped, as it constitutes their primary goal: such an end seems questionable but probable following the arrival on the market of *e-cigarettes*. On the other hand, if it were the case, they would have to anticipate and expand their activities in order to remain active on the market of waste disposal and recycling.

B. Impact gaps

Gaps between the challenge and solutions

The gaps between the challenge and solutions lie in the feasibility of changing smokers' bad habits and in the global costs of the solutions proposed to public services to recycle the final waste. In theory there are a lot of innovative ideas, but what is not addressed properly right now is the cost of such ideas, which restrains the field of action. The best actions would be to find easier ways to collect and recycle cigarette butts in order to lower the costs. Obviously, raising more awareness on the matter would help the cause by stopping smokers from throwing their waste.

Gaps within the solutions

Being able to educate the smoker is a good start. But the main issue is that we have not come up yet with a smart solution that would not require a drastic change of behaviour for the smoker. We also need an efficient bridge between public services and recycling businesses.

Unaddressed obstacles

The importance of changing smokers' bad habits OR building a solution upon these bad habits while still spreading awareness is clearly overlooked. Another huge obstacle that we discovered while gathering information and collecting interviews is how much money it is possible to make in the recycling industry. In other words, there are some start-ups that are recycling in nonecological ways, thus polluting just as much but making money out of it. To us there are a few opportunities in making their job easier for the public services by finding *the* efficient collecting solution for the smoker. Indeed, we discovered that the smoker was often pointed at as the source of the problem. We would like to see him as the solution as well.

Key lessons learned

First, we learned that many initiatives are being taken to fight this issue, but most of them are focussing their efforts on the collecting part of the problem, not the recycling part. We learned as well that this problem is the result of many « small » incivilities, thus making it hard to fight properly. There is also a lot of greenwashing coming from the recycling industry, which sells false solutions. Finally, it was made pretty clear that the solution was not going to come out of the tobacco industry. Indeed, their main concern is the pressure they are facing regarding health issues, not the environmental impact of cigarette butts. Moreover, the last thing anyone who decides to enter this sector wants to do is being seen working with the tobacco industry. The biggest opportunities lie in reducing collection and recycling costs in order to allow public services to work with specialised business. We feel that the solution has to be found while focusing on the smoker, not another protagonist.

C. Solutions mapping

What is happening locally?

On a local level, we witnessed some different strategies aiming to solve the challenge. First of all, in Liège as in any big city in Belgium, there is a cleaning service that is quite efficient. Furthermore, public services of Liège placed 220 pink street ashtrays dedicated to the collection of cigarette butts and is planning to place 60 more every year. From an entrepreneurial point of view, we talked with *WeCircular*, a new start-up that is aiming the same challenge of cigarette butts' pollution in Wallonia.

What is happening globally?

On a bigger scale, we talked with two other start-ups from France that were also specialised in the collection and the upcycling or recycling of cigarette butts: *Recyclop* and *TchaoMegot*. Both of them taught us that the behaviour of the smoker can be the key factor. They also taught us that some companies in this field are mostly there for money through a green image, thus that we have to be careful when we see an industry talking about “recycling” because it might not be as ecological as we thought. We also understood that most start-ups and companies were more focused on a B2B model and that there might be some opportunities by addressing smokers directly. On a legislative level, European Union is currently publishing new directives that aim to limit cigarette butts and other single-use plastics impact on environment.

What's working, and what's not?

WeCircular and *Recyclop* both told us that for now they were mostly self-financed or in debt, but they hope to be profitable soon enough. *TchaoMegot* just registered three patents and invested in huge custom-made machinery, all of this being expensive. Nonetheless, they also think it will be profitable and viable in the long run. Apart from the economical point of view, we can learn about the public services strategies. Their pink ashtrays are helping but are still not perfect, probably because people are not aware of the repercussions of their simple habits.

Where is the focus and the future?

The collection is already under the scope in Liège with those pink ashtrays. Nonetheless, awareness is a bit left over, as much as a way to recycle those cigarette butts once they are collected. Indeed, all those ashtrays are in the end thrown away with regular waste, hence shattering the whole point of having collected and isolated cigarette butts. In a near future, there might be the creation of recycling factory specialised in cigarette butts in Belgium (a bit like what *TchaoMegot* is trying to do). Furthermore, we have seen that most start-ups collect their cigarette butts through a B2B model, thus a solution based on the active participation of smokers might provide new opportunities.

D. Learning log and actions

In order to understand the whole ecosystem of the challenge, its ins and outs, we contacted actors from what we defined as the four axes that have an impact of the problematic: public services of the city of Liège, big names in the tobacco industry, start-ups that were already addressing the problem, and smokers in the street. We could continue to deepen our knowledge by continuing to interview actors from these four axes, widening our scope by talking to people working in a recycling industry, in the washing services, putting ourselves in the shoes of

smokers or observing in a more Cartesian approach, or even leading more quantitative studies, since we focused on a qualitative understanding of the problem so far.

VIII. Key learnings

A. Complexity of the issue

The Liège administration is right now stuck in a position where it wants to move in the right direction to keep on improving the situation regarding the pollution related to cigarette butts but cannot afford to work with other businesses to treat the waste through the entire recycling process. Just for the collection alone, working with a freelance would mean a separated team of workers who would work specifically on the public ashtrays. To that we would need to add a separate warehouse to keep the cigarette butts in good conditions before being taken away by a company or by the public services. At the end of the process of collection, each public ashtray would cost 30 euros to empty, and that only represents taking the waste from one point to another; recycling, which is the most expensive part, is not included in this price. Where it costs 100 euros to evacuate and recycle one tonne of common waste, it costs 12.800 euros to recycle one tonne of cigarette butts. There is thus a clear opportunity to find a way to lower the costs as public services show a great will to collaborate for an improvement of the collection of cigarette butts and their recycling.

B. Tobacco industry's priorities

We found out that the tobacco industry is not concerned about environmental issues, as they are under permanent pressure regarding the consequences of smoking on human health. Indeed, most of the energy is dedicated to the health question and whether they try to fight the « bad publicity » they are given quite rightly. On the matter of the environmental issue, the representative of the tobacco industry we were fortunate enough to interview told us that the process of getting a cigarette done was not as harmful for the environment as we may think. In other words, the tobacco companies do not feel accountable for what the final customer makes of the cigarette once it is smoked. According to them, the entire life of the product does not depend on how they prevent smokers from throwing it in nature, but on how the smoker has been educated his entire life. With regard to this, the industry feels that the person who is disrespectful enough to throw his cigarette is the same person who will throw his bottle of water or his fast food wrapping once done with it. The issue would have to be looked at from an entirely different perspective, a more global one, than the one only taking the manufacturers of cigarette butts into account. This point of view made it crystal clear for us that a solution in collaboration with the tobacco industry was not worth considering. Moreover, our person of contact frankly said that we had no interest whatsoever to be seen working with the industry, as people would only focus on the fact that we try to be the devil's advocate, whether our intentions are commendable or not.

C. “Greenwashing” of the recycling industry

One aspect that came up quite often and that surprised us was the existence of greenwashing in the recycling industry itself. Several enterprises in the business of cigarette butts’ collection have indeed warned us about this issue which may seem counterintuitive for the recycling industry that advocate the protection of the environment as the main object of their business. The founder of *WeCircular* especially insisted on this aspect as he personally struggled with a partnership when he first started his business. He confided to us that making a mistake in choosing badly one of his partners was one of his biggest regrets regarding his company. The company in question has been targeted by the press in the past as their final products – they were decontaminating cigarette butts and made new products with the resulting material – allegedly still contained nicotinoid which is highly harmful to the environment.²²

Furthermore, his comments about greenwashing in the recycling industry were confirmed when we conducted our interview with *Recyclop*. Our contact person in this company had strong opinions about some recycling processes, insisting on the fact that some actors of the industry were not respecting the environment and were thus also conducting greenwashing in their own way. Our interlocutor specifically focused her criticism on processes aimed at decontaminating cigarette butts using water or those aimed at re-using the butts to make other plastic objects. Regarding the first option, she wondered how the water that had been used to decontaminate the cigarette butts was subsequently decontaminated itself. Concerning the latter, she felt that it was not environmentally friendly to create even more plastic with the materials extracted from the cigarette butts.

D. Growing interest from stakeholders

Another learning we made is how much the question is already discussed. Indeed, even though benchmarking was already a huge part of this work, it could have been almost limitless. A lot of start-ups are seeing the light of day concerning the collecting, awareness campaign, treatment and recycling of cigarette butts. Nevertheless, when we had to tackle the theme of “city pollution”, it was the first subject that came to our mind. Moreover, when we did street interviews, most people were saying there was a huge problem about cigarette butts in the city. It is still a real matter; a lot of cigarette butts are seen on the ground in the street. Hence another

learning, while a lot is already made to solve the issue, the perfect solution has not been found yet.

E. Importance of smokers’ awareness

Finally, we understood that the problem is mostly based on small incivilities. People are not even aware of their wrong doings since it is so much embedded in their behaviour to throw their

²² Question à la Une, Tout recycler : la fausse bonne idée ?, https://www.rtf.be/auvio/detail_questions-a-laune?id=2559245&fbclid=IwAR0nfCD_hjDtRxHz_10AQiilpGLOC-YAeTDpqNk3OCgaxEpHD32543yqHg8

cigarettes once they have smoked it. Most of them do not want to change their habits, especially when it has become so natural. Awareness plays a much bigger part than we thought in the resolution of the problem. When we finally began to think about solutions, we had to take into account that habit and either find ways to change it or find solutions that take advantage of that bad habit.

IX. Solutions/ideas

At that point, we had, in our opinion, a global understanding of the problem. We knew the real impact of cigarette butts' pollution, in a quantitative way. We also knew all the actors at play in the ecosystem of the issue and we debated with them. It was time to gather all these pieces of information and try to work and find a solution.

The issue is the result of a complex system made of many components: the cost of collection, the difficulty of upcycling this particular type of waste, the role of public services in the awareness of citizens, the role of the citizens themselves who do not want to change their habits. We had to focus on one specific area of the issue to tackle it, because trying to have an impact on all the axes we discussed seemed impossible.

In our opinion, the best way to reduce the number of cigarette butts in the street was to address the street smokers directly. While, of course, all the other axes of the issue are important, we thought that the smokers were the most valuable actors to work on because, often, they do not know the fallouts of their incivilities and, while being the direct responsible, it is unintentional, giving us more possibilities to find a solution for them. Then, we decided either to work on their bad habits and change the fact that people will automatically throw their cigarette butt in the street, either to take advantage of that bad habit while be sure that cigarette butts were collectable and not polluting water nor the streets.

A. Voting ashtrays

The first idea we came up with emerged when we interviewed smokers. Some of them did not see the pink bins specifically dedicated to cigarette butts in Liège, others said that when there was one across the street, they did not feel like walking more than 10 metres to throw their cigarette butt when they usually throw it right there on the ground. We knew that the mix between funny ballot box and ashtray already existed in places such as festivals, parties, football stadiums, and that other businesses were using them, but we thought that it could totally be a plus for the street smokers. Indeed, making the bins more attractive, visible and interactive could maybe make the smokers walk those 10 metres, see the question of the week and answer it, instead of throwing it away. Our bet is that adding a design and an entertaining factor might change smokers' behaviour in order to make streets cleaner. First, the design factor seemed important because the bins have to be eye catchy. We have to make people come near them even if they have to walk a bit. We had the idea to make them phosphorescent so that they would stand out in the dark, since nightlife is a huge part of Liège. Second, in our opinion, the entertaining factor had to be original in order for our bins to become popular for a large public.

We wanted people to relate to the questions we asked by making references they could relate to. The more relatable the better, to become almost a game people would play between friends. On an economical level, we would obviously need the help of the public services through some subsidies, then we would upcycle the waste we collect by subcontracting some companies specialised in the treatment of cigarette butts.

B. Pocket ashtrays available at relevant sales points

Another solution came to our minds thanks to our field interviews. While we were conducting them, it became clear that one of the main issues faced by smokers was that they did not want to hold their cigarette butts once they had finished smoking. It seemed that adding new public ashtrays would thus not resolve this issue as an effort will still have to be made by smokers in order to reach them. An encouraging perspective which emerged from our interviews in the field is that the option of pocket ashtrays came up a few times amongst the interrogated smokers. However, they all had a different opinion regarding the efficiency of such ashtrays.

This prompted us to think of a solution to make these pocket ashtrays more practical and stylish in order to convince a greater number of smokers, whether or not they are already in possession of such an object. In order for this solution to be as attractive as possible, the ashtray in question would have to be aesthetically pleasing and completely airtight. These pocket ashtrays would be available at points of sales where smokers usually buy their cigarettes. Shops such as bookshops (36%) and department shops (28%) would be targeted in priority in order to sell these products as they are the ones where smokers most often buy their cigarettes and rolling tobacco.²³ Moreover, ashtrays would be installed and available at the entrance of these sales points, so that regular smokers could use them in order to empty their pocket ashtrays, while going to buy their new packet of cigarettes. Ideally, a compressed air system would be installed in these ashtrays in order to extract the cigarette butts from the pocket ashtrays and clean it completely to ensure that it is pleasant to use again for smokers. This system would benefit both the seller, who would attract the consumer to his shop to buy his new packet of cigarettes, and society as a whole, as the streets would be less polluted by cigarette butts.

C. Sewer ashtrays

Finally, we contemplated the possibility of turning the smoker's bad habits to our advantage. Indeed, if this mission has shown us something, it is that it takes some tremendous amount of energy, time and efforts to try and change consumers' bad habits that are deeply embedded in

his behaviour. So, we thought long and hard about a solution that would be efficient without worrying about making the smoker do something unnatural to him.

As we stated many times in this report, cigarette butts often end up in sewers, polluting 500 litres each and blocking the underground channels. If some of these cigarette butts end up in sewers because they were first thrown on the ground, some are directly thrown in them.

²³ Le nombre de fumeurs reste stable dans notre pays, Mutualité partena, <https://www.partena-zickenfonds.be/fr/magazine/vivre-sainement/lenombre-de-fumeurs-reste-stable-dans-notre-pays>

Actually a few smokers we interviewed told us they do not want to throw cigarette butts on the ground but prefer to throw their litter in sewers so they do not pollute (another proof of the lack of information regarding the environmental impact of the cigarette butt). This is how we came with the idea of having a bin inside the sewer, just a few centimetres beneath the surface. This “bin” would be large enough to gather cigarette butts for a few weeks, thus reducing the costs related to the collection.

But how would it work? The basic principle would be to arrange a perforated, sloping metal plate below the surface of the manhole cover. This sloping plate would lead the butts into a deep cylindrical bin where they would be stored for the duration of the waste collection by the utilities. This would allow water to pass through the holes in the plate, and only the butts would be collected in the sewer bin. To make sure people throw their waste in the manholes equipped with the bin, we would paint them in a different colour so they would be clear to see to the smoker. If the manhole is not painted, the smoker obviously *cannot* throw his cigarette butts in it.

The only cloud in the horizon is the counterintuitive aspect of the device. Indeed, we are well aware that saying to citizens “*it is OK to throw your cigarette butts in the sewers, actually we encourage you to do so*” might send the opposite message that the one we are trying to convey. With this idea, we are stuck in a position in which we are convinced of its efficiency and the relative ease to put in place, and the fact that we do not want to encourage people to pollute, on the contrary, we want to bring innovative solutions to fight this pollution. At the same time, we think that this solution paired with great awareness campaigns and educative signs on the manholes can bring a positive change.

X. Conclusion

To conclude, through the analysis of a problem’s ecosystem and by forcing us to focus on understanding the problem’s causes before trying to find a solution, we understood that the complexity of a challenge makes more room for an entrepreneur to work on. Here, in the case of cigarette butts, each stakeholder plays a big role in the pollution of the streets and consequently of the environment at large. Whether it be the smokers, tobacco industry, public services or recycling technology, all are areas where the problem takes its roots, and thus, can be worked on by finding innovative solutions. Especially in times like ours, it was important for us to understand that an entrepreneur has to work on problems that the community is facing. Working in that manner made us realize that the issue was much more complex than expected when we first started our research. For instance, in the recycling industry itself, greenwashing is taking place and may have a negative impact on start-ups that really desire to have a positive impact from an ecological perspective.

The study in depth of the pollution caused by cigarette butts itself has taught us a great deal. By analysing the issue from every protagonist playing a role in the problematic, we came to better understand the magnitude of the cigarette butt issue and the problems faced by all stakeholders.

It is in everyone’s interest to find innovative solutions to make the collection process more efficient, avoiding thus a vast portion of the pollution caused by this litter. But we came

to understand as well that there is no point in preventing cigarette butts from ending up in the environment if there is no proper ecological plan for it after their collection. In Belgium, the resolution of the issue seems stuck in an early stage where the waste gathered cannot be dealt in a circular way. These are the two major challenges to enter the scope of a circular economy: enabling the smokers and the collection services to improve their participation in the process in order to prevent cigarette butts from polluting and causing the catastrophic damages that we all know by now, and making sure that those great efforts are not in vain by having a clear plan to give cigarette butts a second life.

All in all, both the strategy applied and the issue we studied were enriching for us as young entrepreneurs, inciting us to go out of our comfort zone.