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# Exploration of the plastic recycling landscape in Flanders

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# CE CENTER CIRCULAR ECONOMY

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## Exploration of the plastic recycling landscape in Flanders

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# Samenvatting

Om mogelijke belemmeringen en kansen bloot te leggen en te analyseren in het recyclagelandschap van post-consumer kunststoffen in Vlaanderen, werden beschikbare databronnen samengevat en relevante sectororganisaties en bedrijven geïnterviewd. De data betreffende bedrijven betrokken in de waardeketen van kunststoffen in Vlaanderen werden gevisualiseerd in verschillende kaarten en in een interactieve tool gebaseerd op het type kunststof, product en sector. De kaart die de verschillende types polymeer weergeeft toont aan dat er heel wat bedrijven in Vlaanderen actief zijn in de waardeketen van polyolefines. Daarenboven zijn er een aantal beleidsmatige ontwikkelingen (zoals de ban door China, acties vanuit Vlaanderen om gescheiden inzameling van kunststoffen te promoten) die een interessante opportuniteit opleveren voor meer lokale recyclage-activiteiten. Om meer inzicht te verkrijgen in het potentieel voor circulariteit in de waardeketen van dit type kunststof en toepassingen ervan, zijn daarom een aantal relevante bedrijven die met polyolefines werken geïnterviewd. Bovendien ondersteunde de zienswijze van twee betrokken sectororganisaties eveneens onze focus op post-consumer polyolefines.

De bedrijven in Vlaanderen actief in kunststof recyclage geven aan dat ze de beslissing van China om de invoer van bepaalde types kunststofafval te verbieden met ingang van 2018 in het algemeen positief opvatten omdat dit opportuniteiten kan creëren voor meer activiteiten en investeringen in Europa en Vlaanderen. Echter, omdat dit tijdelijk resulteert in een overaanbod op onze markt, leidt dit ook tot een (tijdelijke) reductie in prijzen. Verder ondervinden de betrokken bedrijven vaak moeilijkheden om hun gerecycleerde producten te vermarkten omdat er op dit moment slechts een beperkt aantal toepassingen is voor gerecycleerde kunststof. Daarom zouden regelgeving om het gebruik van gerecycleerde kunststof of overheidssubsidies welkom zijn om de onzekerheden te overwinnen die mogelijke investeringen kunnen beperken.

Deze studie was enkel een verkenning van het recyclagelandschap van kunststoffen in Vlaanderen om eerste inzichten te verwerven over de circulariteit van bepaalde types kunststoffen. Om een meer volledig overzicht te verkrijgen zouden bijkomende interviews met meer bedrijven en exacte hoeveelheden van afvalstromen nuttig zijn.

# Conclusions

In order to identify and analyze possible bottlenecks and opportunities in the current post-consumer plastic recycling landscape in Flanders, available data sources were summarized and relevant sector organisations and companies were interviewed. The data of the companies involved in the plastic recycling value chain in Flanders was visualized in different maps and in an interactive graph based on the type of polymer, product and sector. The obtained map focusing on the different types of polymer shows that several companies are active in Flanders along the value chain of polyolefins. Moreover, several ongoing policy developments (such as the China ban, Flemish actions to promote separate collection of plastics), make it an interesting opportunity for more local recycling activities. Therefore, relevant companies working on polyolefins were interviewed in order to get more insight regarding the potential for circularity of the value chain of this type of polymer and its applications. In addition, the perspective of two involved sector organisations also supported our focus on post-consumer polyolefins.

The companies in Flanders involved in the plastic recycling value chain indicate that they perceive China's decision to forbid the import of certain types of plastic waste from the beginning of 2018 in general as positive as it can create opportunities for more activities and investments in Europe and Flanders. However, as it temporarily results in an oversupply on our market, it also leads to a (temporary?) price reduction. Furthermore, the concerned companies often face difficulties with respect to marketing their recycled products since there is currently only a limited amount of applications for recycled plastic. As such, regulations to promote the use of recycled plastic or government subsidies might be desirable to overcome the uncertainties which can limit possible investments.

This study was only an exploration of the plastic recycling landscape in Flanders to gain first insights on the circularity of certain plastics. In order to have a more complete overview, additional interviews with more companies and exact waste quantities might be beneficial.



# PLASTICS RECYCLING IN FLANDERS



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## Context of the study

The team Plastics of OVAM wants to have a vision text and action plan 2019-2024 for plastics. For the elaboration of this text, OVAM requested support to identify and analyze the current post-consumer plastic recycling landscape in Flanders.

Following tasks were done:

- ① Definition of plastic recycling value chain
- ② Exploration of current plastic recycling landscape with a focus on a selected type of polymer: POLYOLEFIN

## Policy context

Three important policy changes in the near future may influence the plastic recycling landscape:

- ① Import ban of China for (highly) polluted plastic waste, including foils - by the end of 2017
- ② Sorting mixed plastics from residual waste (2018) will increase the amount of collected mixed plastics for recycling.
- ③ Increased target for source separated collection of hard plastics via recycling yards. (2018)

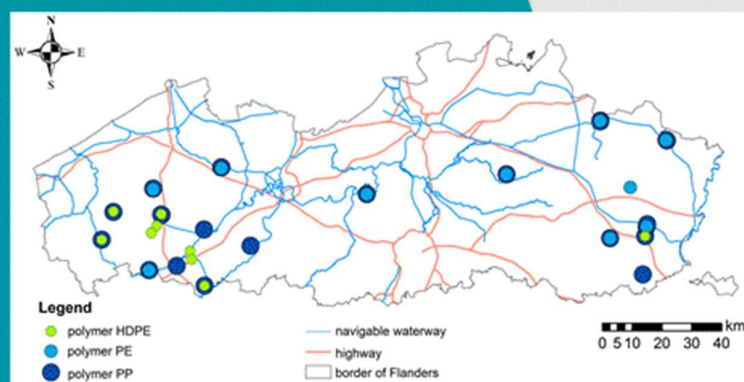
## Value chain post-consumer plastic recycling



## Potential of POLYOLEFIN recycling

Based on the available information and on interviews with key persons involved in plastic recycling (Plarebel and Feder-plast), polyolefins are considered as the type of plastic with the highest potential for recycling in Flanders. Poly-olefins is still a market in evolution due to policy decisions with room for changes.

Furthermore, the whole value chain of this material is available in Flanders and this can lead to opportunities. See map for locations.



# Exploration of the plastic recycling landscape in Flanders

## Introduction

### General - Objective

A new Flemish policy program for plastics is foreseen for 2019 to 2024. The goal of this plan is to demonstrate that with the participation of all actors in the chain the plastic cycle is visibly more closed by 2025 and that leakages from the chain can be measurably reduced. Prior to the process of formulating a clear vision for this Flemish action plan the team Plastics of OVAM wants to gain more insight in the opportunities and potential of plastic recycling in Flanders. Therefore the current project has been included in the program of Steunpunt Circulaire Economie (SuMMa+) as a short-term assignment.

At the moment a lot of high-quality sorted plastic waste is exported for conversion into recyclates, leading to a limited local supply of post-consumer plastic recyclates. If regional policy makers would go for stimulating the use of plastic recyclates, recyclates would need to be imported. In that case a 'level playing field' would be needed according to the plastics processing industry.

In addition, as our local manufacturing industry is primarily focused on more complex and more functional plastics, there seems to be a mismatch between local recycling and production companies. This could be one of the reasons why plastic recycling companies in Flanders cease or decrease their activities or establish themselves elsewhere. On the other hand, the plastic market is an international market, so it is not clear whether these are effectively impeding factors.

In this assignment, the main objective is to support OVAM in identifying and analyzing bottlenecks and opportunities in the current post-consumer plastic recycling landscape in Flanders. The focus is on post-consumer plastic waste as it is assumed that preconsumer plastic waste is mostly already recycled internally.

## Approach

To map the current post-consumer plastic recycling landscape in Flanders, two main tasks were identified:

- 1) Definition and description of the value chain of plastic recycling;
- 2) Exploration of the current plastic recycling landscape.

Task 1 includes a logic flow diagram describing the operations and actors for plastic recycling, which can be used as a basis in task 2. In task 2 a clear overview of the current plastic recycling actors in Flanders is provided based on relevant, available data sources.

Based on the obtained overview in task 2, the scope of polymers with potential for more recycling activities in Flanders was narrowed down to one type of polymer. A number of relevant players were identified and interviewed in order to get more insight regarding the economic obstacles and opportunities for achieving circularity in the chain of the selected polymer. The interviews were done by a PhD student at the University of Antwerp. The key results of these interviews are also included in this report.

Besides a better understanding of the companies' overall perspective, the interviews with the responsables of two federations especially served as direct input to make the choice of zooming in to a specific polymer class. These interviews are summarized in this report.

## Results

### Value chain of plastic recycling

The flow diagram describing the value chain of plastic recycling can be found in Figure 1. Post-consumer plastic waste can originate from two sources, namely from industry and from households. They are called the waste suppliers. Some part of this waste is already collected separately in Flanders, such as PMD<sup>1</sup>, but other parts of plastic waste are not. The source separated waste is then collected, sorted, washed and pressed in bales or put in bigbags by the handlers. Then these bales and bigbags are transported to the reprocessors for further processing to regrind by milling. This regrind is granulated to granulates, which can be used to make a plastic product or a semi-product (a product which contains not only plastic). Along this chain some waste streams go to export, disposal or energy recovery.

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<sup>1</sup> PMD stands for plastic bottles and flasks, metal packaging and drinks cartons. These items are collected separately in a blue bag.

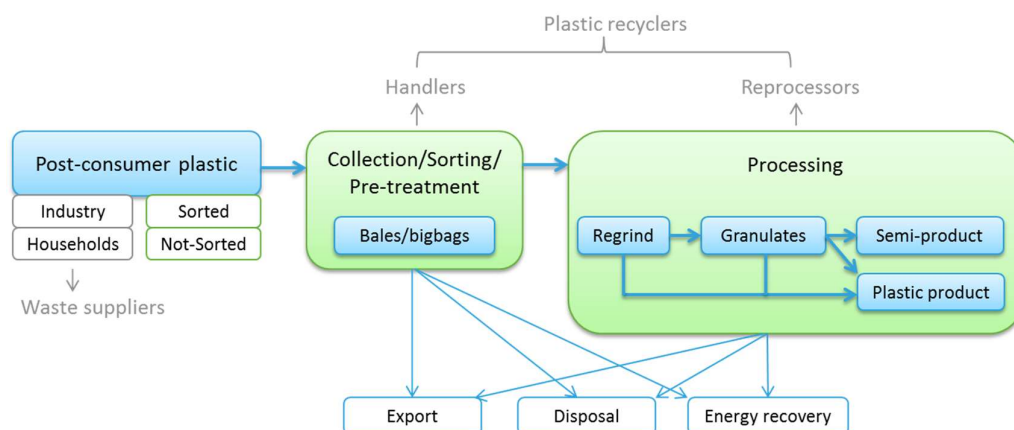


Figure 1: The value chain of plastic recycling.

## Exploration of the plastic recycling landscape in Flanders

Both Petri Ven, the former secretary general of Federplast (Belgian Association of Producers of Plastic and Rubber Articles), and An Vossen, the executive manager of Plarebel (Plastics Recycling Belgium), were interviewed to give their organization's perspective on plastic recycling in Flanders. Their most important remarks are summarized below.

### *Recycling of plastic waste*

Plastic recycling is mainly focused on post-consumer packaging as packaging has a very short lifetime, while plastics from automotive for example have a long life time. This long time between production and recycling makes recycling more challenging due to the historical use of additives.

Recycling contains three main steps: 1) the product needs to be collected in order to take part into the recycling process, 2) the collected product must enter the recycling process, so it may not fall out during sorting and 3) the process should be optimal (return of recycle versus input). Based on these steps, 20% of the plastic foils is currently considered as 'not recyclable'. Polystyrene (PS) is considered as 'not recyclable' since PS products mainly concern small packagings for which no post-separation is operational today (parts smaller than 4-5 cm go to the process residue). New types of polymers, such as bio-based<sup>2</sup>, are 'not recyclable' as well in the beginning. They will contaminate the existing plastic waste stream or the initial available amount will be too small to be recycled cost-effectively, but technically they are recyclable.

### *Chemical recycling*

Chemical recycling is not yet proven at industrial scale. There are a lot of intermediate steps in the chemical conversion of waste to a recycle, which makes it difficult to compete with mechanical recycling in terms of price. Furthermore the plastic waste should be not converted to molecules for fuel and thus not used for energy recovery.

<sup>2</sup> Referring to new biobased polymers with a different chemical structure. So called 'drop ins' are biobased but contain the same chemical structure as their petrochemic counterpart and can be recycled following the current recycling routes.



### *Recycling in Europe*

A lot of our Flemish plastic waste is exported to other countries in Europe for recycling as there is not enough recycling capacity available in Flanders and the current system is hampering the import of waste. To start a recycling plant, a minimum supply of plastic waste is required for a longer time, as well as a good price and a market for the recyclates. A minimum of 20000 ton/year is needed and this amount is mostly not available in Belgium, so import of waste is needed.

At the moment, our post-consumer packaging waste is managed by Fostplus; they collect, sort and export, by using short term contracts and via tenders. These short term contracts give supply uncertainty.

Another important remark is that there is more and more vertical integration in the plastic recycling value chain. International and/or global players control the whole chain and keep the waste within their own chain. This makes it more difficult for companies in Flanders to buy recyclates at an acceptable price.

The quality of the Flemish plastic waste is overall very good due to the good sorting culture, which makes the export price higher than the average market price. Nevertheless, the opportunity of recycling certain types of packaging waste such as PET, PVC, HD-PE and LD-PE in Flanders has already been lost.

### *Challenges*

China continues their green fence policy and forbids the import of polluted plastic waste, mainly foils, from the beginning of 2018. This decision could be seen as an opportunity to revise the current plastic recycling landscape in Europe.

Currently most European plastic foils are exported abroad, while only a small part is recycled within Europe to agricultural foils or trash bags. As such, the oversupply of waste foils will be a challenge for Europe. It is expected that FostPlus will have about 29 kton of foils annually. Possible solutions are: 1) a better separate collection so that a fraction can still be exported, 2) export to other Asian countries (no solution on long term), 3) start own recycling plant(s) in Europe (best solution, although requires large investment).

Besides the foils, PET trays will be another challenge as this application is growing much faster than expected. The PET polymer in these dishes have a shorter chain length than in PET bottles. Currently the traditional recycling process of PET bottles is too aggressive for the PET trays. Also labels, multilayers and attached foils makes recycling of these trays difficult. It will be interesting to recycle these trays in the future, but one must be aware of downcycling if PET bottles are used to manufacture PET trays and of competition with recycled PET bottles.

A last challenge are opaque PET bottles and mixed streams. Mixed streams suffer from composition changes, which can influence the recycling process.

### *Circular economy*

As plastic waste mainly consists of plastic packaging with a very short lifetime, it would be better if plastic packaging is not considered as a part of the product but as a service. Producers should stay the owner of their product during its entire lifetime. That way they will think more responsibly about the end-of-life destination of their product.

## Focus on polyolefins

Based on the available information and on interviews with Plarebel and Federplast, polyolefins are considered as the type of plastic with the highest future potential for post-consumer recycling in Flanders. Polyolefins is still a market in evolution due to policy decisions (China ban, source separate collection of plastic foils) with room for changes and improvements. Furthermore, companies over the whole value chain of this material are available in Flanders and this can lead to synergies and opportunities.

## Overview of companies involved in value chain of polyolefins

In order to map the plastic recycling landscape in Flanders, known companies involved in plastic recycling were mapped. They were divided according to their activity in the value chain. In addition, a distinction was also made based on the type of polymer. To visualize the obtained data, different maps were made and they are shown in the figures below. The size of the bullets on these maps has no meaning. These maps have been compiled with meticulous care and to the best of our knowledge. However, we cannot guarantee the accuracy or completeness of the information.

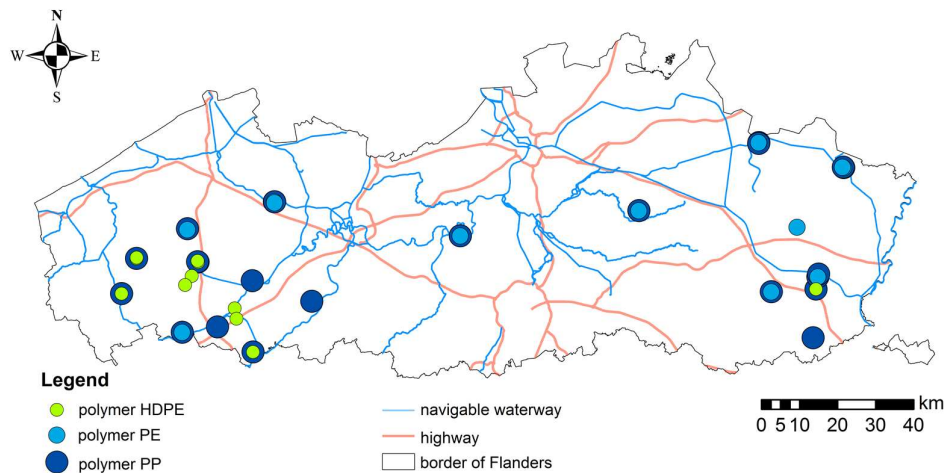


Figure 2: A map of Flanders with all the companies involved in plastic recycling, depending on the type of polymer.

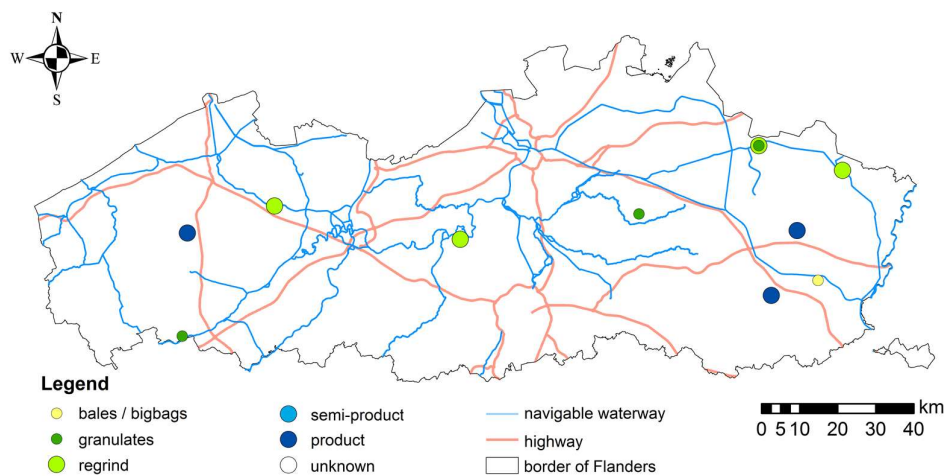


Figure 3: A map of Flanders with all the companies involved in the recycling of PE.

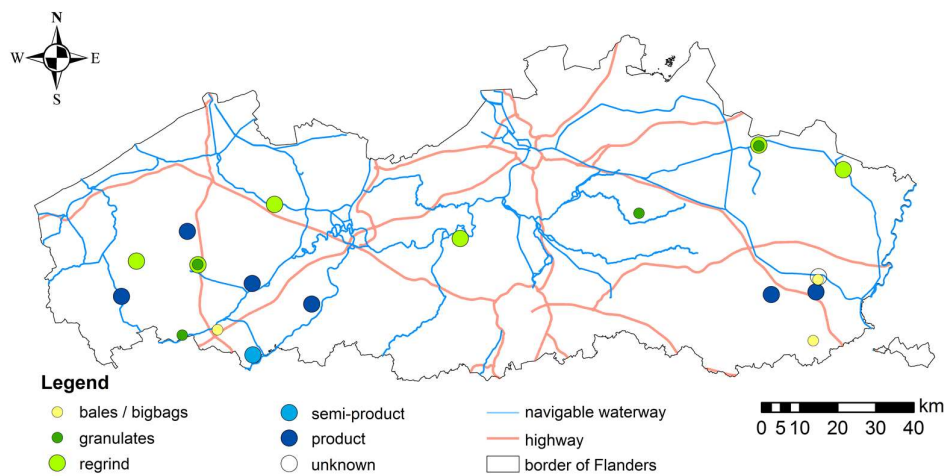


Figure 4: A map of Flanders with all the companies involved in the recycling of PP.

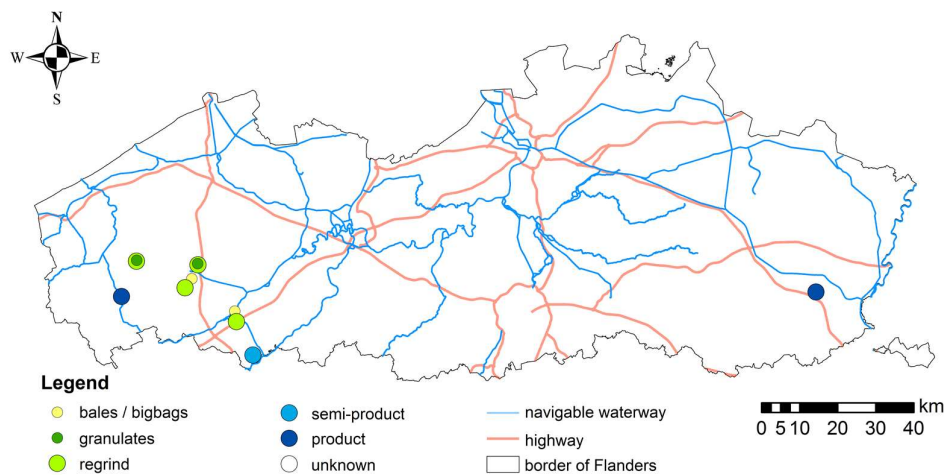


Figure 5: A map of Flanders with all the companies involved in the recycling of HDPE.

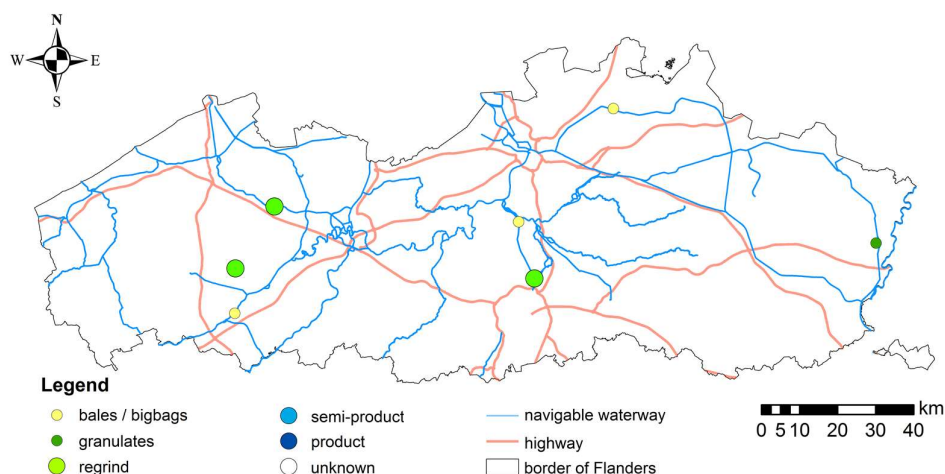


Figure 6: A map of Flanders with all the companies involved in the recycling of foils.

An interactive version of these maps is also available: [www.ce-centre.be/tableau](http://www.ce-centre.be/tableau). This interactive graph gives more information on the name of the company and allows to search on a preferred type of product and sector. A screenshots of this interactive graph is shown below.

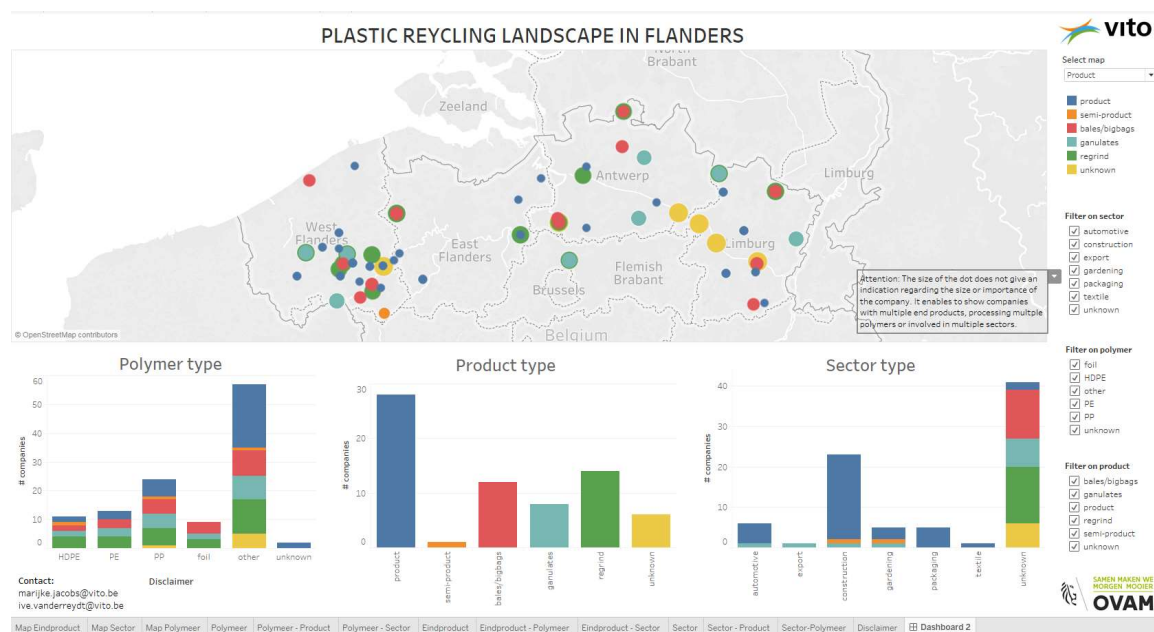


Figure 7: A screenshot of the interactive graph.

## Interviews with companies involved in value chain of polyolefins recycling

Six companies, active in the process of recycling polyolefins, were interviewed in order to map the circularity of these polyolefins in Flanders. The selected companies have a different focus within the process of recycling, ranging from collector to granulator. Questions were asked about the bottlenecks slowing down circularity as well as opportunities for (more) circularity



in the polyolefins recycling chain. The most important remarks of these interviews are summarized below.

Since the beginning of 2018 China forbids the import of certain types of plastic waste. This decision is generally received positively as it might create opportunities. However, it will (at least temporarily) lead to an oversupply of economically less interesting plastic waste on the market, thus lowering the price of this waste. Another possible consequence of this decision could be a specific efficiency loss in terms of color separation during the process of recycling as manually sorting plastic fractions by color is only (economically) feasible in low wage countries. In Europe this sorting can be done with infrared technology. Nevertheless, the economic feasibility of this process depends on the type of material. As a consequence, some materials would not be sorted by color.

A possible way out for the current disequilibrium on the plastics market, would be to export waste streams to China's neighboring countries as they have a competitive advantage compared to Europe. However, this will only be a temporary solution as they will also most likely close their borders after legislative changes, following the Chinese example.

Most companies in the polyolefin recycling chain experience a sales problem. In Belgium, only a limited amount of applications for recycled polyolefins exist. Besides legislative and technical bottlenecks, people tend to be sceptical with regard to plastic recyclates. This negative connotation, which exists in Belgium, is for instance less present in the Netherlands. Currently the recyclates are often not even used for garbage bags. This makes it sometimes difficult to find applications for these recyclates in Belgium.

This market uncertainty slows down investment projects. Possible solutions to this problem could be: obliged quotas for recycled content or support from organisations like Fostplus and Val-i-Pac to the industry. Taxing prime material is not considered to be a good idea. To improve their sales volume, recycling companies aim to deliver a stable amount of recyclates of high quality and in large volumes. Furthermore the economic feasibility seems to improve if the quality of their products is matched with the customer's needs as the customer is then willing to pay more for the products. Specialization and focusing on niche markets through knowledge sharing are also key solutions in Flanders to have a good rendability. Most specialized recycling companies are situated in East and West Flanders as they were originally active in the textile sector but they oriented themselves towards plastic waste.

The decision of China leads to an oversupply of plastic waste on our market followed by a price reduction, but also the price of the prime material influences the market of the recycled granulates. If there is a price reduction of the prime material (which depends strongly on the oil price), there will be less interest in recycled granulates, creating an oversupply. However, the problem of oversupply does not apply to every type of plastic. There seems to be no problem for postindustrial PE, but (LDPE) foils are an issue. In the past these foils went to Lithuania and Bulgaria, but market conditions have changed. The reason why certain foils are not treated anymore is twofold. On the one hand, the market dynamics cause foils to be the least interesting type of plastic to recycle. On the other hand, the small capacity still existing for foil treatment is dominated by foils coming from the UK as the UK subsidizes the export of these waste foils, making them economically much more interesting.

Concerning the recycling process, there is a trade-off between the quality of the waste stream and the residue. At the moment, the average residue is about 10 %. A small part of this residue is still plastic, but it is too small to be recyclable. The obtained regrind is often further processed to granulates as only a small fraction can immediately be used for new plastic products.

In order to reduce the market risk and stimulate new investments, there should be new policy and regulations to overcome uncertainty due to excess supply and limited demand and to stimulate companies working on sustainable economy. One can think of changing ownership of a product, obliged quotas for recycled content, financial stimuli for products with recycled content etc. In addition, sensitizing citizens and sorters of importance on good sorting practices remains an essential task as it will positively influence the quality of our plastic waste.

## Conclusions/next steps

In order to identify and analyze possible bottlenecks and opportunities in the current post-consumer plastic recycling landscape in Flanders, available data sources were summarized and relevant sector organisations and companies were interviewed. The data of the companies involved in the plastic recycling value chain in Flanders was visualized in different maps and in an interactive graph based on the type of polymer, product and sector. The obtained map focusing on the different types of polymer shows that several companies are active in Flanders along the value chain of polyolefins. Moreover, several ongoing policy developments (such as the China ban, Flemish actions to promote separate collection of plastics), make it an interesting opportunity for more local recycling activities. Therefore, relevant companies working on polyolefins were interviewed in order to get more insight regarding the potential for circularity of the value chain of this type of polymer and its applications. In addition, the perspective of two involved sector organisations also supported our focus on post-consumer polyolefins.

The companies in Flanders involved in the plastic recycling value chain indicate that they perceive China's decision to forbid the import of certain types of plastic waste from the beginning of 2018 in general as positive as it can create opportunities for more activities and investments in Europe and Flanders. However, as it temporarily results in an oversupply on our market, it also leads to a (temporary?) price reduction. Furthermore, the concerned companies often face difficulties with respect to marketing their recycled products since there is currently only a limited amount of applications for recycled plastic. As such, regulations to promote the use of recycled plastic or government subsidies might be desirable to overcome the uncertainties which can limit possible investments.

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