

PlastiCity Handbook

For local or regional governmental organisations to establish a community of stakeholders for developing new value chains and business cases for post consumer non household plastic waste in urban environments

Interreg 
EUROPEAN UNION

2 Seas Mers Zeeën

PlastiCity

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Executive summary

Urban environments are major players in the transition toward the circular economy. Currently, about 85% of global Gross Domestic Product is generated through cities. Plastics are one of the most used products in our society with a high impact on our environment, such as on the climate and on the natural environment (ocean soup and microplastics).

In the EU on average only 30% of plastic waste is being recycled. By recycling more plastics emissions can be avoided. That is why the EU wants to increase recycling rates to 55% by 2025.

In plastic recycling there is not enough focus on post-consumer non-household (PC NH) plastic waste (from businesses). Because the composition of these plastics is well known and contaminations are nearly non-existent, recycling should be easy.

In the PlastiCity project we aimed to increase the recycling rates of PC NH plastic waste in four urbanised pilot areas by establishing an urban platform and working together on innovative logistical solutions for the collection, determining the flows and the qualities with a mobile unit. By realising the business case of recycled plastic products new (local) value chains would be established.

In this project we've learned that by working together with partners in the plastic chain, effective logistics e.g. collective milk-run and/or reverse logistics in combination with cross docking can be realised to bundle the plastic in a central location. From there the plastics can be fed into the current recycling chain, be recycled on the spot and used to design and produce new products from recycled plastics. We also learned that the project impacted other policy fields, like climate change, air quality and congestion.

These and other learnings have been used to develop this handbook. This handbook contains guidelines for local or regional governmental organisations for setting up a circular network with local players in the plastic value chain to develop new value chains for non-household post-consumer (NH-PC) plastic waste in urban environments.

The handbook has been developed by the consortium partners of the Interreg 2 Seas project "PlastiCity". This project has received funding from the Interreg 2 Seas programme 2014-2020 co-funded by the European Regional Development Fund under subsidy contract No 2S05021.

plasticityproject.eu

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1. Introduction

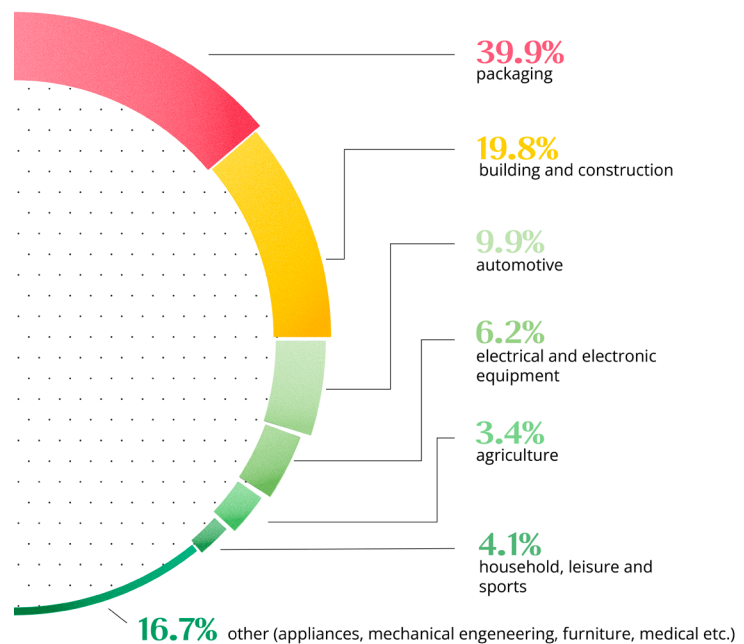
1.1 PlastiCity: a European approach

Plastics are all around us and they define our everyday life. Their unique properties have made them excel in many applications, leading to more fuel efficient cars, better insulation houses, space and air travel, less food waste and so much more. Figure 1 shows that in Europe about 40% of the plastics is used for packaging and more than 20% is used in the building and construction sector. Other important usages are for the automotive, electrical & electronics, household, leisure and sports.

Unfortunately, plastics, mainly single use items have another downside. Plastic waste is polluting our oceans and landscapes. Everyone has heard the term 'microplastics' and 'plastic soup'. The pollution of our soil is not so well known even though the fields where our crops grow are 4 to 23 times more heavily polluted with microplastics than the oceans.¹

As plastic production grows, it will lock in new fossil-fuel infrastructure and increase emissions that arise from the exploration, extraction, transport and refining of oil, gas, and coal.

fig 1: Plastic production by type in Europe



plastic waste and recycling in the EU: facts and figures² : 30-06-2021

Global production of plastics has increased from 2 million tonnes in 1950 to 368 million tonnes in 2020, mainly produced by oil and natural gas.

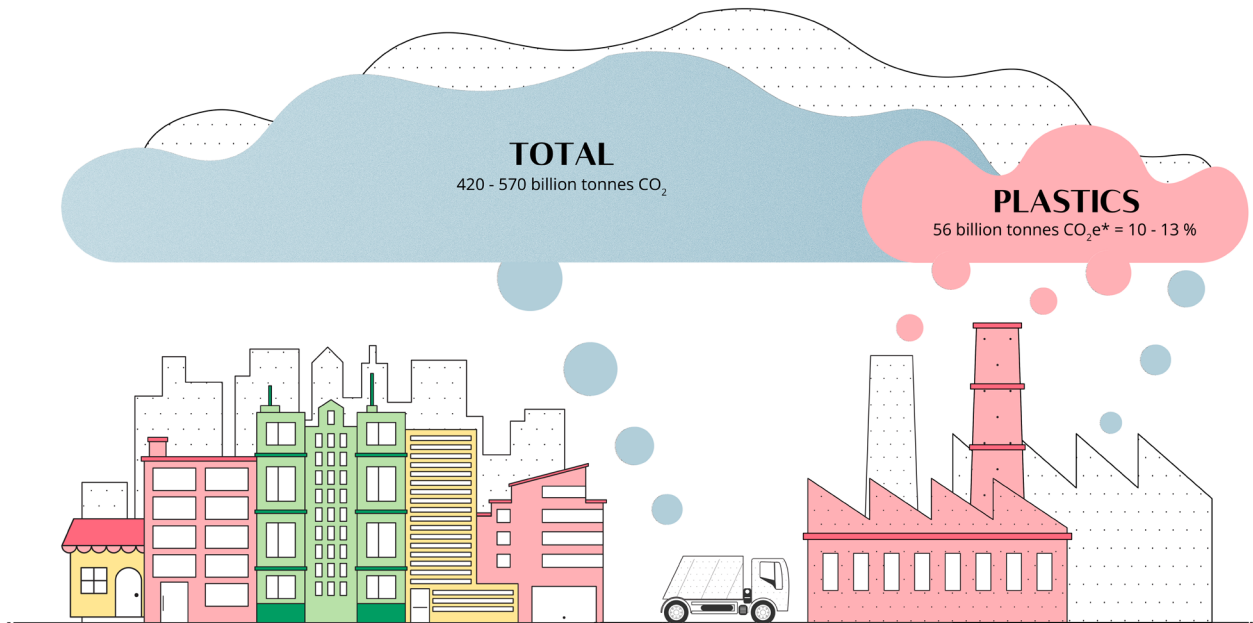
Transport, energy and farming are the three sectors most often blamed for climate change. The emissions caused by plastics production are often forgotten. If we want to limit the warming of the earth to one and a half degrees by 2050, we should not emit more than 570 billion tons of CO₂. Of this, 10% to 13% will be emitted by the production of plastic and the incineration of plastic waste.³

¹ <https://pubmed.ncbi.nlm.nih.gov/29245177/>

² <https://www.europarl.europa.eu/news/en/headlines/society/20181212STO21610/plastic-waste-and-recycling-in-the-eu-facts-and-figures>

³ <https://www.ciel.org/wp-content/uploads/2019/05/Plastic-and-Climate-FINAL-2019.pdf>

fig 2: Plastic & climate change



* CO₂ equivalents: units of measurement for standardizing the climate impact of different greenhouse gases

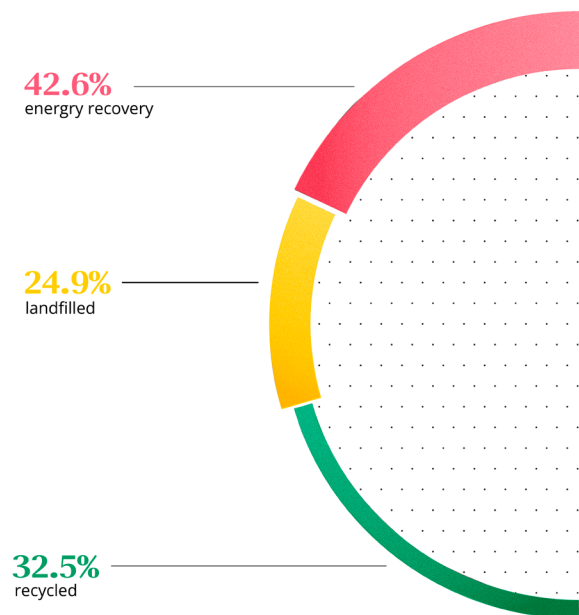
max CO₂ emissions to limit the warming of the earth to 1,5 degrees by 2050: plastic atlas 2019¹

By recycling plastics, emissions can be avoided. Because plastics are mainly made from finite resources, it has a high potential value for recycling. In the EU on average only 30% of plastic waste is being recycled.

If we want to transit towards a more sustainable, yet viable economy we need to be more efficient with our resources. Therefore, it is important to collect, reuse and recycle plastic waste to make sure it does not pollute our environment and contribute to climate change.

A transition towards a more circular economy and increasing plastic waste recycling rates is key action.

fig 3: Plastic waste treatment in the EU



plastic waste and recycling in the EU: facts and figures³ : 30-06-2021

¹<https://www.boell.de/sites/default/files/2020-01/Plastic%20Atlas%202019%202nd%20Edition.pdf>

³<https://www.europarl.europa.eu/news/en/headlines/society/20181212STO21610/plastic-waste-and-recycling-in-the-eu-facts-and-figures>

The European Union (EU) developed a European Strategy for Plastics in a Circular Economy in 2018 (European Commission, 2018), with accompanying plastic recycling targets of 50% by 2025 and 55% by 2030. The main focus lies on post-consumer plastic waste, which is broadly studied. A lot of plastic waste is also being generated during the production of post-consumer goods. This is known as post-industrial waste and is often an easy waste stream to recycle as the composition is well known and contaminations are nearly non-existent. Some companies even have in house recycling loops set up for their production waste. Others sent it to specialised companies to be re-granulated. A third category is the waste produced in other places among the value chains that keeps on slipping between the mazes of the recycling net. Activities like logistics and the use of goods in small to medium-sized enterprises (SME's) also generate large amounts of waste. Think about the plastic wrapping from pallets with shoes delivered to the local shoe shop, the buckets filled with sugar syrup used in the artisanal bakery and during many other applications and uses. This plastic waste, often referred to as 'lost plastics', however suitable for recycling, often does not find its way into an appropriate recycling system, despite its potential. Despite the EU's target for a circular economy, the recycling of post-consumer non-household (PC-NH) plastic waste does not seem to improve structurally, although it has great potential. The PlastiCity project aims to do something about this.

1.2. PlastiCity


There is a lot of plastic waste available in the urban environment that at least technically qualifies for recycling. The PlastiCity project was designed to develop solutions to significantly improve recycling rates of PC-NH plastic waste in urban regions. PlastiCity analyses the potential of these waste streams and the associated factors in the urban environment in a holistic way in order to develop and demonstrate new strategies and create local value chains to increase the recycling rates of PC-NH plastic waste.

1.3. Handbook

One of the deliverables of the PlastiCity project was to develop a handbook for governmental organisations, based on the learnings of the project. The handbook includes the learnings of the PlastiCity project and guidelines with supporting arguments for setting up new value chains for business waste that previously remained untapped.

1.4. Reading guide

Chapter one presents an introduction on the background of the PlastiCity project and reasons for the handbook. Chapter two elaborates on the approach, the objectives and outputs of the PlastiCity project. In Chapter two also the learnings of the PlastiCity project are described. These learnings were used to design the different "steps" of this handbook. The steps and corresponding arguments are explained in chapter three.



2. The PlastiCity Project

2.1. Common Challenge

PlastiCity was the first project in the 2 Seas region that was designed specifically to support the implementation of the European Strategy for Plastics in a Circular Economy (European Commission, 2018).

The 2 Seas region represents the following areas:

- ◆ **England:** South-West, South-East and East of England
- ◆ **France:** Departments of Nord, Pas-de-Calais, Somme and Aisne
- ◆ **Belgium (Flanders):** Provinces of West-Flanders, East-Flanders and Antwerp
- ◆ **The Netherlands:** Province of Zeeland and the coastal areas of the Provinces of Zuid-Holland, Noord-Holland and Noord-Brabant.

The region is one of the top regions in the EU when it comes to generating plastic waste, but overall, plastic recycling rates are still low (on average 20-30%). The region has many cities located near water bodies, that could cause an environmental risk, as it is known that a huge amount of plastic marine debris is caused by cities. At the same time, the circular economy is a huge economic opportunity for these regions.

A lot of plastic waste, especially plastic business waste or better Post-Consumer Non- Household (PC-NH) plastic waste, available in the urban environment is at least on a technical level fit for recycling. However, recycling often does not take place due to several reasons. The current waste contract structure for this waste stream is ineffective. Because every company has its own waste contract and the tonnages per contract are too low, separate collection of only PC NH plastics is too complicated and not viable. Furthermore, there are shortcomings in waste legislation and passive behaviour of actors. This is caused by the fact that nobody feels a sense of urgency, ownership and responsibility.

2.2. The PlastiCity Project

The main objective of the PlastiCity project was to develop and demonstrate new strategies and solutions to increase recycling rates of PC NH plastic waste (so called 'lost plastics') from 20-30% to over 50% in urban environments. By unlocking the use of 'lost plastics' as secondary resource and thereby creating business opportunities. The aim was to also create between 100 and 400 jobs within the circular economy.

The project was executed from beginning of 2019 until the end of 2022 by a diverse consortium with expertise on all parts of the plastic waste value chain in four European regions (Ghent in Belgium, The Hague in the Netherlands, Southend-On-Sea in the United Kingdom and Douai in France).

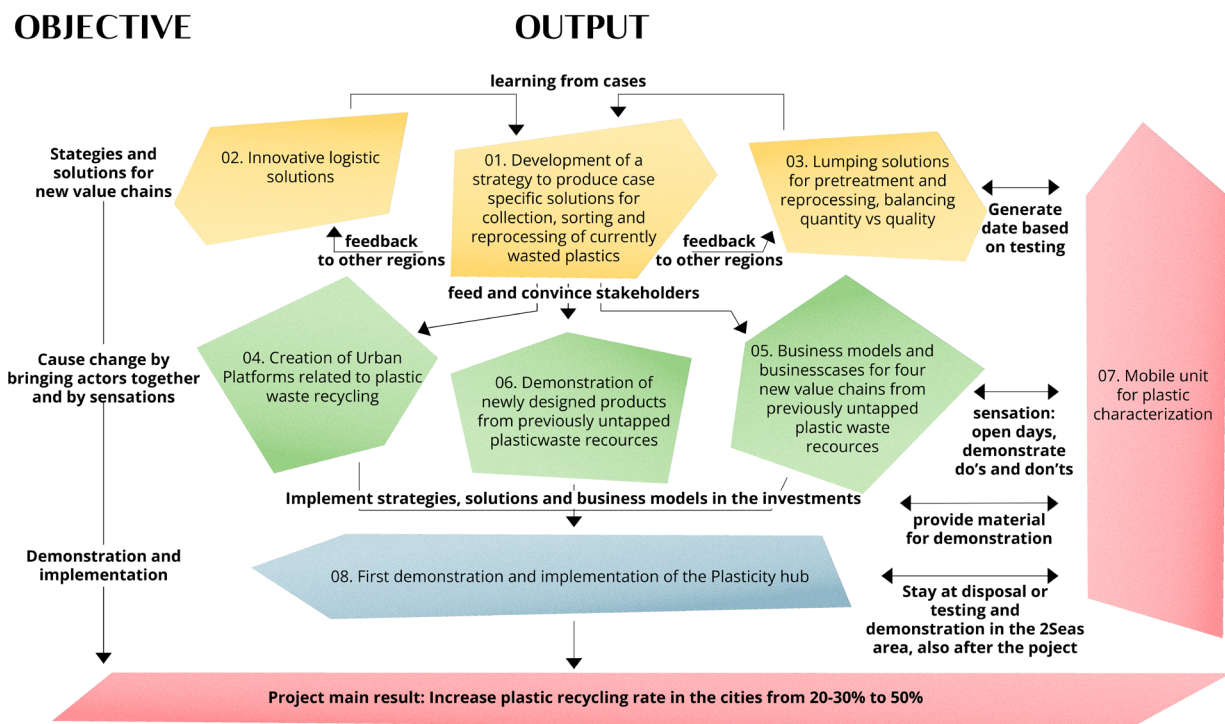
2.3. Realising change

In order to improve recycling rates as formulated above, various chain parameters of the current processing chain of business waste, of which PC NH plastic is a part, need to be analysed and adapted. The current chain consists of many components such as; logistics, waste contracts, types of plastics, their qualities and quantities, mechanical recycling options, required investments for local recycling, new products, reusability etc.

In order to visualize the role and influence of all those parts and to determine which alternatives are necessary, the execution of the project is divided into 3 sub-objectives, each of which has multiple outputs.

The whole set up of objective and accompanying output (O) is shown in the figure below:

Figure 4: Overview of the results, objective and outputs of the PlastiCity project



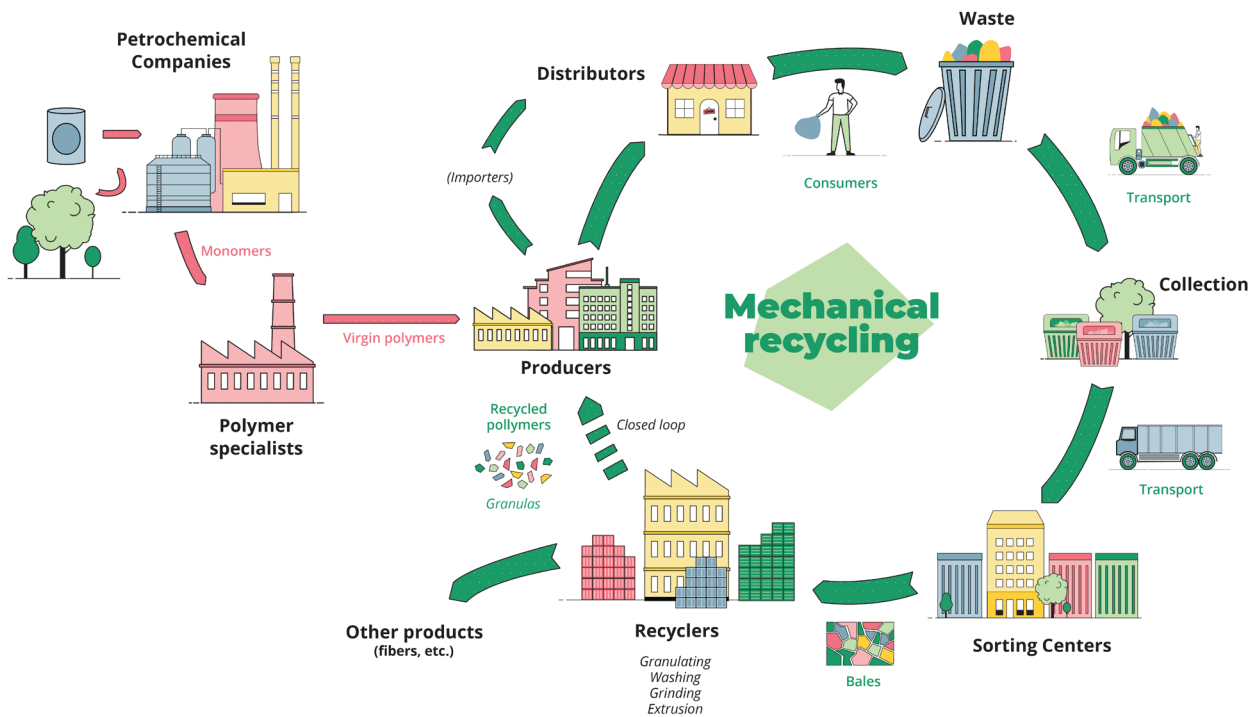
2.4. Activities of the Project

Below is a description of the activities carried out in the PlastiCity project to get to know the different chain parameters in the project and to find out which types and to what extent the parameters need to be changed.

The different activities have been executed in phases. The first phases were aimed on gathering information about the plastic ecosystem in the participating pilot areas. Thereafter our goal was to achieve change and concrete results. Below a summary of the activities:

- A. Finding out the characteristics of the current PC NH plastic waste environment by creating insight in the actor groups involved in the current plastic waste chain, their spatial distribution (where are they located) and their attitudes towards plastic waste.

Figure 5: Demonstration of the actors in the value chain



Jan 21: PlastiCity Replicable Strategy⁶

- B. Designing, building and using a [mobile unit](#) to collect and test (determine mechanical & chemical characteristics) the composition of the collected plastics. Use the outcome for new bundling strategies. And by demonstrating the pre-treatment process to stakeholders with the mobile unit raising awareness, increasing knowledge and raising project commitment of stakeholders.
- C. Determining current and possible future logistic systems by making PC NH plastic waste available and organise the collection of these plastics in order to determine the quantities and qualities of plastic waste per actor group. Based on the outcome, developing innovative sustainable new plastic collection logistics.
- D. Determining new bundling strategies to improve processing and production based on the results of the analysis of the collected plastics in the Mobile Unit.
- E. Creating an urban, interactive digital, platform to exchange data and other information between platform members. By sharing knowledge and increasing awareness, you can induce behavioural change. By encouraging collaboration, you encourage stakeholders to work together on a long-term basis.

⁶<https://www.plasticityproject.eu/downloads/>

- F. Realising a local HUB to take over the role of the mobile unit and ensure lasting bundling (based on improved lumping strategies) and testing the composition of the collected plastics. Processing the recycled plastic to production quality and designing, testing and producing products from the collected plastic business waste.
- G. Realising new business opportunities
Demonstrating and implementing in four case study areas, four new value chains with the design of four new products/business cases.
- H. The implementation of these activities has yielded a lot of knowledge and learnings. They are elaborated below.

2.5. Learnings

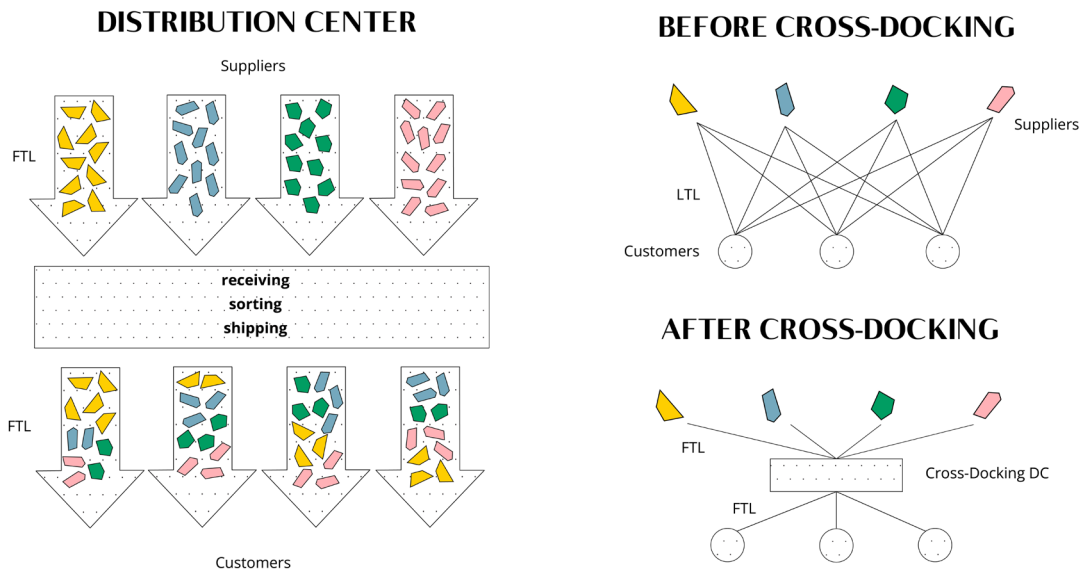
The lessons learned have also been used to design the guidelines for governments to try to increase the recycling rates of PC NH plastic waste themselves. The lessons learned have been captured by interviewing those most involved project members per output. This concerns project representatives from governments, companies, consultants and other involved parties. The results are elaborated below.

2.5.1. Logistics

- It is recommendable to first map and analyse the current logistical characteristics involved in (separate plastic) waste collection, like for instance the policies on accessibility, mobility and air quality (environmental zones etc.), that could influence urban waste collection and the spatial distribution of actors (classified in locally, regionally, nationally or EU and division of actor groups), because this could influence the logistic costs.
- Develop logistical ideas first, before arranging a specific PC NH plastic waste collection approach.
- In general, SMEs have relatively small amounts of plastic waste that are not attractive to collect separately as part of an existing contract. Current waste contract partners will be dissatisfied when the plastics are removed from their waste contracts. If recycling rates of PC NH plastics waste is to be increased, they need to be detached from the current waste contracts. To establish this, separate collection of PC NH plastics is required. If the waste collection is to be financially attractive, there needs to be a sufficient amount of plastics with a certain continuity and quality. It furthermore strongly depends on distances, personnel and fuel prices and the value of plastic waste.

- In an urban environment, cross docking locations are an attractive asset because it can be combined with a hub. The hub can be used as “in between” storage facility to build up mass. Because of the cross docking function in- and outgoing plastic can be bundled here or even granulated to recycling on site or increase the weight/volume ratio for further transport or for testing.

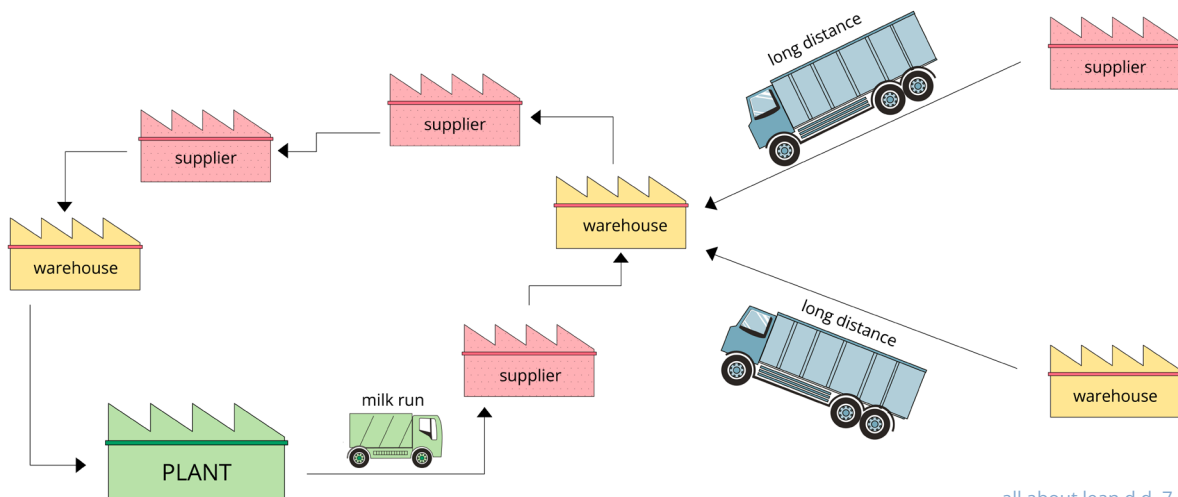
Figure 6: Cross Docking Distribution Centre



The Geography of Transport Systems d.d.7-11-22⁷

- Hubs would be ideally located near business centres or industrial estates (concentration of plastic waste nearby).
- Milk runs prove to be an efficient collection method for a specific waste stream and an effective way of feeding the hubs. Because plastic is low weight, it can easily be transported with electrical vehicles, thus reducing local emissions.

Figure 7: External Milk Run Long Distance Haul



all about lean d.d. 7-11-22⁸

⁷ <https://transportgeography.org/contents/chapter7/logistics-freight-distribution/cross-docking-distribution-center/>

⁸ <https://www.allaboutlean.com/external-milk-runs/external-milk-run-long-distance-haul/>

- Compressing plastics in vehicles is an effective way of increasing collection volume and therefore increases logistic effectiveness.
- Collection in itself is not a problem. The challenge is to collect plastic waste effectively and to provide a continuous flow of plastic of constant quantity and quality. All supply chains (on local, regional or larger geographical scale) can lead to viable business cases and (intermediate) products. If that is not the case, it helps downsizing the investments in the processing equipment. In that case, a local chain would prove more appropriate.

2.5.2. Lumping

- Lumping is the bundling of plastics with similar qualities to make it more attractive to recycle. Lumping plastics is easier in a local plastic value chain because it is shorter and it is therefore better and easier to control the quality of the plastic supply chain.
- The quality of the plastics per business category is reasonably comparable and can therefore be easily combined, as was concluded based on extrapolations of one of the partners in a pilot area.

2.5.3. Hub

- Hubs are not easy to achieve, due to aspects like availability of suitable space, required investments and equipment, requirements with regard to permits etc. So, when realising a hub, all these aspects need to be carefully considered and recorded in order to avoid delays or disappointments amongst the partners. This also applies for the profits that might be made by the hub. These agreements differ per situation.
- Based on experience and calculations from the University of Ghent the PlastiCity project learned that there are three viable chains. The first chain just fulfils the basic ideas of the project, being to increase recycling rates of PC NH plastic waste and feed them into the current chain (so no additional processing steps on local level).
The second processing variant is a small-scale hub, with small quantities of plastics, which requires small investments on recycling and production equipment to make products that are probably sold locally.
The third processing variant concerns a recycling unit for 10,000 tons (films). This is a small commercial viable processing unit to make recyclate to be fed into the current processing chain or to be used to make new products. Because of the production capacity, it can be sold on wider than just local level.
These calculations have been conducted by the University of Ghent.

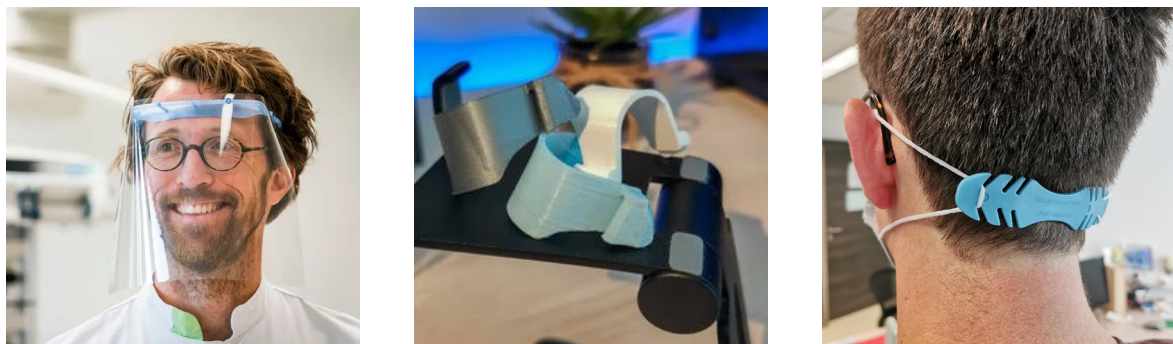
2.5.4. Urban Platform

- ◆ For a digital platform to work, a community needs to be established first and must be composed of committed actors, stakeholders, who are willing to actively contribute (intrinsically motivated) to the goals of the project (common interest and beliefs).
- ◆ Successful potential products could increase belief in success of the overall project and transition, and therefore in lasting corporation.

2.5.5. Business Cases

- ◆ New recycled plastics products have been designed and produced, as the examples below show.
 - ◆ face shield from recycled PET
 - ◆ nose bridge from recycled food grade PP buckets
 - ◆ ear buddies are made of recycled industrial cuttings from artificial turf
 - ◆ In the PlastiCity project also other new products from recycled plastic have been designed and developed. Find them here.

Figure 8: Examples of new products made of recycled plastics by partners of the PlastiCity project



- ◆ We learned that although these new products could be developed on a local level, it is challenging to produce them in a complete local value chain. Not for all new designed products all steps, actors or materials in the value chain were available on local level e.g. the face shield was locally produced and used, but not made from local plastics. This means that the business case can also be realised if only part of the chain is local.
- ◆ Viable cases vary over time and depend on fuel prices, labour costs and market prices.
- ◆ Do not limit the search for new business cases or products to one opportunity, but aim for more potential products and cases.

2.5.6. Communication & Mobile Unit

- ◆ The purpose of the [Mobile Unit](#) was threefold:

Figure 9: Photo of the Mobile Unit



- ◆ Collection and processing point for plastic waste.
 - ◆ Quick research point (determine mechanical & chemical characteristics).
 - ◆ Communication and raising awareness amongst SMEs about the possibilities of plastic recycling.
-
- ◆ If local authorities lack a network of their own, use the networks of others, such as business and interest groups linked in groups, to build your own network, this could help to build up the required network for the project.
 - ◆ Organising face to face meetings is highly recommended. If COVID-19 taught us anything, it is that people feel less and less involved through virtual meetings, slowly diminish the feeling of involvement and togetherness. This does not help in achieving a community and/or jointly formulated goals, approaches and business cases.

2.5.7. Strategy

- ◆ The current plastic chain is globally or European oriented. Recycling initiatives of PC NH plastic waste are limited and occur among larger companies or in the case of larger bundled plastic waste streams (eg at a distribution center involving reverse logistics). Within waste collection, competition runs quite high. Business, contracts and trade secrets are heavily guarded. Smaller projects, in terms of amounts of plastics, are not seen as a trend to the current status quo.

- The approach was to first get to know the waste and PC NH plastics environment on theoretical level before executing activities aimed at changing the existing chains.
- Increasing recycling levels of PC NH plastic waste requires these plastics to be removed from existing waste contracts and be collected separately. Organising this requires an independent overarching actor, like a governmental organisation with no commercial interest.
- The chosen strategy of a project requires flexibility in order to be able to absorb influences from inside and outside a project and to turn a threat into an opportunity (e.g. to realise an output: face shield from recycled PET during COVID-19).
- Managing triple helix projects could prove difficult due to differences in interests and different backgrounds and way of thinking.

2.6. Conclusions

The PlastiCity project has yielded valuable results that make it easier for (local) governments to develop initiatives themselves to separate plastic business waste, that now still ends up being burned or dumped.

Plastic is a bulky product. Plastic separation and separate collection does take place at larger companies with larger quantities of plastics and at companies that can handle bundling of waste flows at their logistics centres and by means of reverse logistics. The bundled plastic is collected at their logistic centre by a waste processor. This is not the case for SMEs. Many companies in urban areas are SMEs. These companies have relatively small quantities per contract, which means that separate collection is not feasible. To make this possible, this will have to be placed in a separate contract. As with reverse logistics, bundling can take place by applying a milk run and using a logistics centre/cross docking location and/or a hub where flows are bundled. Collection vehicles with compression capability can be used to improve the volume to weight ratio, and bundling at the hub also leads to volume and weight increase.

The processing variant in which the improved separate collection in the current chain is served via the hub, can also be used to start up the two local processing variants. Based on the support and willingness of the partners and the area characteristics, and therefore also the logistical aspects, it can be determined in mutual consultation which processing variant is possible. Moreover, it is possible to grow from first the small-scale variant and then to the 10,000 ton variant.

Based on these general conclusions and the other lessons learned, chapter three provides concrete steps with accompanying considerations to increase recycling rates of PC NH plastic waste and to establish value chains and business cases on the most effective level for your region.



3. Handbook

3.1. Introduction

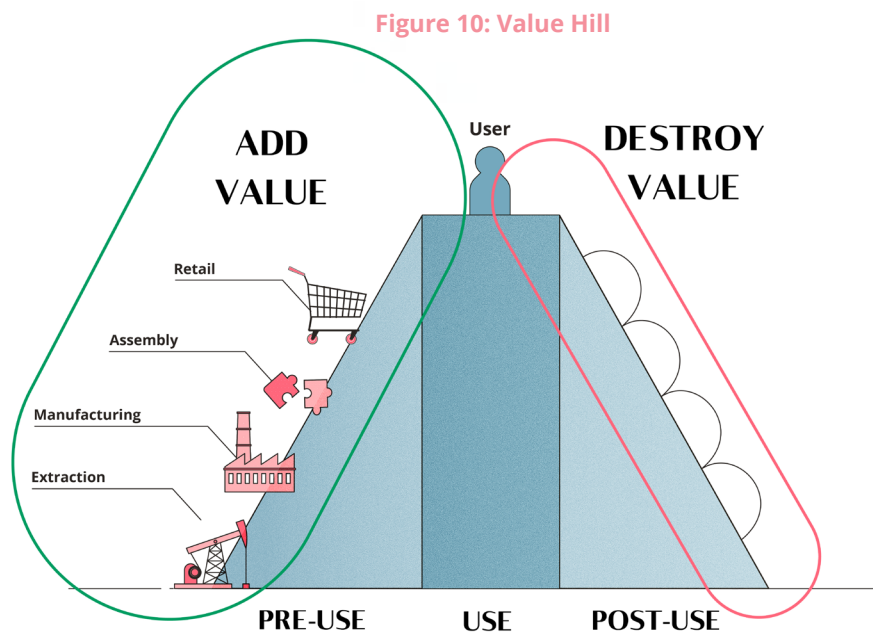
This handbook is a product of the PlastiCity project. The experiences and lessons learned by the partners of the PlastiCity project have been used to shape this handbook so other (local) governmental organisations in urban areas can develop new plastic recycling chains to extract valuable raw materials, in this case PC NH plastic waste. This handbook contains instructions describing how to develop a local value chain of industrial plastic waste. While there is some logic in the sequential steps described, the order is not mandatory. They are primarily intended to collect information on the existing waste ecosystem to build a local strategy upon.

3.2. Global plastic value chain

We advise starting with a description of your current plastic ecosystem. This means sketching the characteristics of the “ecosystem” in which the new value chains will have to be realised. This perspective is important to understand the need and necessity of the activities to be developed.

3.2.1. Plastic value chain: pre-use and use phase

As the learnings have shown us, the existing plastic value chain (the steps to create value form a chain) is oriented on global or at least on European level, but are mainly used in urbanised areas. Major players with large investments in mainly production installations and many multinational users determine the value chain and thus the (economic, quality and environmental) characteristics. They influence and determine a big part, the pre-use phase and use of the value chain (green oval).



“master circular business with the value hill”: Circle Economy; September 2016

3.2.2. Plastic value chain: post-use phase

This does not only apply for the pre-use and use phase, but also for the post-use phase. In the post-use phase, big waste contractors are active (red oval). Every individual company (so-called waste owner) is by law obliged to have his own waste collection and processing contract. Mostly all waste streams of one company are collected by one contractor. The removal of a company's waste flows is aimed at doing this as smoothly as possible so that the waste owner does not have to worry about it.

This way of working is not always conducive to resource efficiency. Separation by the waste owner is not optimal, which means that a lot of valuable waste ends up in the residual bin and is incinerated or treated in a way that generates the least costs or most profit for the waste contractor.

Moreover, there is often no room in (existing) waste contracts for smaller valuable waste streams, such as recyclable plastics. These are therefore often not collected and processed separately because it is, per contract, too expensive and unprofitable.

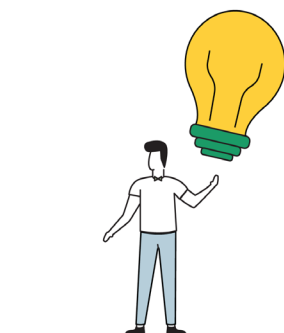
3.2.3. Role of local government

The last characteristic of the current system concerns the role of the government. Waste legislation is determined by higher authorities. So local governments, apart from providing and enforcing environmental permits, actually can't interfere much with the waste contracts that companies enter into with waste processors, except advise on improvement. This means that local governments have to search for local oriented strategies to apply the EU policy on promoting the transition to a circular economy in the business community, certainly towards the local SMEs.

Governments have no direct role in the plastic chain. They are not directly involved in commercial activities; they are not designers, producers or parties that put a product onto the market.

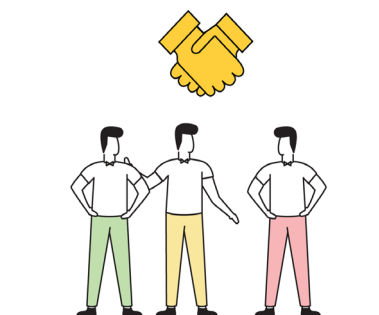
They can, however, be involved in the new value chains or business case in a more indirect way – such as, as (A) initiator, (B) mediator, (C) facilitator, (D) licensing authority and/or (E) (launching) customer.

Figure 11: Roles of the Governmental organisations



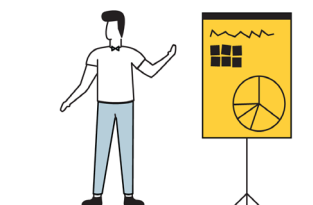
A. Initiator

- ◆ Initiate projects, such as PlastiCity
- ◆ Develop local or regional policy on circular economy
- ◆ Develop policy on circular procurement



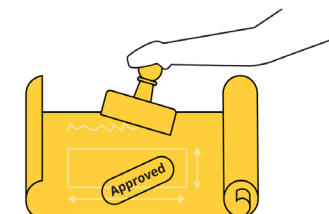
B. Mediator

- ◆ Bring together actors and stakeholders
- ◆ Organise workshops between stakeholders



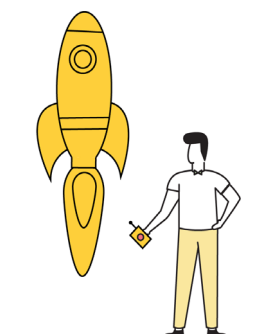
C. Facilitator

- ◆ Make locations available
- ◆ Provide grants aimed at developing, producing or recycling plastic products



D. Licensing authority

- ◆ Assist in permitting recycling facilities
- ◆ Designate specific locations in special planning for plastic recycling activities



E. Launching customer

- ◆ Purchase products
- ◆ Develop specific criteria for recycled products when purchasing products

Jan 21: PlastiCity Replicable Strategy⁹

With their responsibility in mind, governments are the ideal organisation(s) to initiate the development of new (local) plastic value chains. Integrated realisation of improved separation and collection of plastics does not only affect the field of circular economy, but also environmental permits, accessibility and air quality. These policy fields are all the (joint) responsibility of local and regional authorities.

⁹<https://www.plasticityproject.eu/downloads/>

3.3 Developing new (local) plastic value chains

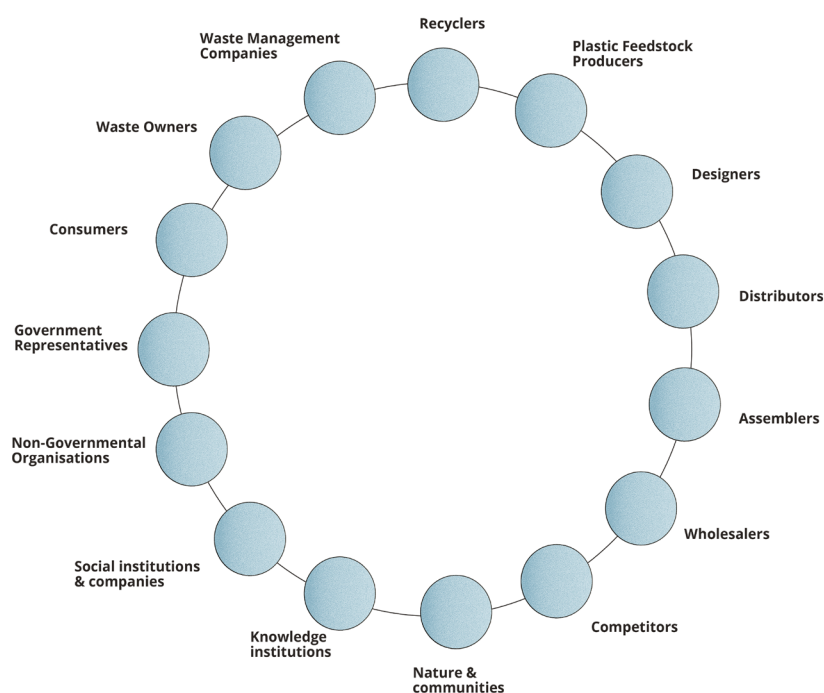
As done in the PlastiCity project, the first activity to undertake is to get to know the local waste and plastic ecosystem. That is when you gain insight into the current system, pinpointing where there is room for improvement.

3.3.1. Actor/groups and geographical spread

Transforming current waste value chains into local chains requires insight in the presence, the spatial distribution and characteristics of the actors present on local or other levels that influence the local level.

The first step to undertake is to gain insight into the local plastic supply chain. This foremost concerns the actors who are directly involved in the plastic chain, such as producers, distributors, recyclers etc. In addition, there are a number of other actor/groups involved in the plastic chain, such as NGOs, governments, waste owners (see below).

Figure 12: example of actors in the plastic chain

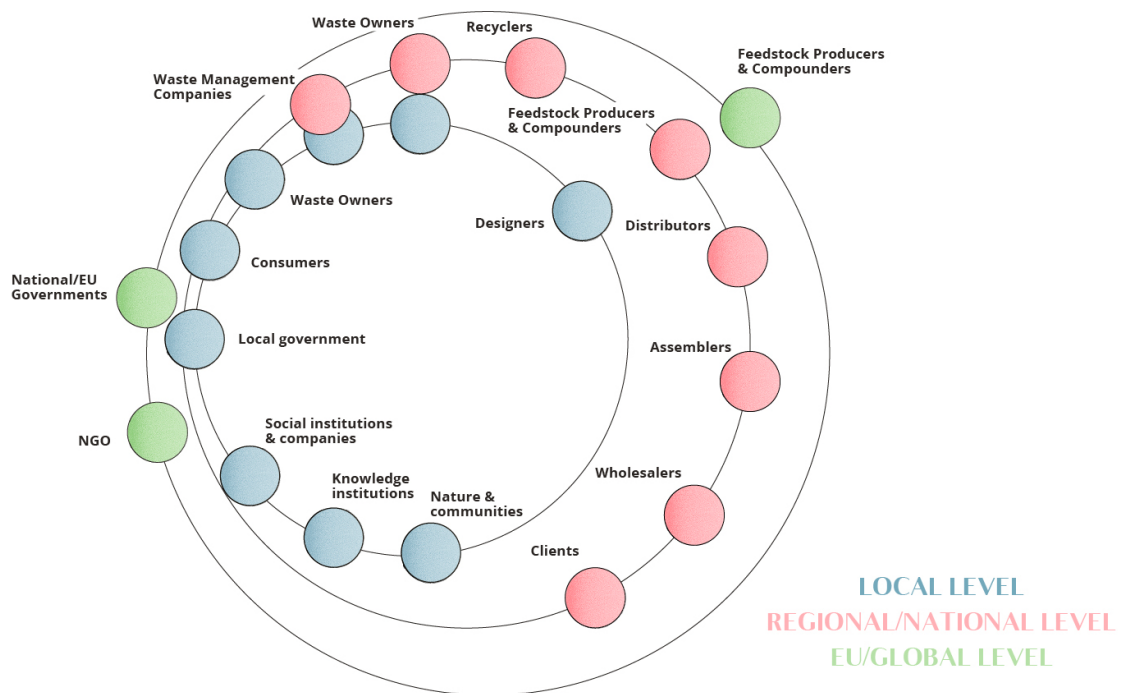


There are different approaches to map the plastic supply chain. A first one is to use an existing database of companies which is offered by a number of service companies. In that case, the accuracy of the database and the search filters are important factors. Another one is to use databases owned by the local government or by sector- or business federations. Also, the existing local (circular) networks or business networks and interest groups can be used to build up the required network for the project. (see step 3).

Also keep in mind that an actor can be represented in several groups; for example, a government organisation is also a waste owner or a recycler can also be an assembler or competitor. In addition, some actor groups, mainly waste owners, can be very large and it can be useful to divide them into business categories, e.g. based on SBI or NACE codes.

The second step is to visualize the spatial distribution of the actors. Waste owners are mostly spread all over the area, but are also concentrated in business or industrial estates. It is very important to know where the crucial player in the plastic chain, like logistical companies, recyclers etc are located. In the further course of the project, this may prove to be of great importance to determine which processing variant might be or can be achieved.

Figure 13: Example of the spatial distribution of actors in the plastic chain



The third step: arrange engagement.

This step is all about how to select and arrange actors that are or want to be engaged and become stakeholders that commit to the goals. It is about more than just mapping the actors and knowing what role they play in the existing plastic value chain. It requires actors that are willing to become an active member of a local plastic community that is cooperating to achieve change.

Firstly, arranging engagement is about knowing what role the actors want to play in creating (a) the new chain(s) and what contribution they are prepared to make to bring about that new chain or business case. For each actor this will often be based on the nature of the company, its place in the chain and the available knowledge and expertise and the determination to achieve change. For instance, a waste owner needs to be prepared to separate his plastics and store it separately. Because the competition within waste collection and processing runs quite high, waste owners must be steadfast in separating their plastic waste. A designer must be prepared to think outside the box and be creative in designing new products from recycled plastics, which may have other qualities than virgin plastics.

Being engagement can show from the expressed wish of the actor himself to want to be involved and to want to invest in the transition.

Secondly, engagement and commitment in the network can be checked and, partially, be arranged. The engagement can be checked through for instance A) investigating whether the actors have formulated and implemented sustainability or circularity policies, and through B) checking if the actors have previously developed and or been involved in the realisation circular or recycling initiatives. These criteria can also be used to select actors to be asked to participate in the network. There could even be plastic recycling initiatives amongst them. If so, it is surely helpful to include them in the network.

Checking this increases the chance of having really involved actors; stakeholders, represented in the local value chain. This increases the chance of success during the execution.

3.3.2. The plastic waste

It is important to analyse the plastic waste streams in your region, get to know the different types of plastic waste and make estimations of the volumes and qualities. This is the raw material that forms the basis for the possibilities of new local value chains and business cases.

The fourth step would be to determine the volume and quality of PC NH plastic waste. In the PlastiCity project this was done in two steps: collection and analyses of the collected plastics.

Plastic volume and flow

Plastic waste of waste owners, mostly SMEs, is often not separately collected and processed. PC NH plastic waste is usually collected with the residual waste and often incinerated. Therefore, it is difficult to know how much plastic waste is generated.

Each region organised test collections for restricted number of companies. The collected volumes were stored at a PlastiCity hub. If this is not yet present it can also be done on the spot, together with the waste owner. In that case it is best to do this just before the bin is emptied, because it shows how full the bin is and what proportion of it is plastic.

It is furthermore important to determine if this is a continuous flow or whether there are, for instance, seasonal influences.

Figure 14: check plastic waste flow and quality

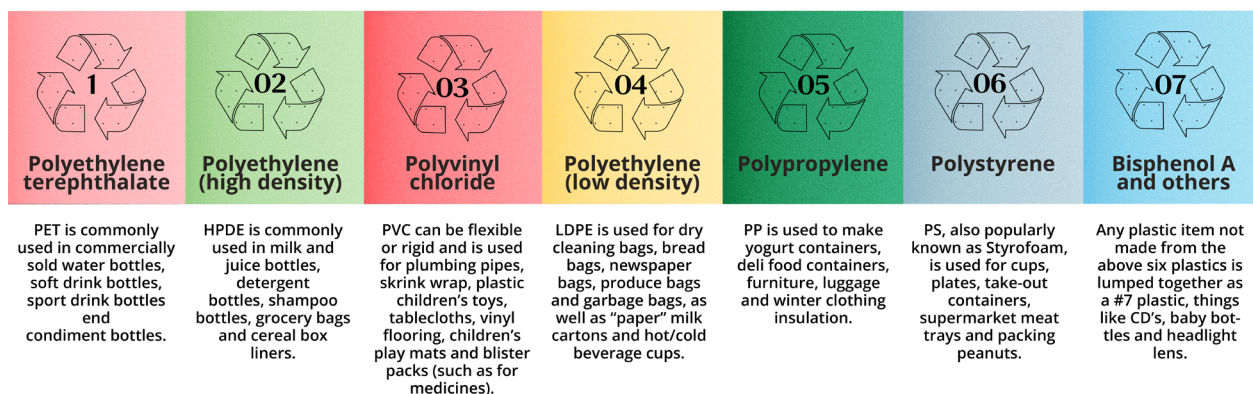


The quantity of plastic waste in an area is influenced by the number of companies and the distribution of those companies over the various business categories. It can take quite some time and effort to get a global overview of the plastic flows. The PlastiCity project has not produced data on the possibility to extrapolate the amount of plastics waste per company type and size or turnover. Such an approach would greatly reduce the time it takes to visualise the plastic quantity per region.

Plastic quality

It is not always required, as we have done in the PlastiCity project, to analyse the retrieved plastics in a temporary laboratory (the PlastiCity Mobile Unit). You can also cooperate with a plastic research group. Or determining the quality of the plastic waste streams by classifying them according to the markings on the plastic waste and a description of the plastic waste products should be enough characterisations for the recyclers to know how to recycle it. The markings are shown in figure 15. If there is doubt, a plastic expert can make a very good estimate of the types and qualities of the PC NH plastic waste present.

Figure 15: An Overview on Plastic Coding System for Resin Types



3.3.3. Logistics

The fifth step is about creating an overview of the logistical alternatives. The first thing to do is, like the Plasticity project has taught us, map, summarise and analyse the policies with regard to mobility, accessibility and air quality. In many cases and increasingly, this leads in a direction in which congestion in the (inner) cities must be prevented as much as possible and the air quality in the (inner) cities must be further improved.

Adequate logistics are important for a feasible business case. As we have seen, this is also determined by the possibilities of bundling flows. In current logistics systems, logistics distribution centres, reverse logistics and cross docking are seen as measures that make logistics more effective. The advantage of this is that flows are bundled. This is of great importance for the separate collection and processing of PC NH plastic waste in order to be able to collect effectively.

In order to be able to estimate the effective collection of PC NH to some extent, it is important to generate insight into the logistics field. This means knowing where the companies are located that want to have plastic waste processed separately and where the current logistics hubs are. These locations can then be combined with a plastic hub function. However, there can be all kinds of reasons why this is not possible, eg use of space or because it is not possible from a permit point of view to combine both functions.

Municipalities or regional governments are also in charge of spatial planning. This creates the opportunity to identify possible locations for a hub. The best locations for this are the locations where a lot of companies are concentrated, like industrial estates or business areas, because there are also a lot of plastics at these locations.

No area is the same. Action will therefore always have to be taken on the basis of the character of the area and the desire and possibilities of the partners in the community.

3.3.4. Urban Platform/HUB

Sixth step: make involvement concrete

To establish new value chains or develop new recycled plastic products, you need stakeholders who are well-informed and committed. Within a so-called urban platform, stakeholders can meet and discuss how the value chain(s) and business case(s) can jointly be realised. A community can be created by means of meetings aimed at how to organise cooperation, determining common goals, the approach, brainstorming to determine possible new products and calculate business cases and the function and design of a plastic hub.

Having a network of engaged stakeholders can and needs to be developed further. The combined commitment should be made concrete. Concrete results strengthen cooperation and belief in the goal.

The plastic hub is a physical place, where the collected PC NH plastic waste of participating waste owners can be stored, bundled and tested in order to determine its applications. Furthermore, potential product ideas, generated in the urban platform, can be designed, tested and possibly produced here.

The nature of the hub may differ and will depend on all aspects mentioned above as well as on the will of the stakeholders. The investments in the hub are subordinate to the function(s) of the hub.

As the learning of the PlastiCity project has shown, four hub variants can be pursued. These variants can also be realised successively as a growth model. This makes it possible to gradually develop the local chain.

- ◆ First variant is the one where the main objective is to improve the recycling rates of PC NH plastics. The separated plastic can then be introduced into the existing recycling chain. This means that no local chain is yet being worked on. Creating a community or investing in a hub is not necessary.
- ◆ The second variant is where improving the recycling percentages of PC NH plastics could lead to feeding it in into existing recycling initiatives. In this way very quickly first products could be made to strengthen the corporation.
- ◆ The third variant is where improving the recycling percentages of PC NH plastics leads to bundling (and testing) of the plastics with small-scale recycling and the development of products that are likely to have a strong local character. This improves recognisability and relatability. There could be a community and a small-scale hub, with low investments and this may even be possible with 2nd hand equipment.
- ◆ If there is the possibility to scale up further, a recycling unit of 10,000 tons can be realized. This is the processing unit that can serve large urban areas. Of course, this also means that a larger investment is needed. (research of U-Ghent)

3.4 From opportunity to business case.

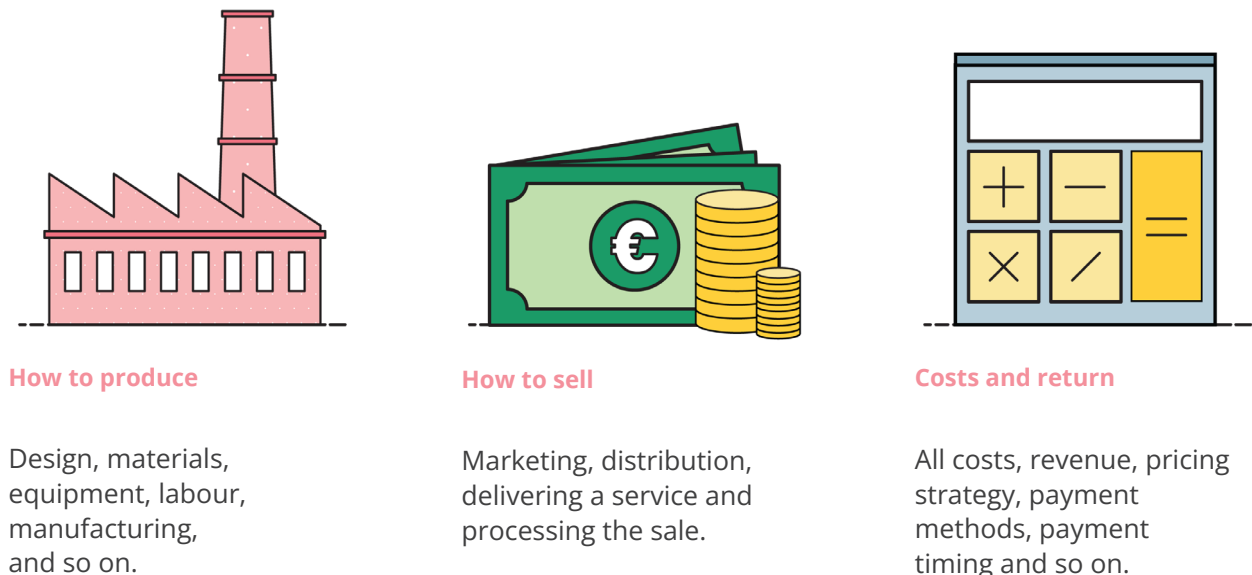
3.4.1. The realisation of business opportunities

In the classic economic approach, a business case – or, even better, a feasible and viable business case – is one in which a return on investment or growth opportunities can be created. Where revenue exceeds the costs.

Business (case) development entails all tasks, which serves the purpose of ‘developing’ the business opportunity and implementing the creation of long-term value for an organisation, customers, markets and relationships.

A tool to be used in the process of business development is the business model. At its core, a business model is a description of how the business makes money. In its simplest form, a business model should contain three parts, as illustrated in figure 16:

Figure 16: minimum required aspect to take into account for a business case calculation



Jan 21: PlastiCity Replicable Strategy¹⁰

In classic economics, the primary corporate objective is mainly on profit maximisation or pursuing cost-cutting through greater efficiency in supply chains, factories and operations. This has more or less led to the classic linear economic approach of ‘take, make, waste’.

If businesses are aimed at self-preservation, they should take their natural prerequisites into account to ensure they do not endanger their own, or their client’s, existence, due to depletion of resources and the effects of climate change. In previous years since the Industrial Revolution, this has not always been the case.

Nowadays, society is more aware of the need to also take natural and social prerequisites into consideration. So, a shift towards a circular economy, using circular business models, is preferred. These business models are explained here¹¹.

Within the platform the stakeholders should discuss, calculate and determine the business opportunity and find out whether it could be a business case.

¹⁰<https://www.plasticityproject.eu/downloads/>

¹¹ Circular Business Model Literature review: <https://www.plasticityproject.eu/downloads/>

3.4.2. Non-disclosure agreement (NDA)

In the situation where a potential business opportunity has emerged, a certain form of confidentiality and/or careful selection of stakeholder involvement may be necessary. This is to protect the commercial interests involved and to avoid competition during the phase of product development and introduction. In such circumstances, it might be preferable to sign an NDA.

3.4.3. Changed boundaries and opportunities

When the stakeholders in the urban platform start executing the different activities in this plan, actors in the chain will react to these activities, i.e. get triggered to respond and thus create new opportunities. At the same time, external effects can change the ecosystem (during PlastiCity project this was the outbreak of COVID-19). It is always important to be aware of shifting boundaries, interest and relations. It could mean that planned actions cannot be executed, but also that new opportunities present themselves. These new opportunities have, given the changes set in motion, the best chance of being successfully executed. Flexibility in implementation is therefore of great importance.



4. Reports & contact

4.1. Overview reports and visuals

The handbook provides a summary of all the work that has been done by the PlastiCity Project partners. If you want to go more in depth we invite you to read the reports and papers that have been written. You find all these documents on the [download page on the PlastiCity website](#).

- ◆ [Replicable strategy - to produce case-specific solutions for collection, sorting and reprocessing of waste plastic](#)
- ◆ [Actors and their attitudes - report analysing the behaviour of actors in the value chains of plastic waste recycling in Europe](#)
- ◆ [Strategies report - for reverse logistics related to plastic waste](#)
- ◆ [Scenarios report - describing the potential of new ways of transporting plastic waste](#)
- ◆ [Report on the successful products from recycled Plastics](#)
- ◆ [An overview on all designed products](#)
- ◆ [Recommendation on urban platforms](#)
- ◆ [Circular Business Model Literature review](#)

During the project we also produced some nice videos showing what we were doing, you can find them on the [PlastiCity Youtube channel](#)

- ◆ [An introduction to the PlastiCity project](#)
- ◆ [PlastiCity virtuele tour van de mobiele unit](#)
- ◆ [Logistics scenarios and solutions](#)
- ◆ [Plastic Cycling Tour in Den Hague](#)
- ◆ [PlastiCity in Southend-on-Sea](#)
- ◆ [PlastiCity Ghent](#)

4.2. Keeping in touch with local Urban Platforms / project partners

The PlastiCity will end in December 2022 but the work goes on. Each region has chosen or is developing his own pathway into the future.

Douai: collaboration on the Actif platform

[The ACTIF platform](#) is created by the Chamber of Commerce in Southwest Toulouse for companies to promote recycling and reuse. The idea and proposal is for the north of France Chamber of Commerce to set up the same initiatives generated by Southwest Toulouse. The platform is also for sharing skills and storage options. The site is based on membership and declaration of companies. There is an opportunity for stakeholders who have accounts on the Actif platform to put up an offer or a demand on the site.

[Keep in touch](#)

Invest in Ghent: plastic recycling is part of the Cleantech ambitions

Ghent has created a dedicated [website Invest in Ghent](#) and [linkedin Invest in Ghent](#) to support the economic spearheads, which also includes cleantech and circular economy. These digital channels are used and will continue in the longterm to be used to share information and connect on the topic of plastics.

[Keep in touch](#)

Southend-on-Sea: the PlastiCity pledge

The Plasticity Pledge in Southend is promoted on the Southend Climate Action website:

[Ongoing Work – Climate Change \(southendclimateaction.co.uk\)](#) and via a Press release:

[PlastiCity mobile unit opens its doors to highlight importance of recycling – Southend-on-Sea City Council.](#)

This short-term six-month programme invites engagement with everyone, including schools, churches, businesses and is promoted in media coverage with press releases. A celebratory event will be held at the end and feedback sought about how the pledge went.

[Keep in touch](#) or plasticity@southend.gov.uk

The Hague: join PlastiCity Den Hague on linkedin

Den Hague intends to establish a meeting group with stakeholders so that they can continue to work with each other and continue with the PlastiCity hub independently.

In addition, the Urban platform can be found on a tab on [the PlastiCity the Hague website.](#)

[Keep in touch](#)