UPLIFT
sUstainable PLastIcs
for Food & drinks packaging indusTry

H2020 Work Programme

D1.1 Analysis of plastic value chain – M9

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This document is the Analysis of plastic value chain, corresponding to D1.1 (M9), led by DTU, of the UPLIFT project. This document contains a detailed description and analysis of a Danish value chain for plastic waste management, focusing on the company Vestforbrænding as a case study. The document is meant to provide an illustrative example of the current status of plastic waste management, to be used as a starting point to optimize and develop innovative value chains within the UPLIFT project. In addition, the present analysis will be used as a benchmark scenario when analyzing the sustainability of the UPLIFT concept.

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Executive summary

The D 1.1 deliverable describes and reports an analysis of the current plastic value chain, to provide an overview of the current situation. The study is based on a case of Vestforbrænding, Denmark's largest waste company, who treats waste form 18 municipalities. The main focus of the study is on how the plastic becomes waste, after handling from citizens / municipalities - collection companies - waste management companies - recycling companies – and producers of new recyclable plastic.

Acronyms and abbreviations

EEA	European Economic Area
EU	European Union
MPO	Mixed Polyolefins
PE	Polyethylene
PET	Polyethylene terephthalate
PP	Polypropylene

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1. The legal framework

On the 4th of July 2018, the new EU Waste Framework Directive (European Parliament, 2018) came into force. The European Union Member Countries were given two years to transpose the Directive into their national legislation. While the EU Directive sets some general common rules, some differences can be expected across countries, due to specific choices when laying out the national rules. In Denmark, the new EU Waste Framework Directive was implemented in the Danish Waste Order Nr. 2159 (BEK 2159:2020).

The new Waste Framework Directive (European Parliament, 2018) brings more strict requirements on waste prevention and contains higher standards for recyclable household collected waste and similar waste from manufacturers/businesses. By containing requirements that force the member countries to prioritize prevention, recycle, and reuse over landfilling and incineration, the new Directive is implemented to improve the so-called "waste hierarchy". Furthermore, the new Directive contains provisions for separate collection of food waste and textiles; moreover, it has broadened producer responsibilities on packaging waste.

The new EU Waste Framework Directive (European Parliament, 2018) set out the following goals on waste management:

- In 2025: 55% of the collected household waste and similar waste arising from industries/businesses and 65% of all packaging waste must be recycled. There will be requirements to ensure separate collection of textiles, and producer responsibility regulations/systems will extend to all packaging waste.
- In 2030: 60% of the collected household waste and similar waste arising from industries/businesses and 70% of all packaging waste must be recycled. 6
- In 2035: 65% of the collected household waste and similar waste from industries/businesses must be recycled. Furthermore, a maximum of 10% of the collected household waste can be sent to landfills.
- From 2023: the separate collection of organic waste will be mandatory; this will apply to households, businesses, and restaurants. Furthermore, a uniform method for measuring recycling will be introduced, which calculates the actual amount of waste recycled.

The New Waste Framework Directive additionally introduces specific recycling targets for individual waste packaging materials (European Parliament, 2018). An overview of these recycling targets is provided in Table 1.

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Table 1 – Recycling targets for individual packaging waste materials (European Parliament, 2018).

	Latest 2025	*Latest 2030*
All kinds of packaging	65%	70%
Plastic	50%	55%
Wood	25%	30%
Metal	70%	80%
Aluminum	50%	60%
Glas	70%	75%
Paper and cardboard	75%	85%

1.1. Why separately collecting household plastic waste?

In the circular economy, effective and harmonized waste collection is a vital first stage for efficient recycling. By separating waste correctly at the point of collection, the recycling process is more efficient and will increase the quality and quantities of recycled products. Improved waste collection positively impacts the waste streams and their suitability for downstream pre-treatment, sorting, and recovery operations. Source-sorting and separate collection are particularly important for plastic waste, as it is a more cumbersome material to work with than, e.g., glass, paper, or metal.

Since the former Danish Government adopted a Resource Strategy in 2013 (BEK 2159:2020), a particular focus has been on the separate collection of plastic from household waste. In the new Danish Waste Order (BEK 2159:2020), plastic is one of the ten focus fractions included in calculating towards the strategy's goal of 50% collection for recycling.

In a broader context, initiatives will have to deal with how we use and consume plastic products, with decreased use of disposable products and increased recycling of long-lasting products. The rationale is that recycling plastic will prevent the depletion of natural resources and reduce energy consumption at the manufacturing stage. However, transitioning to a circular economy of plastic requires a very fundamental change from many parties. On the one hand, it will require a more uniform consumption of plastic packaging. On the other hand, it requires new technologies that can help recycle and possibly upcycle even more of the collected plastic.

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2. The plastic value chain - Vestforbrænding as a case

The following value chain describes the management of plastic waste by Vestforbrænding I/S, a danish waste management company trading the household plastic waste collected in 18 municipalities in Denmark. Based on the new Danish Waste Order (BEK 2159:2020), Vestforbrænding held three workshops with the 18 municipalities to find the best collection system across municipal boundaries.

A simplified overview of the value chain from plastic waste to a new product made from recycled plastic is shown in Figure 1. The following sections will first provide an overview of plastic waste amounts and composition in the Vestforbrænding's area, and then describe the individual stages of the value chain in detail.

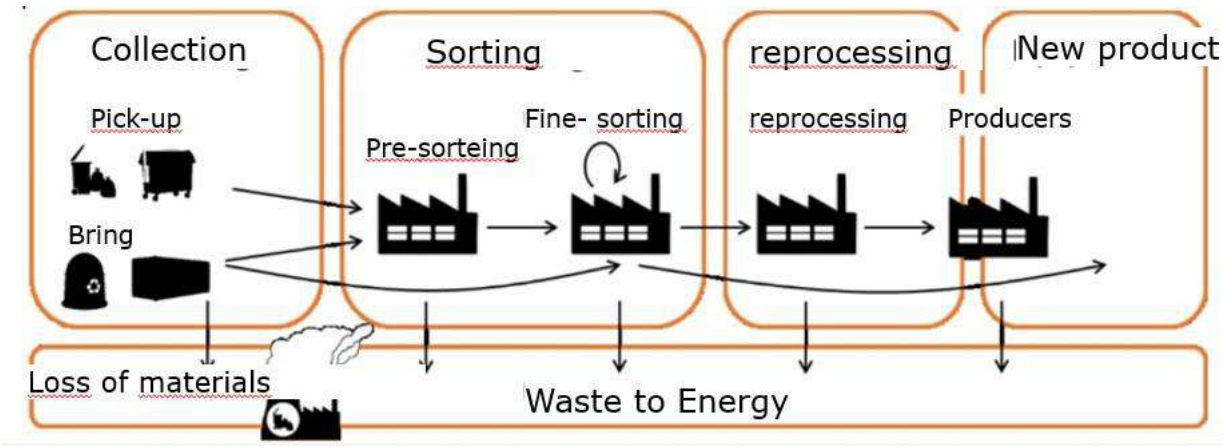

Figure 1 – Overview of the value chain for the conversion of plastic waste into products. The sorting processes and reprocessing can take place in the same place. There can be several sorting stages.

2.1. Quantities and composition of household plastic waste

2.1.1. Quantities of plastic waste from households

Vestforbrænding has been handling plastic waste collected at households since 2013, when the first municipalities introduced the separate collection of plastic from households, including both hard and soft plastic in the same waste bin. The reason for collecting hard and soft plastic in the same container is to make it simple for citizens to sort without having to deal with different types of plastic. In addition, experience has shown that collecting hard and soft plastic together provides the largest possible proportion of good quality plastic and the greatest possible recycling potential.

Nowadays, almost each of the 18 municipalities in Vestforbrænding's area collects household hard and soft plastic together (app. 0,8 million people), the majority via multi-chamber containers for houses and common equipment for multi-storey

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dwellings and in public spaces. Vestforbrænding is trading all the household-collected plastic for the municipalities excluding Copenhagen municipality.

Figure 2 shows the development in the amount of household-collected plastic waste in the Vestforbrænding area: in 2018, approximately 3,500 ton of household plastic waste were collected for recycling and about 6,400 ton are expected to be collected in 2021. It is also expected that volumes will continue to increase in the coming years.

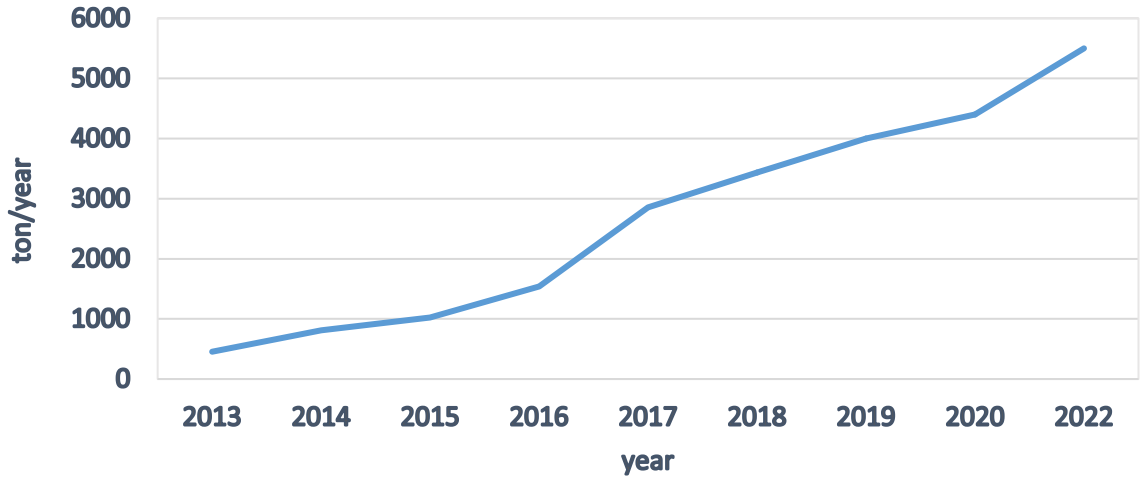

Figure 2 – Quantities [ton/year] of plastic waste collected from households in the 18 Danish municipalities served by Vestforbrænding (excluding Copenhagen).

2.1.2. Composition of plastic waste from households

Table 2 provides an overview of material fraction composition of the waste collected in the plastic bin in the Vestforbrænding's area, in the period January 2021 to October 2021. It is seen that the plastic sorted for recycling is a mixture of several polymers. The waste collected in the plastic bin also contains some impurities, namely about 3% of metals (i.e., tin and aluminum) and about 21% of other non-plastic materials.

2.2. Waste collection systems

2.2.1. Backyard systems

For households served by a backyard collection system, the recommended container solution for households within Vestforbrænding municipalities is shown in Figure 4. In backyard collection systems, the waste (i.e., residual waste, source-segregated material fractions) is stored in bins or bags in the backyard of the building (or in the proximity of the access to the property) and thereby collected by the collection crew. The standard solution for a household in the Vestforbrænding area of competence is:

- Three 2-chambers bins with a volume of 240 liter for collecting respectively:
  - Residual / food waste;
  - Glass / metal;
  - Paper / mixed tetrapark and plastic;
- One 1-chamber container for cardboard;

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- One environmental box (red box, 21 liters) for the collection of hazardous waste;
- Textiles and bulky waste (including items for direct recycling) will be collected in clear bags at the curb in either the route or on-request scheme.

Table 2 – Material fraction composition of the waste collected in the plastic bin in the Vestforbrænding's area in the period January 2021 to October 2021.

Material fraction	Name of standard	Amount [ton]	Contribution [%]
Materials sorted for recycling			
Mixed PET	DerGrünePunkt, 328-1+2, 325	743,65	5,06
Polypropylene plus (PP)	DerGrünePunkt, 324-1	1245,54	8,47
Polyethylene (PE)	DerGrünePunkt, 329	838,40	5,70
Plastic films	DerGrünePunkt, 310	3386,63	23,03
Mixed Polyolefin (MPO) Items	DerGrünePunkt, 323	0,00	
PET trays	DerGrünePunkt, 328-5	232,59	1,58
PO plastic bottles	DerGrünePunkt, 321	0,00	0,00
Mixed plastic	DerGrünePunkt, 350, 352	4598,97	31,28
Black/dark plastic	Min. 90% of black/dark plastic	162,83	1,11
Tinplate Specification 2014	DerGrünePunkt, 412	237,39	1,61
Aluminium 2018	DerGrünePunkt, 420	146,89	1,00
Tetrapak		9,71	0,07
Total sorted for recycling		11602,60	78,90
Residues		3102,34	21,10
Total		14704,94	100.00

Figure 3 - Recommended standard solution for collecting ten waste material fractions in a backyard waste collection system.

Some municipalities prefer to keep the collection of glass in cubes as the primary collection solution. For these municipalities, it is recommended that the container for paper / plastic and tetrapak in the standard solution (Figure 3) is changed to a 1-

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chamber container for plastic and tetrapak, and that paper is collected in the chamber used for glass in the standard solution, as shown in Figure 4.

Figure 4 - Recommended solution for those municipalities who want to keep glass collection in a cube.

The Danish Order on Waste (BEK 2159:2020) states that the cubes for glass must, as much as possible, be placed within a reasonable walking distance and that the collection efficiency must be the same as for the standard system with the glass bin in the backyard; this requires a dense and accessible network of cubes. It is currently uncertain whether the "*producer responsibility*" in the future will impact the ability to collect glass in cubes.

Finally, some municipalities prefer to keep the 4-chamber solution at the households. In this case, it is recommended that the 4-chambers bins are used for the fractions: glass / metal / paper and plastic mixed with tetrapak. Alternatively, the insert in the container can be taken out, so that the container is converted into a 2-chamber.

2.2.2. Drop-off systems

For areas served by drop-off collection systems, the recommended container solution within Vestforbrænding municipalities is shown in Figure 5. In drop-off collection systems, the waste (i.e., residual waste, source-segregated material fractions) is dropped in containers placed in the neighborhood or at central transport routes (e.g., shopping centers, markets, bus stations, etc.). The drop-of containers are placed frequently enough so that the distance to reach them is short. Drop-off systems are solutions used where it is not possible or appropriate to establish collection at individual households; it is hence used in areas with a common collection, including multi-storey dwellings, terraced houses, summerhouses, allotment gardens, municipal institutions, and public spaces. The recommendation for areas with common collection is based on the use of standard equipment (primarily containers on wheels, cubes, and buried systems) and is illustrated in Figure 5 with an example of a container solution.

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Figure 5 - Example of a recommended container solution for collecting 10 fractions in areas with multi-storey dwellings collection.

The solution illustrated in Figure 5 is an example of how the different fractions can be collected in areas with a drop-off collection system, but the specific design used will depend on local conditions. It must be expected that it will be possible to convert existing containers used for residual waste to containers used for specific waste fractions (e.g., tetrapak), thereby potentially minimizing the number of new containers. As for households, it is recommended that plastic and tetrapak are collected as a mixed fraction in the future. The primary reason for the joint collection is that it is important that the waste sorting is the same across all households and dwellings in Denmark, regardless of the specific collection system implemented (e.g. backyard vs drop-off systems). It is also important that the communication is provided in a similar manner to the citizens, regardless of the type of housing and the municipality of residence. It should be noted, however, that this does not include the recycling stations, where citizens are used to sorting their waste more than in their homes, and where, among other things, plastic is divided into several fractions.

2.2.3. Collection vehicles

In most Danish municipalities, waste collectors use multi-chambers vehicles (Figure 6) to optimize the number of empties per year. A multi-chamber collection vehicle can empty collect several waste fractions when stopping at one location. Two-chambers collection vehicles (Figure 6, right) are particularly common in Denmark, because they have a better operating economy and lower maintenance needs than other types of vehicles in the Danish context.

There are pros and cons to both, the four-chambers vehicle and the two-chambers vehicle, and the type of bins used for collecting and storing the waste at households. With the help of the right communication efforts and sorting instructions for the citizens, it is possible to alleviate most of the challenges associated with both solutions.

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Notably, plastic is a light waste fraction, and in general, some plastic waste may blow away during emptying. When plastic is emptied in the four-chamber vehicle, it can be more challenging to get the plastic out of the four-chamber container, as the container cannot be "knocked" on the car when emptied, as it is possible with 2-chamber containers on the two-chamber car.

Figure 6 – Example of multi-chamber waste collection vehicles: a four-chambers vehicle on the left, a two-chambers vehicle on the right.

2.3. Sorting of plastic waste collected from households

As both hard and soft plastic are collected in the same bin, plastic waste collected from households is a mixture of many different types of plastic (Table 2), which requires further sorting before the plastic can be mechanically recycled. The sorting has two aims: i) separating missorted recyclable fractions (e.g., paper, cardboard, metal) and impurities (non-recyclable waste); ii) sorting out single polymers. The possibilities for using the sorted plastic are largely dependent on the purity after sorting. Once sorted and purified, the pre-processed waste is exempt further to reprocessing, and from there to a new manufacturing/production stage.

2.3.1. Sorting requirements for plastic waste from households

In November 2019, a new tender was conducted for the trading of household-collected plastic waste, based on tender principles and criteria approved at Vestforbrændings Board meeting in September 2019 and based on a completed market dialogue. Based on this market dialogue, it was assessed that a new tender could contribute to increased transparency and documentation, but could not be expected to increase the final recycling.

Table 3 shows the stricter requirements included in the new contract compared with previous contracts on regulating the treatment and trading of plastic waste collected in Vetforbænding's areas. These requirements have been created, based on the market dialogue and Vestforbrænding's experience from previous contracts with plastic sent for recycling.

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In the current 2020-2023 tender, the requirement is that:

- A minimum of 75% of the delivered amount of plastic fraction (incl. incorrect sorting) must be sorted for recycling;
- a minimum of 30% of the delivered amount of plastic fraction (incl. incorrect sorting) must be set aside for recycling as pure plastic fractions;
- a maximum of 25% of the plastic is sent for energy recovery;
- Missorted recyclables (e.g., paper, cardboard, metal) that are sorted for recycling may be included in the sorting target of 75%, but may nevertheless be a maximum of 6%.

Finally, the tender requires final treatment in the EU/EEA, meaning that that the plastic must not leave the EU/EEA unless it has been processed to a point where it is no longer defined as waste in accordance with the end-of-waste criteria set by the EU Waste Framework Directive (European Parliament, 2018). For example, if the plastic is processed into materials (e.g., pellets) or products (e.g., plastic bags), it is no longer classified as waste but as a product that companies can sell on the global market. There are further requirements for tracking and making available information about which companies purchase the sorted fractions.

A particularly interesting new requirement in 2020-2023 is the possibility that Vestforbrænding can repurchase (i.e., bring back) selected types of sorted plastic. This opportunity will allow Vestforbrænding to recycle the plastic themselves, in connection with "own" production of, e.g., waste cubes, waste bins, or recycle plastic bags citizens can use to sort their food waste in. The repurchased plastic can also be used for experiments in connection with, for example, further sorting (e.g., projects such as UPLIFT).

Table 3 – Overview of the requirements set by Vestforbrænding in the tenders for plastic waste collected from households.

Requirements for treatment plants	*2016-2017*	*2018-2019*	*2020-2023*
Sorting into pure plastic fractions	70%	75%	75%
Sorting of plastic in the EU / EEA	-	25%	30%
Possibility of auditing	✓	✓	✓
Annual mass balance	✗	✓	✓
Batch runs of current statements	✗	✓	✓
List of purchasers	✗	✓	✓
Bag opener	✗	✓	✓
Sales for sorted plastic in the EU / EEA	✗	✗	✓
Vestforbrændings quantities are treated separately	✗	✗	✓
Requirements for monthly reporting of sorting results	✗	✗	✓
Sorted plastic must live up to standard	✗	✗	✓
Certification of recycling plant	✗	✗	✓
Possibility of repurchasing plastic	✗	✗	✓

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2.3.2. Contract covering the sale of plastic waste collected from households

Following the tender, Vestforbrænding entered a contract with *DKK Plastics* to sort and market plastic waste collected in the Vestforbrænding's area per 1 January 2020, where the plastic is sorted at the *EGN* sorting and reprocessing plant in Germany. The contract was entered for 2020, with an option for an extension until 2022. The agreement covered the treatment of up to 10.000 ton of household-collected plastic waste. The contract guarantees that:

- a minimum of 78% of the delivered quantity of plastic (including missorted recyclables) is sorted for recycling;
- a minimum of 45% of the delivered quantity of plastic (including missorted recyclables) is set aside for recycling as pure plastic fractions;
- the maximum amount of waste sent to energy recovery is 22%;
- Missorted recyclables (e.g., paper, cardboard, metal) are included in the sorting target of 78% but amount to a maximum of 6%.

An overview of the tender requirements and contractual obligations for the sorting and handling of plastic waste collected by Vestforbrænding is provided in Table 4, which additionally shows how the requirements became stricter compared to the previous contract. Table 5 shows the distribution of the sorted material flows in relation to the requirements set in the contract with DKK Plastics for 2020. The possibility of taking back sorted materials includes PE, PP, PET, foil and mixed plastic.

Table 4 - Overview of minimum requirements, contract, and actual sorting for plastic waste collected by Vestforbrænding in the previous and current contract.

	Period	*Sorting into pure fractions*	*Total sorting, to recycling*	*Sorting, waste*
Minimum tender requirements	2017	25%	75%	Max 25%
Contract, Alba	2018-2019	31%	78%	22%
ALBA, actually sorting	2018	42%	78%	22%
Minimum tender requirements	2019	30%	75%	Max 25%
Contract DKK Plastics	2020-2023	45%	78%	22%
EGN, actually sorting	2020	46%	79%	21%

Table 5 - Distribution of sorted material flows set in the contract with DKK Plastics for 2020.

Material	*Example*	*Contract requirement*
Pure fractions	PP, PET, PE, foils, etc.	78%
Mixed plastic	Other plastics	
Missorted recyclables	Paper, cardboard, metal	
Recidual Waste	For incineration	22%

Figure 7 provides an overview of the fate of plastic waste collected from households in the Vestforbrænding's catchment area in 2020. As it can be seen, the contractual obligations (see Table 5) for 2020 were fulfilled. The figure also shows that it may be

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difficult to have an accurate quantification of how much plastic is recycled, because of the losses occurring at different stages in the value chain.

An overview of the (R3 certified) companies that purchase the sorted plastic from EGN can be found in Appendix 1. The certification includes requirements for material flow, the quality of the sorted product received (which must consist of 90-98% of the desired type and be included in the production at the company), and that outgoing waste from the company is disposed of correctly, as set by Vestforbrænding in the tender requirements (Table 3). Based on the market dialogue, it has been assessed that, at present, no further requirements can be imposed on these companies.

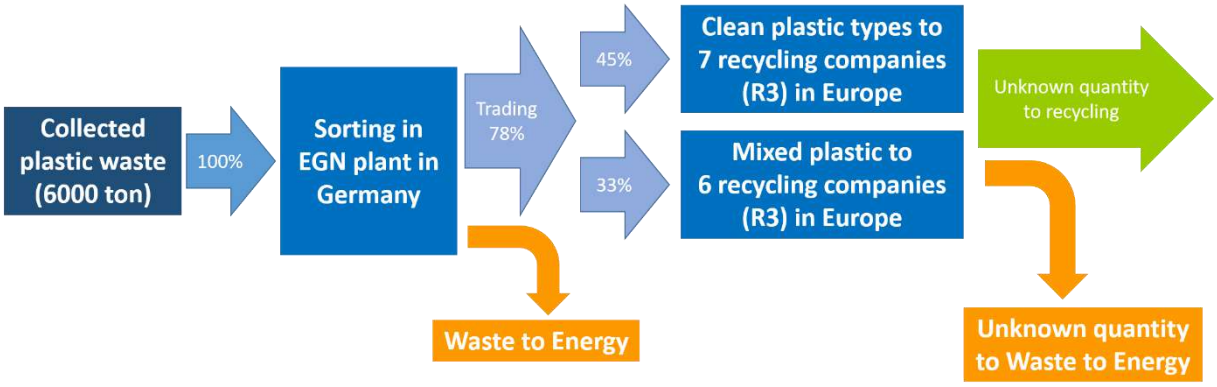

Figure 7 – Overview of material flows sorting and marketing of plastic waste from households collected in the Vestforbrænding's catchment area in 2020.

2.3.3. Auditing of the contract with DKK Plastics / EGN

Like previous contracts, the current contract between DKK Plastics / EGN and Vestforbrænding includes a clause according to which Vestforbrænding can carry out inspection visits and audits of the sorting company. Vestforbrænding plans to conduct an audit in 2021 to ensure that DKK Plastics / EGN's systems support correct measurement, control of the handling and sorting of household plastic, and the reported data for Vestforbrænding are credible and aligned with the contract's requirements (see Table 3). The audit includes specifically follow-up on documentation on:

- the suitability of the management systems to ensure compliance with the agreed sorting efficiencies (percentages);
- that Vestforbrænding's plastic is processed separately;
- records of material flows received by the facilities devoted to sorting and handling the plastic waste form Vestforbrænding.

2.4. More variety of the sorted plastic in the future

To develop a system fulfilling the rules set in the Danish Waste Order (BEK 2159:2020), Vestforbrænding held a workshop where the inputs from the 18 municipalities, the stakeholders in the sales market, and other waste companies in Zealand were

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discussed. During these workshops, it was assessed that it would be most beneficial to collect also multilayered food and beverage cartons (e.g., tetrapak) together with the mixture of plastic fractions. This would fulfill the requirement set in the new Danish Waste Order (BEK 2159:2020), which requires sorting of food and beverage cartons from the residual waste. It was assessed that it is necessary to mix fractions to accommodate the frame of maximum of four bins per household.

The reasons behind the municipalities and Vestforbrænding choice to mix plastic and tetrapak can be summarized as follows:

- The sales market can handle the mix and has experience with it already.
- The new mixed fraction can be accommodated within Vestforbrænding sales agreement for plastic.
- Many citizens will experience it as an improved service that other plastic-like wastes (i.e., food and beverage cartons) are sorted together with plastic. However, food and beverage cartons can be perceived by some citizens as made primarily of cardboard, thereby potentially creating confusion: this will require an increased communication effort targeting some products/materials, for example, the milk carton. Packaging manufacturers can (and are expected to) help in this process, for example, by printing guiding pictograms and other information regarding waste sorting directly on the packaging. Experiences from, e.g., Sønderborg Forsyning (dialogue November 2020) show that citizens have an easy time understanding and sorting out the mixed fraction and that there are no immediate challenges with milk cartons made of cardboard/paper.
- Waste material fractions covered or not-covered by the producer responsibility are kept separate.
- Both plastic and multilayer beverage packaging are wet waste fractions; their mixing has no negative impact on the quality of secondary materials separate in the following stages of the value chain. Conversely, mixing multilayer beverage packaging with cardboard or paper (dry waste fractions) would significantly decrease their quality for further recycling.
- Both plastic and multilayer beverage packaging are under the future responsibility of the manufacturer.
- The existing waste schemes/solutions in the municipalities are only affected to a small extent. Only the bin for plastic waste will be affected: an increased frequency for emptying the bin may be needed, together with the application of extra pictograms to remark that also food and beverage cartons are to be sorted together with plastic.
- A report published by the Danish Environmental Protection Agency assessed that "Drink cartons can be collected separated together with plastic and metal without affecting the loss or quality of these. This is a standard elsewhere in Europe (including Belgium, the Netherlands, Spain and Portugal) and used in the further calculations". The same report states furthermore: "No assessment has been made of the collection of beverage cartons as a separated faction."

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3. Discussion on how the UPLIFT technology can help in the future reuse-system

Several mixed recycled plastics, namely, mixed bilayer polypropylene/poly (ethylene terephthalate) (PP/PET) film, mixed polyolefins (MPO), and talc-filled PP are very difficult to recycle with current mainstream approaches based on mechanical processes. Currently, mixed plastics are at best downcycled to lower materials/products, with a significant loss of functionality and the generation of substantial flows of rejects. As shown in Figure 7, significant losses throughout the value chain make it challenging to estimate how much plastic is recycled accurately.
As schematically presented in Figure 8, several approaches may need to be combined to increase plastic recycling rates. It is often discussed how and to what extent (bio)chemical recycling can create new opportunities towards achieving high recycling rates for plastic. Such an approach offers an expanded potential for utilizing several types of plastic waste and producing recycled plastic with excellent functional properties and wide application possibilities. However, there are also challenges - both in legislation and technology - which mean that this recycling method is not yet seen on an industrial scale.
From an industrial standpoint, the Uplift project is looked at with high expectations, as it can help accelerate this development towards a circular economy for plastic. An important aspect is represented by the possibility of handling streams of mixed plastic types, allowing for a source-separation system relatively simple and easily understandable by the citizens.

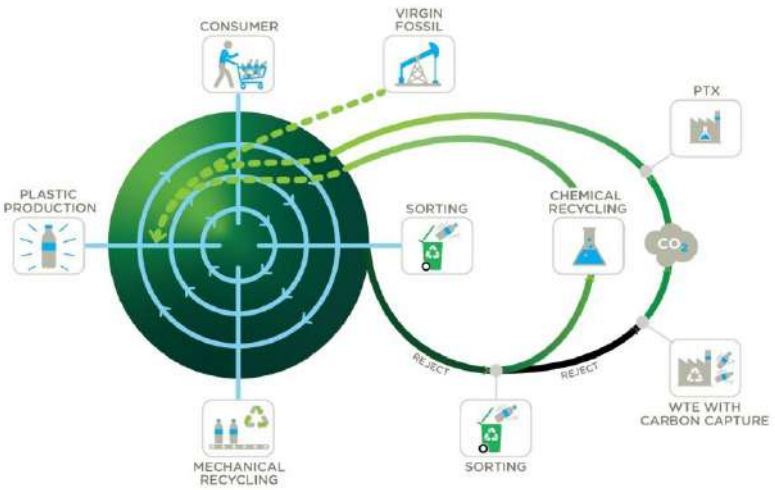

Figure 8 – Overview of a potential value chain for plastic recycling.

4. Conclusion

The present Deliverable D1.1. "Analysis of plastic value chain" described a value chain for plastic waste management using the Danish company Vestfornrænding as an illustrative example. The deliverable describes how the technical system was

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developed to comply with legislation, be as simple as possible, and fulfill the needs of different stakeholders in the value chain. Examples of how contracts are negotiated and monitoring is implemented are provided. The deliverable also briefly discusses how the future systems for plastic waste management may evolve and how the technology proposed and developed in the UPLIFT project could play a role in the transition towards a circular economy for plastic. The present analysis is expected to be used as a benchmark scenario when analyzing the sustainability of the UPLIFT concept in WP5.

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6. ANNEX 1

Overview of (R3 certified) buyers of sorted plastic fractions from EGN's plant in Krefeld in Germany, cf. Figure 3. The fractions are sold via DKK Plastics to the listed recipients.

Fraktion after sorting	**Buyers**	
Pure Fraktion		
PE	PRH, Tyskland KRN, Holland MultiPET, Tyskland	6 R3 virksomheder
PP	PRH, Tyskland KRN, Holland	
PET	MultiPET, Tyskland	
Sort plast	PRH, Tyskland KRN, Holland John Erik Toft Ecoinvest, Bulgarien	
Folier	EGN, Tyskland Rom plast, Tyskland John Erik Toft Ecoinvest, Bulgarien	
Mixed Plast		
PO (mixed plast)	PRH, Tyskland Vogt Kunststoffe, Tyskland John Erik Toft Ecoinvest, Bulgarien	6 R3 virksomheder
Other sorted recyclable materials (incorrect sorting)		
Jern og hvidblik	Vebo/Sortech Recycling, Tyskland Boetzel Schrott, Tyskland	
Aluminium (NF)	Vebo/Sortech Recycling, Tyskland	
Papir/pap	EGN, Tyskland	

Waste to Energy	
Ikke genanvendeligt affald	EGK, Tyskland WSAA Neuss, Tyskland

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